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TITLE OF THESIS/TITRE DE LA THÈSE The Demand for Provincial and Local
Government Bonds

UNIVERSITY/UNIVERSITÉ Carleton University

DEGREE FOR WHICH THESIS WAS PRESENTED/
GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE Master of Arts

YEAR THIS DEGREE CONFERRED/ANNÉE D'OBTENTION DE CE DEGRÉ June 1979

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THE DEMAND FOR PROVINCIAL AND LOCAL
GOVERNMENT BONDS

by

BRUCE D. LISTER

A thesis submitted to Carleton University
in Partial Fulfillment of the requirements
for the degree of Master of Arts in Economics

April 1979

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The undersigned recommend to the Faculty of
Graduate Studies acceptance of the thesis "The
Demand for Provincial and Local Government Bonds"
submitted by Bruce Duff Lister, B.A. Honours,
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April 1979

Acknowledgements

I gratefully acknowledge the clear counsel of Professors Choudhri and Winer over the twelve months taken to complete this thesis. Successive drafts were improved largely because of their wise insistence that non-federal government bond supply would require a separate study, their application of Occam's Razor to prune extraneous argument, and their many theoretical clarifications. Much of this thesis was written in the early mornings and evenings after the author had completed the MA (Economics) requirements in the September 1977 - August 1978 year of educational leave graciously financed by the Government of Canada, and had resumed full-time duties with the Fiscal Policy Division of the Department of Finance. Last but not least, the forbearance of my family is greatly appreciated.

Bruce D. Lister
April, 1979

ABSTRACT

Lender demand equations are constructed for the quarterly net flow of Canadian, US and Eurobond market long-term portfolio investment in Canadian provincial and local government direct and guaranteed bonds for the period 1Q62 to 3Q78.

A simple flow demand model is found preferable to the incomplete stock adjustment model and the instantaneous adjustment model. Arguments for the OLS and 2SLS estimations of the simple flow and incomplete stock adjustment models are reviewed.

This study parts company with predecessors in that it models bond demand determinants as important in themselves, rather than as minor elements in primarily bond-supply models, in which Canadian non-federal governments allocate bond supply between several markets, largely unfettered by bond demand constraints within a finite, politically-acceptable range of relative yields.

Lender flow demand has been found to depend upon provincial and competing long and short-term yields, upon three risk factors, and upon proxies for investor portfolio size in Canada, the US and the Eurobond markets.

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CHAPTER 1

INTRODUCTION AND SUMMARY

Nature and Purpose of Thesis

In this study, lender demand equations are constructed for Canadian and foreign investment in provincial and local government bonds.

A number of forms of lender demand model are evaluated, the purpose being to see which performs best.⁽¹⁾ The forms tested are the simple flow model, the incomplete stock adjustment model and the instantaneous adjustment model. For the twin purposes of prediction and policy analysis, a simple linear model of net flow demand is found preferable to alternative flow and stock models. Arguments for the OLS and 2SLS estimations of each are reviewed.

This study parts company with predecessors in that it models bond demand determinants as important in themselves, rather than as minor elements in primarily bond-supply models, in which Canadian non-federal governments allocate bond supply between three markets, largely unfettered by bond demand constraints within a finite, politically-acceptable range of relative yields.

Lender flow demand has been found to depend upon provincial and competing yields, upon proxies for investor portfolio size and three

risk factors. Since the mid-seventies, some competing U.S. bonds suffered from the reappearance of significant defaults in U.S. non-federal government debt for the first time since the Depression. In Canada, there have been effects from resurgent worry about the national unity question since 1976. Quantification of the approximate effects on bond sales of the New York City fiscal crisis and the Canadian unity question represent an interesting econometric aspect of the recent history of the external relationships of the Canadian economy.

Summary of Contents of remaining Chapters and Appendices

Following this introductory chapter, the second chapter reviews the literature on capital flows. Chapter three describes the market for provincial and local government direct and guaranteed bonds. Chapter four outlines the specifications for the lender demand equations. Their estimation for the 1962-78 period and their interpretation are handled in chapter five. Conclusions are summarized in Chapter six.

Appendix I discusses the rationale for the consolidation, for debt study purposes, of provincial government direct debt with that of their municipalities, with the guaranteed debt of their crown-owned enterprises, and with their bonds held by the Canada and Quebec Pension Plan Investment Funds.

The data base and key to mnemonics are provided in Appendix II.

CHAPTER 2

A REVIEW OF THE LITERATURE ON CAPITAL FLOWS

Capital movement literature is composed of two streams: the older one centres around the "transfer problem", the mechanism of adjustment of the current accounts of borrowing and lending countries to an exogenous change in capital transfers. The second stream stems from the Meade-Tinbergen analysis of policy instruments and targets, and treats capital flows as endogenously influenced by variations in interest rates, incomes and exchange rates.

This more modern emphasis on the endogeneity of capital flows arose from the balance of payments problems since the late 1950's, and the theoretical work of Mundell and Fleming on internal and external balance. The interest-sensitivity of capital flows became recognized as of crucial importance to the relative strength of fiscal and monetary policies under fixed or flexible foreign exchange rate regimes.

Our concern in the context of this study is not the changing environment for fiscal policy, but the evolving views on the determinants of capital movements.

CAPITAL FLOW THEORY IN THE EARLY 'SIXTIES'

As Branson (1971) pointed out, until the mid-1960's, the standard theory of portfolio capital movements related capital flows to levels of interest-rate differentials. A country could

improve the capital account of its balance of international payments by raising its interest rates. As long as it kept them relatively high, the improvement would be sustained. Mundell (1960, 1962) assumed this relationship, and Kenen (1963) regressed the change in the stock of U.S. claims on foreigners on the level of interest rate differentials, finding evidence of interest sensitivity.

There were policy ramifications involving U.S. monetary policy and withholding taxes on foreign-source income. "Operation Twist" in the early sixties attempted to boost short-term rates to improve the capital account of the U.S. Balance of Payments, while keeping long yields down to stimulate domestic investment in plant and equipment, and thus U.S. growth. The interest equalization tax, that started in 1963-64 on the U.S. income from its new and already-issued securities by many foreign countries, was equivalent to a decrease in foreign rates relative to U.S..

This early flow theory of international portfolio flows co-existed with increasingly accepted theories of real investment and portfolio choice. As postulated by Jorgenson and others, neo-classical demand for investment goods presupposes the desired capital stock to be related to expected output and the user cost of capital good ownership (including interest and taxes). Ceteris paribus, changes in interest rates cause changes in the desired capital stock.

The generic specification of the flow theory of portfolio capital movements can be depicted:

$$\Delta B = f(r^0, r^a, W, \sigma) \quad (1)$$

where: ΔB is the net change in the stock of the financial asset or liability outstanding,

r^0 is the interest rate on "own" bond,

r^a is the interest rate(s) on the competing financial asset(s) or liability,

W is the wealth proxy for the size of the lender's portfolio, and

σ is the risk premium or discount assigned by the market to "own" and/or competing bonds.

Rhomberg's (1964) model of the Canadian economy included a specification of net long-term private portfolio flow determination between the U.S. and Canada:

1Q52 - 4Q59 "Limited Information Estimation Method"

$$\Delta B^C = -111 + 149 (r^{CF} - r^{UF}) + 83 W^{ui} + 89 Q1 + 60 Q2 + 57 Q3$$

(2.98) (3.46) (2.70) (1.82) (1.58)

DW = 1.29; SEE = \$65 million

where, using the standard notation employed throughout this thesis, (see pages 00-0):

ΔB^C is the net change in U.S. holdings of Canadian bonds,

r^{CF} is the long-term Canadian federal bond rate,

r^{UF} is the long-term U.S. federal bond rate,

W^{ui} is U.S. net foreign investment which serves as a proxy for lender portfolio size, and

$Q1$, $Q2$ and $Q3$ are seasonal dummies having the value of unity in the first, second and third quarters, respectively, and zero elsewhere.

What this flow equation says is that an increase in the Canadian long-term interest rate by 1% point on average in the 1952-59 period, with the U.S. rate remaining unchanged, would have raised permanently the portfolio capital inflow into Canada by about \$150 million at quarterly rates, or \$600 million, annually. Over the 1952-59 period the average interest-rate spread was 75 basis points, with a high of 1.36% and a low of .19%. U.S. portfolio investment tends to be about 8% of total U.S. net foreign investment plus or minus an amount depending upon the deviation of the interest rate differential from +.75%.

The \$150 million effect of the 1% point interest rate change in Rhomberg's study compares with a range from other flow theory studies from \$92 million in an earlier investigation by Rhomberg (1960) to a high of \$173 million in a study by Baguley (1969) with Officer (1968) and Freedman (1970) in between.

The flow formulation has been subject to theoretical criticism on two grounds:

- (i). it ignores the realignment of existing portfolios in response to a change in the rate differential between the own asset and its competitor(s);
- (ii) as indicated earlier, it implies a continuing capital flow in response to a given and unchanging rate of return differential even if borrower's and lenders' portfolios remain unchanged in size.

As Helliwell et al point out (1971) it is not adequate to defend the flow model on the grounds of high transactions costs in an environment of steady wealth growth. The existing size and structure of the portfolio ought to influence the allocation of portfolio increments in response to given rates of return.

The generic stock adjustment model of portfolio capital movements can be depicted as, alternatively:

$$\frac{B^*}{W} = f(r^0, r^a, \sigma) \quad \text{or} \quad B^* = Wf(r^0, r^a, \sigma) \quad (2)$$

where: B^* is the desired stock of assets or liabilities, and other variables are as defined in equation (1).

PORTFOLIO CHOICE THEORY

The model of portfolio choice pioneered by Markowitz (1959) and Tobin (1958, 1965) makes the distribution of assets depend on both their relative rates of return and risk. Given the size of the portfolio, changes in rates lead to changes in the allocation of assets and thus to capital flows. This implies that a relative boost in domestic interest rates will produce a one-shot stock-adjustment inflow of capital as portfolios are redistributed. "One-shot" can of course cover an extended period of time. As Tinbergen (1964) put it: "Monetary policy ... can indeed attract a certain amount of capital from abroad, corresponding with the interest offered. When demand for assets reaches its equilibrium at the new interest rate, no further inflow of foreign investment will, however, occur unless a further rise in rates is effectuated".

Tobin had earlier made the similar point: "A country cannot expect to cover a basic deficit on current or long-term investment account indefinitely by attracting short-term money, unless it is prepared to jack its interest rates higher and higher".

~
Amongst the investigators modelling the determinants of the stock of foreign claims were Bell (1962), Lee (1969) and Miller and Whitman (1970). From the standpoint of a capital exporting nation the stock view of international capital movements holds that the fraction of total assets held abroad is a function of the level of interest rates and of the risks at home and abroad.

An increase in the domestic interest rates of a capital-importing nation like Canada will cause a shift in the stock of foreign portfolios towards Canadian assets - the "stock-shift effect" -and, assuming a continuing growth in total foreign assets, a reallocation of marginal additions to portfolios towards Canadian assets - the "continuing-flow effect". It is presumed the "continuing-flow effect" is small compared to the "stock-shift effect". Permanent improvement to a country's capital account, in this view, could not depend on the small "continuing-flow effect", but on repeated discretionary interest rate boosts by the authorities to secure repeated "stock-shift effects". Hence Tobin's remark quoted earlier.

Two questions are left begging. The first is the equilibrium interest rate spread between regions in a country, or between countries like Canada and the U.S. in an optimal currency area, or

between countries in different optimal currency areas like North America and Europe. Canada, for example, is judged by foreign investors to have had sufficiently attractive prospects that it has been "permitted" to have peacetime deficits on current account for over a century, financed by a mix of direct investment and short and long-term private portfolio inflows. Sales of provincial bonds are a major component of the latter inflow. In the case of Canada the "stock-shift" and "continuing-flow" effects presumably are relevant to monetary policy actions that push interest spreads off trend.

The other question left hanging is the duration of the one-shot "stock-shift" effect. Hendershott (1967) interpreted the stock-flow controversy, that started with the studies by Bell (1962) and Kenen (1963), as revolving around the speed with which asset holdings are adjusted in response to changes in interest rate differentials. Hendershott correctly interpreted Kenen's regression of capital flows on the level of interest rate differentials as assuming a very slow speed of adjustment. However, Hendershott was not correct in assuming that the regression of stocks against the levels of rate differentials by Bell and successors always connotes fast adjustment. Simulations of long-term capital equations of a stock adjustment form, on the Bank of Canada's RDX2 model (1976, 1977), suggest a duration of adjustment lasting over a decade.

Adjustment to the desired stock can be completed or not within the current time period. Incomplete adjustment to the change in the stock can be depicted:

$$\Delta B = \lambda (B^* - B_{-1}) \quad (3)$$

where: $0 < \lambda < 1$

From specification (3):

$$\begin{aligned} \lambda B^* &= \Delta B + \lambda B_{-1} \\ B^* &= \frac{\Delta B + B_{-1}}{\lambda} \end{aligned} \quad (4)$$

From alternative specifications (2) and (4):

$$\begin{aligned} \frac{\Delta B + B_{-1}}{\lambda} &= Wf(r^0, r^a, \sigma) \\ \Delta B &= \lambda Wf(r^0, r^a, \sigma) - B_{-1} \end{aligned} \quad (5)$$

The instantaneous adjustment to the designed stock assumes:

$$B = B^* \quad (6)$$

In terms of first differences the portfolio capital equation in this instantaneous adjustment case is approximately equal to (from equation 2):

$$\Delta B = \Delta B^* = \Delta Wf + W(f_1 \Delta r^0 + f_2 \Delta r^a + f_3 \Delta \sigma) \quad (7)$$

Let us examine an example of Freedman's (1970) application of stock theory to U.S. portfolio capital demand for Canadian provincial foreign-pay bonds.

$$\frac{B^u}{W^u} = 0.008 + 0.0004 (r^{cp} - r^{up}) - 0.161 RT + 0.688 \frac{B^u}{W^u - 1} - 0.0010 DUM4$$

$$(5.3) \quad (1.1)$$

$$R^2 = .97; \quad DW = 2.10;$$

$$(5.4) \quad (10.8)$$

$$SEE = 0.0004$$

$$(5.1)$$

where $\frac{B^u}{W^u}$ is the ratio of U.S. holdings of foreign-pay provincials over a proxy for U.S. wealth,

$r^{CP} - r^{UP}$ is the interest differential between the yields on Canadian-pay and U.S.-pay provincial bonds,

RT is the reciprocal of time since 1Q46, because Alberta completed its debt re-organization program in 1945 and no province has defaulted since, and

$DUM4 = 1$ for 1Q61 - 3Q62 reflecting U.S. investor nervousness that began with the imposition of a Canadian withholding tax on new issues of external bonds held by foreigners and ended with the fixing of the external rate on the Canadian dollar.

Stock specifications for U.S. holders of provincial Canadian-pay bonds were also estimated.

To overcome possible simultaneous equation bias, Freedman re-estimated the lender equations using instrumental variables. He solved for r^{CP} with all the independent variables from the supply and demand equations as instruments. The use of instruments increased the magnitude and significance of the coefficient of the interest differential variable in the provincial supply equation, reduced it in the municipal supply equation, increased it in the municipal demand equation, and made no change in the provincial demand equation.

Calculation of the equilibrium values for the borrower and lender stock demand equations appears to indicate most of the adjustment for provincial bonds to have occurred within 3 time periods.

Freedman's U.S. lender demand equation says that a 100 basis point increase in the domestic bond rate in the sample period (1Q55 - 1Q62, 3Q62 - 4Q66) led to a \$254 million increase in U.S. holdings

of provincial and municipal bonds, \$57 million in federal, and \$457 million in corporates. Of the \$768 million total, 46% occurs within the first year after the change in interest rates.

The distinction between foreign holdings of Canadian-pay and foreign-pay Canadian bonds was not pursued in the latest versions of the Bank of Canada's RDX2 model or its predecessor. Helliwell et al (1971) did not view foreign-held Canadian-pay securities as a distinct commodity for which there could be independent supply and demand equations.

Helliwell et al distinguish between borrower-dominated gross new issues abroad and argue that international trade in outstanding bonds is guided by short-run demand motivations, while Freedman cites evidence that this is not invariably so. Among other things this evidence points to the fact that international trade in outstandings is extremely small relative to changes in the foreign-held stock of Canadian bonded debt or gross new bond issues.

Just as the pure flow form has unrealistic equilibrium properties in that it can be shocked into never-ending adjustment, so the pure stock form without an allowance for adjustment lags "implies rates of capital flow that become infinitely large as the length of the observation period approaches zero". (Helliwell et al, 1971). Ideally a theoretically appropriate model should contain elements of both the pure stock and flow approaches. (1)

CHAPTER 3

Recent trends in Provincial and Local Government Bonds

Recent trends in Provincial-Local Cash Requirements and Financing

The direct and guaranteed debt of the provincial-local sector has grown markedly in the past decade, especially in the mid-seventies. About 80% of the liabilities of this sector are in bonded debt form. Overall, its bonded debt totalled \$83 billion at the end of 1978, over \$56 billion held in Canada, \$19 billion in the United States and over \$7 billion in Germany, Switzerland, the Middle East, Japan and elsewhere. About 80% of this foreign-held debt may be denominated in foreign currencies (Economic Council of Canada, 1977). The annual flow in the bonded debt of this sector in recent years has been averaging over \$8 billion, of which about \$3 billion is from abroad and finances an important part of Canada's international current deficit of around \$5 billion annually. The derivation of sector borrowing requirements, and their financing by instrument are given in Table 1.

Table 1

PROVINCIAL AND LOCAL GOVERNMENT AND CROWN ENTERPRISE

BORROWING REQUIREMENTS AND FINANCING, 1974-77

(in \$ millions, on the basis of Statistics Canada's National Economic and Financial Flow Accounts)

<u>Derivation of Borrowing Requirement</u>	<u>Actual</u>		<u>Preliminary</u>	
	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
PLH Revenues	32,630	37,411	43,287	50,907
Expenditures	32,715	39,654	45,779	51,162
Deficit	-160	-2,055	-2,517	-255
PLH Crown Enterprise Saving	904	505	1,049	1,414
Investment	-3,594	-5,863	-5,867	-6,835
Deficit	-2,690	-5,358	-4,818	-5,421
PLH Govt. & Enterprise: non-budg reqt.	2,517	1,719	1,775	3,555
-increase (-) in cash	-330	-505	-2,311	-224
-borrowing reqt.	5,697	9,637	11,421	9,455
Canada & Quebec Pension Plan Surplus	1,693	1,899	2,109	2,235
Borrowing Req't. (ex. CPP & QPP)	4,004	7,738	9,312	7,220

Financing by Instrument

Prov. domestic marketable and saving bonds	932	1,559	1,820	2,124
Provincial foreign-pay bonds*	1,487	2,921	4,384	2,588
Local domestic-pay bonds	390	726	539	644
Local foreign-pay bonds*	160	479	699	278
Bank loans (ex. med. & long-term)	489	581	389	-126
Short-term paper	-55	342	22	-279
Other**	601	1,130	1,459	1,991

* Sum of provincial and local govt. foreign-pay issues excluding both trade in outstanding bonds and medium-term bank loans:	1,647	3,400	5,083	2,866
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** Includes non-marketable bonds issued by provinces to the CPP Investment Fund. Also includes syndicated medium and long-term bank loans.

The surge in provincial-local debt came with:

- (i) the 1974 structural reform in the form of the indexation of personal income tax,
- (ii) the first-ever exercise of significant discretionary stimulus in the form of the billion dollars in tax cuts by large provinces in the 1975 recession, which coincided with
- (iii) Olympic installations and
- (iv) an upswing in provincial energy investment to double its previous peak percentage of GNE in the mid-sixties.

With most Canadian electrical capacity owned and guaranteed by provincial government, the parent-guaranteed bond financing of such projects as Quebec's James Bay development and Ontario's nuclear programme threatened to pre-empt some of the prudent unborrowed direct debt capacity of provinces and local governments, posing challenges for fiscal and debt management from the 'mid-seventies onward.

Ontario, for example, perceived that the combination of its government expenditure growth and Ontario Hydro borrowing requirements would diminish Ontario's credit status and market

reception to Ontario offerings. "Hydro capital appetite became a dominant factor in the government's budgetary planning strategy. Consequently, Ontario embarked on a program of severe restraint and limited Hydro's borrowing to \$1.5 billion for the years 1976, 1977 and 1978". (Ontario Treasury, 1978). The outcome has been a stretching out of some projects and postponement of others.

During this process the Ontario Treasury developed a methodology to forecast a trend of borrowing limits of capital availability which under normal market circumstances would preserve credit status. Its econometric detail has not been seen by this author.

The relevance of the Ontario study to this study is that both represent an extension of econometric analysis from one source of funds - tax revenues - to the other major source - net new debt proceeds. Both elements would be essential building blocks in a complete non-federal government finance model.

TRENDS IN TYPES OF HOLDINGS OF PROVINCIAL-LOCAL BONDS

This study models about 80% of provincial-local net new debt flows in the form of Canadian and foreign-held bonds which ran at an average quarterly rate of \$2,023 million in 1978. Of this total, Canadian-held bonds accounted for \$1,636 million or 81%, somewhat above their 72% average from 1962 to 1978.

The foreign-held component totalled \$387 million, of which US-held bonds accounted for \$199 million quarterly or 10%, and Eurobonds accounted for \$188 million quarterly or 9% of the all-bond total.

The remaining 20% of provincial-local net new debt flows was in bank loans, short-term paper, trade payables, mortgages and federal loans, etc.

Table 2, on page 19, shows the annual growth in total holdings of provincial and local government bonded debt accelerating from an average of 10.3% in the 1961-1971 period to 13.8% in the 1972-78 period. Of this, the Canadian-held component accelerated somewhat more slowly from 10.3% to 12.4%, while the foreign-held component accelerated more quickly from 10.4% to 17.9%. The US-held sub-component rose from 9.2% to 14.8% over the two time periods. Eurobond market holdings were negligible until 1968. They then grew extremely rapidly. In the 1972-78 period their growth was 29.6% annually.

Within Canadian overall holdings, the extension of state pension provision in the form of the Canada and Quebec Pension Plans from 1966 onwards, and the flow of oil royalties into Alberta's Heritage Trust Fund and General Revenue Fund after world oil prices quadrupled in 1973, caused private sector holdings

to grow at slower rates (6.5% and 9.5%), than the public sector's holdings (19.7% and 15.0% in the 1961-71 and 1972-77 periods, respectively).

The growth in the stock of provincial-local bonded debt slowed in 1977, because: (i) Quebec's huge hydro bond placement in the US in 1976 involved some borrowing ahead of needs; (ii) Quebec subsequently resorted to medium and long-term syndicated bank loans denominated in Canadian and foreign currencies which took the place of bonds to some extent; and (iii) as implied earlier, provincial and local direct deficits narrowed somewhat, and crown corporation investment projects were stretched out or postponed.

Towards the end of our sample period, A.C. Tomlinson, Chairman of First Boston Corporation, a large underwriter of provincial bonds in the U.S., was warning that provincial external borrowing had risen to unsustainable levels in 1976. (Tomlinson, 1976)

By early 1977, the U.S. Securities and Exchange Commission (SEC) was reacting to the reappearance of significant defaults in U.S. non-federal government debt and the peak rate of Canadian provincial external borrowing. The SEC pushed successfully for disclosure of more inter-governmentally comparable data on all consolidated public debt within a province on the prospectus of any province borrowing publicly in the U.S. (Chudy, 1977)

TABLE 2 DISTRIBUTION OF STOCK OF PROVINCIAL AND LOCAL GOVERNMENT
BONDED DEBT, BY HOLDER (PAR VALUES, IN \$ MILLIONS)

	AT END OF CALENDAR YEAR				
	1961	1966	1971	1976	1977
Persons and unincorp. business	2,774	4,254	4,578	7,261	9,166
Non-financial private corps.	-	-	-	25	29
Fed. Non-financial enterprises	13	17	10	4	6
Provincial non-fin. enterprises	29	292	312	367	437
Monetary Authorities	-	-	-	-	-
Chartered banks	583	607	1,049	1,010	855
Trust Cos. & Other "near-banks"	649	882	1,586	2,267	2,386
Insce. and pension funds	3,308	4,880	6,199	10,389	10,973
Investment dealers & other private instns.	463	673	1,171	1,622	1,822
Fed. financial institutions	-	-	1	1	1
Prov. Fin. Instns (incl. QPP but excl. CPP)	28	205	1,068	2,722	3,144
Federal government	10	24	18	12	14
Prov. and local govts (incl. hospitals)	1,737	2,952	5,129	8,059	9,557
Canada Pension Plan	-	463	4,420	10,541	12,184
Rest of World	2,809	4,539	7,538	19,622	22,539
of which: US	2,633	4,346	6,322	14,498	15,830
Europe & other	138	158	1,191	5,027	6,557
Unallocated valuation adj.	38	35	25	107	152
Total	<u>12,403</u>	<u>19,788</u>	<u>33,079</u>	<u>63,902</u>	<u>73,113</u>

Sources: Statistics Canada: Financial Flow Accounts, Volume II, 1961-1976.

(Catalogue 13-563 Occasional System of National Accounts)

Statistics Canada: Financial Flow Accounts, Fourth Quarter 1977

(Catalogue 13-002 Quarterly)

TABLE 3 DISTRIBUTION OF STOCK OF PROVINCIAL AND LOCAL GOVERNMENT BONDED
DEBT, BY HOLDER (% SHARE OF TOTAL)

	<u>1961</u>	<u>1966</u>	<u>1971</u>	<u>1976</u>	<u>1977</u>
Persons and unincorp. business	22.4	21.5	13.8	11.4	12.5
Non-financial private corps.	-	-	-	-	-
Fed. Non-financial enterprises	0.1	0.1	-	-	-
Provincial non-fin. enterprises	0.2	1.5	0.9	0.6	0.6
Monetary Authorities	-	-	-	-	-
Chartered Banks	4.7	3.1	3.2	1.6	1.2
Trust Co. & Other "near-banks"	5.2	4.5	4.8	3.5	3.3
Insce. and pension funds	26.7	24.7	18.7	16.3	15.0
Investment dealers & other private instns.	3.7	3.4	3.5	2.5	2.5
Fed. financial institutions	-	-	-	-	-
Prov. Fin. Instns (incl. QPP but excl. CPP)	0.2	1.0	3.2	4.3	4.3
Federal government	0.1	0.1	0.1	-	-
Prov. and local govts (incl. hospitals)	14.0	14.9	15.5	12.6	13.1
Canada Pension Plan	-	2.3	13.4	16.5	16.7
Rest of World	22.6	22.9	22.8	30.7	30.8
of which: US	21.2	22.0	19.1	22.7	21.7
Europe & other	1.1	0.8	3.6	7.9	9.0
Unallocated valuation adj.	0.3	0.2	0.1	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0

Sources: Statistics Canada: Financial Flow Accounts, Volume II, 1961-1976.
(Catalogue 13-563 Occasional System of National Accounts)
Statistics Canada: Financial Flow Accounts, Fourth Quarter 1977
(Catalogue 13-002 Quarterly)

As can be inferred from the primarily long-lived assets for which provinces and their agencies borrow money, their median debt maturity is 15-20 years.

The desire for long maturities matches the retirement income motives of persons and their pension intermediaries in Canada, the US and elsewhere. It is not surprising that Table 2 shows the main holders of provincial and local debt are persons, insurance and pension funds and the Canada and Quebec Pension Plan Investment Funds. A breakdown of US and other foreign holdings would confirm the similar predominance of insurance and pension fund holders abroad.

In Table 3, the shares of persons, insurance and pension funds, provincial financial institutions and foreign sector has been rising within the 72-79% range.

The only significant non-retirement motive for holding provincial and local bonds is the purchase of own-sector bonds by provinces and municipalities themselves. Table 3 indicates their share of holdings to be in the 13-16% range.

The effect of higher inflation and higher expectations for real retirement income has been to involve the state more in pension provision, and for private pension fund managers to

compete more in their share of the market. For example, consciousness of rate of return considerations is honed far more finely nowadays than in the 1950's after the 1939-51 era of pegged bond prices. In this study of the determinants of the demand for provincial and local bonds, it is therefore not surprising that rate of return coefficients are significant and robust. The state-administered Canada Pension Plan Investment Fund assets bear a yield related by formula to market long bond rates. The Quebec Pension Plan assets bear market-determined yields, and so do those of the Alberta Heritage Trust Fund and the Alberta General Revenue Fund.

Since the post-war reintroduction of flexible interest rates, the risk of inflation and the cycle in bond prices have assumed paramouncy, whilst the Depression-spawned risks of default have receded into the background. The last reorganization of governmental bond default in Canada - involving Alberta ironically enough - was completed in 1946. For years, the only reflection of this type of risk was seen in a widening of the yield spread, vis-à-vis Ontario and the Federal government, for provinces whose share of total financing started exceeding traditional norms. (Wust, 1967) In 1970, and again in the 1977-78 period, the market perceived the necessity of a risk premium for Quebec bonds to reflect the adverse consequences of the possible separation of that province from the rest of Canada. The latest episode followed the 1974-1976 peak of the fiscal crisis in New York city. During this period US municipals

Baa-Aaa yield spread widened considerably above normal. (Melton, 1977) In the first quarter of 1976, in that era of relative attractiveness of Canadian bonds, Quebec was able to make a single bond placement worth over \$1 billion in the US market. This temporary increase in the perceived risk on US competing instruments diverted perhaps \$400 million a quarter extra to Canadian provincial-local bonds.⁽¹⁾

However, from 2Q76 through the end of the estimation period, the marketability abroad of some provincial-local bonds was harmed by the deleterious effect on foreign investor confidence of intra-provincial wrangling over Olympic financing in 1976, and the resurgence of the national disunity question following the election of the Parti Québécois late that year. During the intervening period, the US bond market assigned part of the debt of the provincial-local sector to a higher risk category. (Wynant & Thibeault, 1978). Quebec-Ontario yield spreads were significantly wider. To some extent syndicated medium and long-term bank loans took the place of what would have been bond issues. Lacking published time series on such bank loans and bonds combined, this author used bonds alone, but successfully included this risk variable on Canadian provincial-local bonds abroad. It is set at unity for the 2Q76-4Q78 period, and zero at all other times. This cost Canada an average of perhaps \$375 million a quarter in bond inflows, necessitating replacement inflows in the form of syndicated bank loans abroad. This and other factors have led to syndicated bank loans being supplemented by the sale of official reserves and the sale of federal bonds abroad.

In the final half of 1978, Eurobond market aversion to North American foreign exchange rates caused a cessation of Canadian provincial and local bond issues there. This cost Canada perhaps \$350 million for each of two calendar quarters.

A final institutional point about this bond market is that debt suppliers and debt absorbers think in net flow terms. Governments think in terms of the annual flow of financial requirements to be met in capital markets. Institutional investors periodically decide on the allocation between types of financial instrument of the incoming net flow of deposits and premiums, etc. There is much less emphasis on the cumulated stock of financial liabilities and the allocation between instruments of the cumulated stock of financial assets. Secondary trading markets have improved for provincial and local government long-term bonds, and corporate bonds and mortgages, their main competitors. Nevertheless, a preponderance of this type of fixed income security stays in one institution's possession from origination to maturity. The typical large holder is faced at debt maturity with not only a rollover decision, but also whether to take up some of the new increment offered. Holders of provincial bonds other than the particular issue being refunded usually have the choice of swapping similar bonds in exchange for the new issue or paying cash. The debt retirement-debt new issue decision is inter-related, both on the side of the debt issuer and also on the side of the investor. This suggests modelling of net flows rather than gross new issues, gross retirements and trade in outstandings separately.

This parts company with RDX2, in which these three elements are treated separately, and the university of Toronto FOCUS model, in which set new issues and trade in outstandings are modelled separately.

(Jump, Duggan et al 1978)

CHAPTER 4

THE MODEL OF THE MARKET FOR PROVINCIAL AND LOCAL GOVERNMENT BONDS

To represent investor demand for provincial and local government bonds we use the following linear approximation of the incomplete stock adjustment model (5) in Chapter 2⁽¹⁾:

$$\Delta B = \pm \alpha_0 + \alpha_1 r^o - \alpha_2 r^a + \alpha_3 W^L - \alpha_4 B_{-1} + \alpha_5 \sigma \dots \quad (8)$$

where:

ΔB is the net change in provincial-local bonds held in a particular market,

α_0 is a constant,

$\alpha_1 r^o$ is the expected interest rate on provincial bonds,

$\alpha_2 r^a$ is the expected interest on competing instrument(s),

$\alpha_3 W^L$ is the wealth of the lender country,

$\alpha_4 B_{-1}$ is the stock outstanding of provincial-local liabilities in the particular market, lagged by one calendar quarter, and

$\alpha_5 \sigma$ are dummy variables representing seasonal and perceived risk factors assigned by investors to foreign bonds and/or provincial bonds.

The expected signs before each coefficient are as indicated in specification (8) above.

The simple flow model can be viewed as a special case of specification (8), in which:

$$\alpha_3 = 0, \alpha_4 = 0, \text{ and } \alpha_1 = \alpha_2,$$

The instantaneous adjustment version, from equation (7), can be written as: (2)

$$\Delta B = \alpha_0 + \alpha_1 \Delta r^0 - \alpha_2 \Delta r^a + \alpha_3 \Delta W^L + \alpha_4 \sigma \dots \quad (9)$$

In the next chapter we estimate specifications (8) and (9) to test their relative performance, using quarterly unadjusted data. (3)

Market demand for provincial-local bonds institutionally divides into domestic and foreign compartments. In turn foreign holdings can be divided into U.S. and Eurobond market holdings. The latter consists of Europe, OPEC surplus countries, South Africa, Japan and other East Asian countries such as Malaya and Singapore.

As a proportion of total annual flow demand for provincial-local bonds, Canadian holders accounted for 53 to 106% during the 1962-78 period, for an average of 71%. All foreign holders accounted for -6 to 47% annually, for an average of 29%.

Aggregation is of course a problem for the determinants of other foreign demand. There is a precedent for the use of the Swiss Government bond yield, a proxy for the German rate, as the representative

competing rate of return in the Eurobond market (Bank of Canada, 1976, 1977). However, there are no precedents to fall back on with respect to the wealth of the principal lender countries in the Eurobond market. Nominal GNE suggests itself as a useful proxy, however quarterly data are not available for several countries. Those who would aggregate GNP from different optimal currency areas have to confront the "Gershenkron Effect". For example, in adding Indian and US GNP how does one decide on a common unit value for the output of domestic servants, which is cheap in India but prohibitively expensive in the US. Without adjustment for this problem, we aggregated the quarterly nominal GNP in US dollars of West Germany, Japan and Saudi Arabia. The resulting time series was multiplied by C^{EQ} - the dummy variable valued at zero before 1Q68, and unity thereafter, to denote the recommencement of large-scale portfolio capital exports by countries outside North America.

The specification of the simple flow model to be estimated for the domestic and the two foreign sectors is:

$$\Delta B^C = \beta_1 r^{CP} - \beta_2 r^{CM} + \beta_3 W^C \quad (10)$$

$$\Delta B^U = \gamma_1 r^{CP} - \gamma_2 r^U - \gamma_3 r^{US} + \gamma_4 W^U - \gamma_5 \sigma^C + \gamma_6 \sigma^U \quad (11)$$

$$\Delta B^{EQ} = \theta_1 r^{CPQ} - \theta_2 r^{EQ} - \theta_3 r^{ESQ} + \theta_4 W^{EQ} + \theta_5 \sigma^{EQ} \quad (12)$$

The key to the standardized notation in above specifications (10) to (12), used throughout the remainder of this thesis, is given in Appendix II. Let us discuss in turn specifications (10) to (12).

Specification (10) says that the net new Canadian flow demand for provincial-local bonds (ΔB^C) is positively associated with the expected provincial bond yield (r^{CP}), and Canadian private bousehold wealth (W^C). It is negatively associated with the expected Canadian mortgage yield (r^{CM}).

It will be noted that there are no risk variables in the Canadian demand equation. Except where specifically proxied, it is assumed there is a constant level of risk in relevant assets from 1962 to 1977. I found the reciprocal of time since the Alberta Government bond reorganization in 1946 to be insignificant. While memories had not faded by the early sixties (Fullerton, 1962), they had faded by the end of that decade (Freedman, 1970). In "reduced-form" supply-demand equations (Bank of Canada, 1976, 1977; Jump, Duggan, et al, 1978), such supply intervention variables as Canadian federal "suasion" against Canadian borrowing abroad in the early sixties and in 1970 have proved significant. Government intervention that directly acted on the after-tax yields on new bond holdings had been found significant in earlier studies. However, the Canadian Withholding Tax changes of the early sixties, and the US Interest Equalization Tax episode of 1963-4, were not found significant in our Canadian or foreign specifications of bond demand. As will be noted below, Canadian and US bond risk variables are found significant in the US demand equation, and a North American risk variable is found significant in the Eurobond market equation.

Let us now discuss in turn the measures used for the expected rates of return on "own" bond liabilities and those on competing assets and wealth.

It is assumed in the Canadian and foreign equations, that expected (holding-period) yields best equal current yields, the only exception being mortgages.⁽⁴⁾ Statistical fit is slightly superior when the Canadian residential mortgage yield is lagged over the current and immediately-preceding calendar quarter, than when it is unlagged and in conformity with all other current interest rates in the model.⁽⁵⁾

Competing asset yields are only epitomized by one long-term rate and one short-term rate.⁽⁶⁾ In the Canadian case it is mortgages only.

As indicated above, asset yields are regressed as separate variables. Rejected alternatives included the spread(s) between the provincial bond yield and current yields on mortgages or federal bonds, non-normalized, or normalized by being divided by the competing yield.

To measure the size of lenders portfolios in Canada I tried the following four candidate proxies for wealth:

- (i) the private household wealth series constructed by the Bank of Canada for RDX2,
- (ii) Canadian nominal GNE,
- (iii) Canadian nominal GNE divided by the federal long bond rate, or

- (iv) Canadian GNE, discounted as in (iii) and averaged over eight calendar quarters.

The Bank of Canada series on private household wealth performed best, and is the only measure of Canadian wealth reported on in the next chapter.

Specification (11) says that net new US demand for provincial-

local bonds (ΔB^u) is positively associated with the expected provincial bond yield (r^{cp}), US private household wealth (W^u) and a New York City fiscal crisis variable (σ^u). It is negatively associated with the expected US Aaa corporate bond yield (r^u), the expected US 90-day federal treasury bill rate (r^{us}) and a Canadian disunity risk variable (σ^c).

In the US market context, let us return to the measures used for the expected rates of return on "own" bond liabilities and those on competing assets, wealth and risk.

Time series on US-pay provincial yields for the entire 1962-77 sample period were not available. To fall back on the current Canadian-pay series is to assume constant yield spreads (i) between Canadian-pay and US-pay provincial bond yields on outstanding bonds (ii) between new issue yields and those on representative outstanding bonds and (iii) between the yields on Canadian provincial and local government bonds.

As in the Canadian and Eurobond market specifications, competing asset yields are restricted to one long-term and one short-term. Aaa corporates were chosen as the closest long-term substitutes for Canadian provincial-local direct and guaranteed bonds. US municipals (i.e. state and local bonds) are tax-exempt. Their competitors in the US market (including Canadian provincial and local bonds) are not exempt from tax in the US. The majority of Canadian provincial bonds abroad are for their crown-owned and guaranteed electric utilities. Their "opposite numbers" in the US are for the most part corporate bonds issued by the private sector.

The US short-term rate is the federal 90-day treasury bill rate. As in the Eurobond market, short-term instruments are moderate competitors for normally long-term funds. In periods of heightened anticipation of yield increases investors temporarily park more long-term funds in short-term instruments. (7)

To measure the wealth term in the US market I tried four candidate proxies equivalent to those discussed for Canadian lender portfolio size. The Bank of Canada series of US private household wealth performed best, and is the only measure of US wealth reported on in the next chapter.

It can be argued that bond demand is influenced separately from yields, risk or wealth, by the bond marketing development budgets of bond dealers. The penetration of foreign markets beyond the traditional US north-east and mid-west into the US south-west

and into offshore Eurobond markets entailed very considerable business development. This idea was not pursued because of a lack of a satisfactory index of bond dealer business development budgets in new areas.

As described in Chapter III there are two risk variables in the US equation. The New York City fiscal crisis is valued at unity from 4Q74 to 1Q77, the peak of investor uncertainty over poor-quality US municipals and public utility bonds that was catalyzed by the crisis. It is valued at zero before 4Q74 and zero after 1Q77 when New York City's immediate problems were alleviated by US federal transfers and other measures. This variable is positively associated with US demand for (higher-quality) Canadian provincial-local bonds. The Canadian bond risk variable, reflecting inter-governmental wrangling over the financing of the Montreal Olympics and the election of the Parti Quebecois in November 1976, is negatively associated with US demand for Canadian provincial-local bonds. It is valued at unity from 2Q76 to the end of the estimation period. Before 2Q76 it is valued at zero, despite earlier periods in which separatist feeling caused Ontario-Quebec yield spreads to widen temporarily.

Specification (12) says that the net new Eurobond market demand for provincial-local bonds (ΔB^{EQ}) is positively associated with the expected provincial bond yield (r^{cp}) and a proxy for the size of foreign investment portfolios outside the US. (W^{EQ}). It is negatively associated with the expected Swiss federal government long-bond yield (r^{EQ}) and the Eurodollar deposit rate. (r^{ESQ}) Because Eurobond market

demand was negligible before 1Q/78, all variables were multiplied by a dummy variable (C^{EQ}) valued at zero before that date and unity thereafter.

As described in the third Chapter, there is one risk variable (σ^{EQ}) in the Eurobond market equation, set at unity for 3Q78 and 4Q78, to denote the culmination of Eurobond market lack of confidence in North American exchange rates.

Not discussed until the next chapter is the question of the influence of the onset of a floating foreign exchange regime for Canada in particular after 2Q70 and for the Western World in general after 4Q72.

SUPPLY AND THE ESTIMATION PROCEDURE

In this thesis we are mainly concerned with modelling the demand equations. However, some view of the supply function is necessary for the purpose of properly estimating these relationships. The problem can be illustrated by considering the following two extreme cases.

We consider two extreme cases: -

$$r^{CP} = \overline{r^{CP}} \quad (13)$$

In this first extreme case, the government sets the yield on its bond offerings (r^a), and the demand equations determine the amount as well as its composition. (see diagram 1). In this case supply is perfectly elastic at $\frac{1}{r^{CP}} = \frac{1}{r^{CP}}$

While this specification is convenient, as the interest rate is exogenous specifications (1) to (12) can be estimated by ordinary least squares. It has been argued however that this is not a plausible description of government borrowing behaviour. (8)

Diagram 1

At the other extreme the government could fix the total amount to be borrowed and then let the demand equations determine the interest rate (r^{CP}) and the composition of borrowing between sources. In this case the supply curve is vertical. (see diagram 2).

Letting $\bar{S}$ represent the sector's net new bond issues, we assume that:

$$S = \bar{S} \quad (14)$$

While (14) would appear to be a more realistic assumption than (13), specifications (10) to (12), if estimated by ordinary least squares, would exhibit simultaneous equation bias.

Diagram 2

The following diagram helps to illustrate the downward nature of the bias in ordinary least squares estimation in the case in which the government sets the amount to be borrowed.

Suppose some exogenous factor drives up bond demand from DD to $D'D'$. As shown in Diagram 3, the price goes up while the interest rate goes down. This means that the error term in the demand equation is negatively related with the interest rate. Thus ordinary least squares estimates are likely to be biased downwards.⁽⁹⁾ A proper estimation procedure in this case would be to use correctly-specified two stage least squares.

Diagram 3

In the next chapter we present both ordinary least squares and two stage least squares estimations.

CHAPTER 5

ESTIMATION RESULTS

The time series used in this study are reproduced in Appendix III. As indicated earlier all data series are quarterly and unadjusted for seasonality. Measurement problems in the wealth, yield and risk terms were discussed earlier.

The estimation period is from 1Q62 to 4Q78.

Estimation results are presented in Tables 4 to 6. Tables 4 and 5 present OLS and 2SLS estimations, respectively, based on the simple flow and linear incomplete stock adjustment models of investor net demand for Canadian provincial and local government direct and guaranteed bonds in the Canadian, US and Eurobond markets.

For the most part, 2SLS coefficient values are higher than OLS, confirming the bias expected. Since there is a fair degree of similarity on the whole between the OLS and 2SLS results, our discussion will concentrate on the OLS results which are simpler to interpret.

The preferred equations of Tables 4 and 5, which exclude the lagged stock of own bond liabilities in each market, have coefficients whose signs are in the expected direction, and significant in all instances except the provincial bond rate in the Canadian

equation. For estimation periods up to 4Q77 the provincial yield was significant. Future revisions to Canadian Financial Flows data for 1978 might help in this regard.

<u>Explanatory Variable</u>	<u>Expected Direction of Sign</u>
Provincial interest rate	>0
Competing interest rates	<0
Lender wealth	>0
Canadian bond risk	<0
US bond risk	>0

The coefficients of Canadian equation 10(a) and foreign equations 11(a) and 12(a) are generally plausible in size, although the Canadian bond risk variable (-\$456). million per calendar quarter) would appear too high.⁽¹⁾

Let us explore the meaning of the simple flow equations, 10(a), 11(a) and 12(a).

A 1% point increase in bond offering yields by provincial treasurers, ceteris paribus, would have boosted net flow demand for provincial and local government bonds by \$117 million per calendar quarter from 1Q62 to 4Q78, or an annual average of \$468 million.

This suggests for the 1962-78 period that under a fixed exchange rate, a narrowing in the Canada provincial-U.S. corporate yield spread of 1%, caused by a fall in the Canadian yield, with analogous narrowing between Canadian and Eurobond yields, would have incurred a loss of \$373 million from foreign exchange reserves.

If caused by an unmatched increase in the U.S. rate the loss would have been a similar \$376 million. Under a semi-flexible regime, the adjustment could be shared between official reserves of foreign exchange and the external value of the Canadian dollar. Under a fully flexible regime the effect would be wholly felt on the dollar of course.

Since the coefficient of the short-term yields in the US equation is about one seventh of the long-term bond yield coefficients, a 1% point change in the competing short rate would only have about 13% of the foregoing effect described with respect to long rates.

The implication of quarterly growth in Canadian, US and Eurobond lender country wealth at an annual equivalent of 10% during the 1962-78 period would have been a quarterly growth in demand for provincial-local bonds of \$94 million, \$47 million domestic in origin and \$47 million foreign.

Allocation amongst provinces on the very approximate basis of economic shares would have implied, of the \$94 million in Canadian and foreign demand for the bonds of this sector, that \$6 million would have been for Atlantic Canada's provinces, municipalities and electric utilities, \$23 million for Quebec, \$38 million for Ontario, and \$27 million for the West. (2)

As indicated in Chapter 3, the direct effects on sales of provincial-local bonds in the US of the newly-perceived risk in US municipals from 4Q74 to 1Q77 were to divert \$400 million a quarter to Canadian provincial-local bonds. In the opposite direction, the newly-perceived risk on Quebec-related provincial-local bonds from 2Q76 through the end of our estimation period in 4Q78, diverted \$375 million a quarter in US demand away from provincial-local bonds.

It is of interest to note the following results from sensitivity tests on a forecast for 1979 of ex ante demand for provincial-local bonds, using Canadian equation (10a), a combined US and Eurobond market equation, and prevalent publicly-available forecasts of interest rates and wealth. (3)

(SUMMATION FOR CALENDAR 1979 OF RAW QUARTERLY DATA IN \$ MILLIONS)

	<u>Canadian</u>	<u>US & EURO.</u>	<u>TOTAL</u>
Base Case Forecast	6429	2635	9064
Sensitivity to:			
Mortgage Yield +1% Pt.	-520		-520
Prov. Bond Yield -1% Pt.	-546	-1146	-1692
US Corp. Yield +1% Pt.		-1366	-1366
Cdn. Wealth +10%	55		55
US & EURO. Wealth +10%		56	56
Cdn. Bond Risk -.5 (1Q79-4Q79)		792	792

In 1979, if US interest rates were to climb say a further 1% point, and if Canadians were not to match it, nearly \$1400 million in US and Eurobond demand would switch away from Canadian provincial-local bonds.

If there were a halving of the Canadian disunity risk premium perceived as necessary in the US on Canadian provincial-local bond yields, nearly \$800 million in US demand would be diverted back to Canadian provincial-local bonds in calendar 1979.

If there were a 10% increase in nominal GNE and wealth in 1979 in Canada, the US and in Eurobond market lender countries, investor demand for provincial-local bonds would increase by \$111 million. Half of this would originate in Canada and half abroad.

The second equation for each market in Tables 4 and 5 includes as an extra regressor the stock of provincial-local bond liabilities in that market, lagged by one calendar quarter (B_{-1}). In all but the Eurobond equation this variable exhibits a positive sign which is contrary to not only the negative sign associated with the incomplete adjustment model, but also the, nearly zero-valued coefficient expected in the flow model case. The problem lies in the strong multicollinearity between the wealth and the lagged stock terms. It is accordingly difficult to isolate the proper coefficient of either when both wealth and the lagged stock term are included as explanatory variables. Though it is difficult to choose between the two models because of the collinearity between wealth and the lagged bond stock, the results are not inconsistent with the simple flow version excluding B_{-1} . Further data would be required to solve this problem.

The estimation results for the instantaneous adjustment model are given in Table 6. Based on standard indicators of statistical fit the results for the instantaneous adjustment model are inferior to those of the simple flow and incomplete stock adjustment models in Tables 4 and 5.

The specifications do not include terms to capture the effect on bond marketability abroad of the shift from fixed to flexible or semi-flexible foreign exchange rate regimes in the 1970s, with their greater variance in exchange rates. Nor do they include terms for isolated periods of rapid exchange rate change, presumably characterized by abnormal "speculation", with the exception of the risk term (σ^{EQ}) for the Eurobond altitude to North American, which cost Canada perhaps \$350 per quarter in the last half of 1978.

Askari, Raymond and Weil (1977) in an examination of Canadian-UK portfolio capital flows during the 1954-1966 period found evidence of a discouraging effect on capital mobility in the Canadian floating rate period. It would be interesting to see their technique applied to much larger capital flows between Canada and a country enjoying a current account surplus after the resumption of large-scale Eurobond operations in 1968. As they put it: "A larger sample is possible, but we omit that period leading up to and including the British devaluation of 1967 in an attempt to measure the effect of two technically different payments systems and not the effects of underlying economic crises".

There are at least two ways to set up tests for the hypothesis that provincial-local bonds were more difficult to market abroad in say, the US after the Canadian dollar was floated in 2Q70 or after leading world exchange rates were floated in 1Q73.

- (i) To test if the constant term shifted between the pre-1973 fixed period and the subsequent float, I added a dummy variable (σ^{reg}) to the US OLS estimation in Table 5 and valued it at unity only from 1Q73 and onwards.

σ^{reg} was insignificant with the wrong (positive) sign. The same test with similar results was performed with the dummy valued at unity from 3Q70 onwards (i.e. the period in which the Canadian rate floated); and

- (ii) To test if the response to the yield spread had been altered by the shift in exchange rate regime, I omitted σ^{reg} as a separate regressor, but added a variable (r^{sprela}), which is the product of the Canadian-US bond spread ($r^{\text{CP}} - r^{\text{V}}$) times σ^{reg} . r^{sprela} was insignificant with the wrong (positive) sign, whether σ^{reg} was unity from 3Q70, or only from 1Q73 onwards.

TABLE 4. ORDINARY LEAST SQUARES ESTIMATION OF SIMPLE FLOW AND INCOMPLETELY ADJUSTMENT MODELS OF CANADIAN, U.S. AND EUROPEAN NET FLOW DEMAND FOR CANADIAN PROVINCIAL AND LOCAL GOVERNMENT BOND AND GUARANTEED BONDS (1)

(Coefficients are valued in \$ millions per calendar quarter. Brackets under coefficients denote t statistics. Parameters defined in Appendix II)

DEPENDENT VARIABLE	ATTACH EFFECT OF EACH INDEPENDENT VARIABLE ON DEPENDENT VARIABLE OF THIS MODEL, 1967-69/78										INDICATORS OF STATISTICAL FIT (2)
	NET FLOW	PROVINCIAL BOND	LOCAL BOND	COMPETING (3)	SHORT-TERM	LONGER TERM	RECENTLY ISSUED	RECENTLY ISSUED	RECENTLY ISSUED	RECENTLY ISSUED	Coeff. of Variation of Regression (ADJ. R ²)
10(a)	Δs^*	117.38 ⁰⁰ (1.46)	-121.532 ⁰⁰ (-1.99)								.8717
10(b)	Δs^*	96.660 ⁰⁰ (1.98)	-103.802 ⁰⁰ (-1.55)								.8750
U.S. market											
11(a)	Δs^*	321.83 ⁰⁰ (1.43)	-379.38 ⁰⁰ (-1.43)								.8719
11(b)	Δs^*	294.82 ⁰⁰ (1.43)	-379.38 ⁰⁰ (-1.43)								.8719
Eurobond market											
12(a)	Δs^*	50.872 ⁰⁰ (1.26)	-47.210 ⁰⁰ (-1.15)								.60998
12(b)	Δs^*	40.926 ⁰⁰ (1.99)	-21.714 ⁰⁰ (-1.34)								.60733

EXPLANATIONS

- (1) The single flow model is equations 10(a), 11(a) and 12(a). The incomplete stock adjustment model is equations 10(b), 11(b) and 12(b). For two stage least squares estimation see Table 5. The data base is in Appendix II.
- (2) The minimum significant t statistic under a one-tail test in this context is 1.64. The range of Durbin-Watson statistic denoting freedom from autocorrelation for the Canadian, U.S. and Eurobond market equations is 1.73 - 2.27 or slightly wider.
- (3) The lowest competing rates to the provincial bond yield in the Canadian, U.S. and Eurobond markets respectively are the Canadian residential mortgage yield distributed over the current (1) and preceding (1-1) calendar quarters, the U.S. 90-day treasury bill yields, and the Swiss government bond and Eurobond deposit yields. The uncorrelated zero degree Allen lag coefficients for the Canadian mortgage yield are:

Equation 10(a)		Equation 10(b)	
Period	Coefficient	Period	Coefficient
1	-262.79	1	-241.64
2	-160.76	2	-127.86
3	-131.35	3	-101.80
4	-131.35	4	-101.80
5	-131.35	5	-101.80
6	-131.35	6	-101.80
7	-131.35	7	-101.80
8	-131.35	8	-101.80
9	-131.35	9	-101.80
10	-131.35	10	-101.80
11	-131.35	11	-101.80
12	-131.35	12	-101.80
 

TABLE 5 TWO STAGE LEAST SQUARES ESTIMATION OF SIMPLE FLOW AND INCOMPLETE ADJUSTMENT MODELS OF CANADIAN, U.S. AND EUROPEAN NET FLOW DEMAND FOR CANADIAN PROVINCIAL AND LOCAL GOVERNMENT DIRECT AND GUARANTEED BONDS (1)

(Coefficients are valued in \$ millions per calendar quarter. Brackets under coefficients denote t statistics. Notations defined in Appendix II)

DEPENDENT VARIABLE	ATTACHED EFFECT OF EACH INDEPENDENT VARIABLE ON DEPENDENT VARIABLE, CUMULATIVE PERIODS, 1962-1978									
	1. POINT FLOW INCREASE		2. BILLOW INCREASE		3. RISE TO US INVESTORS		4. RISE TO U.S. GOVERNMENT		5. SEASONAL FACTORS	
	PROVINCIAL	LOCAL	PROVINCIAL	LOCAL	PROVINCIAL	LOCAL	PROVINCIAL	LOCAL	PROVINCIAL	LOCAL
INDEPENDENT VARIABLE	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)	COEFFICIENT (1)
NET FLOW	97.187 ¹ (1.00)	-109.04 ¹ (-1.45)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
US MARKET	87.88 ¹ (1.00)	-79.88 ¹ (-1.00)	0.0071 ¹ (1.01)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
10(c)	Δ ¹	-109.04 ¹ (-1.45)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
10(d)	Δ ¹	-79.88 ¹ (-1.00)	0.0071 ¹ (1.01)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
11(c)	Δ ¹	-82.531 ¹ (-2.40)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
11(d)	Δ ¹	-533.89 ¹ (-6.17)	-21.197 ¹ (-2.56)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	-46.616 ¹ (-1.91)
12(c)	Δ ¹	-23.397 ¹ (-2.56)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)
12(d)	Δ ¹	-27.835 ¹ (-2.56)	-21.197 ¹ (-2.56)	4.0012 ¹ (0.67)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	46.616 ¹ (1.91)	-46.616 ¹ (-1.91)	-46.616 ¹ (-1.91)

FOOTNOTES

- See Table 4, footnote (1). For ordinary least squares estimation see Table 4. For two-stage least squares, the fitted values of the provincial bond rate are estimated by regressing it against all of the independent variables in all three market equations, as well as all new provincial-local bonds in total (ΔB¹). The calculated values of the provincial bond rate replace their actual values in re-estimation of the original equations.
- See Table 4, footnote (2).
- See Table 4, footnote (3). At the two-stage least squares yield coefficient values are implausibly smaller than ordinary least squares, for an unconstrained zero-degree Almon lag over the current and immediately preceding calendar quarters, the current unlagged mortgage yield is used instead. The mathematical properties of the combination of the Almon-lagged mortgage rate regressor and two stage least squares warrants further investigation.

TABLE 5 INSTANTANEOUS ADJUSTMENT MODEL OF CANADIAN AND U. S. NET FLOW DEMAND FOR PROVINCIAL AND LOCAL GOVERNMENT BONDS

(Coefficients are valued in \$ millions per calendar quarter. Brackets under coefficients denote t statistics. Nonmetrics defined in Appendix II)

DEPENDENT VARIABLE										INDICATORS OF STATISTICAL FIT (1)			
NET FLOW DEMAND	AVERAGE EFFECT OF EACH INDEPENDENT VARIABLE ON DEPENDENT VARIABLE, GIVEN VALUES, 100.00%				WELF. DET. (R ²)				STANDARD ERROR OF ESTIMATION (IN \$ MIL. PER QTR.)				
	12 POINT INCREASE IN COUNTRY IN PROVINCIAL	12 POINT INCREASE IN COUNTRY IN PROVINCIAL	12 POINT INCREASE IN COUNTRY IN PROVINCIAL	12 POINT INCREASE IN COUNTRY IN PROVINCIAL	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN	CHANGE IN RISE TO HYDROGEN IN
	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM
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	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM
	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM
	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM
	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM
	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG TERM	LONG				

FOOTNOTES

- (1) See Table 4, footnote (2)
- (2) Same as in Table 4, footnote (2), except read changes in yield instead of yield, and mortgage yield is current rather than a distributed lag.

CHAPTER 6

CONCLUSIONS

In this study of domestic, US and Eurobond demand for the direct and guaranteed bonds of Canadian provincial and local governments from 1962 to 1978, the following models were evaluated:

- the simple flow model,
- the incomplete stock adjustment model, and
- the instantaneous adjustment model.

A simple flow demand model was found preferable to the incomplete stock adjustment model or the instantaneous adjustment model. Arguments for OLS and 2SLS estimations of the simple flow and incomplete stock adjustment models are reviewed.

Lender flow demand has been found to be positively associated with the provincial bond yield, foreign bond risk at the 1974-1977 peak of the New York City fiscal crisis, and with proxies for the size of investor portfolios in the Canadian, US and Eurobond markets. It is negatively associated with competing yields, the Eurobond risk variable for the latter half of 1978, and Canadian bond risk since 1976, arising first from inter-governmental wrangling over the financing of the Montreal Olympics, and since November 1976, from the election of the Parti Quebecois with its threat to Canadian

unity. We tried the effect on bond marketability abroad of the shift in the early seventies from fixed to flexible or semi-flexible foreign exchange rate regimes, with their greater variance in exchange rates. Such variables were found insignificant.

Quantification of the approximate effects of the three risk factors, on sales in the US of Canadian provincial and municipal bonds, represent an interesting econometric aspect of the recent history of the external relationships of the Canadian economy.

This study is also distinguishable from predecessors in its inclusion of a proxy for Eurobond market wealth in the form of aggregate West German, Japanese and Saudi Arabian quarterly nominal GNE in \$US.

This study parts company with predecessors in that it models bond demand determinants as important in themselves, rather than as minor elements in primarily bond-supply models, in which Canadian provinces and municipalities allocate bond supply between several markets, largely unfettered by bond demand constraints within a finite, politically-acceptable range of relative yields.

Government bond supply is not modelled at any length in this study. Hopefully our endogenization of 80% of the demand for provincial-local net new debt would be combined with such specifications as exist of non-federal government debt supply, and remaining debt demand, federal transfers to other governments, other expenditures and own-source revenues, and net new financial asset acquisition in macro sub-models of government finance.

APPENDIX I

RATIONALE, FOR DEBT STUDY, OF CONSOLIDATION OF PROVINCES, MUNICIPALITIES AND THEIR CROWN ENTERPRISES

This appendix discusses the definition of the non-federal government sector used in this thesis, and provides a rationale for the consolidation of provinces, municipalities, crown enterprises and social security funds for debt study purposes. It alludes to data limitations that prevented disaggregated modelling by province and also prevented the "cleaning-out" of short-maturity bonds and the inclusion of medium to long-term bank loans.

This thesis employs the expanded concept used in Hansen's (1969) study of fiscal policy for the definition of the government universe. With respect to the non-federal government sector the broadest definition consists of: provincial and local governments (including hospitals) their crown-owned enterprises, and the Canada and Quebec Pension Plan Investment Funds. In Statistics Canada's Financial Flow Accounts and National Balance Sheet Accounts the following sectors were aggregated:

Sector IV 2 - Provincially-owned "Non-Financial" Enterprises

Sector IV.3 - Municipally-owned "Non-Financial Enterprises

Sector IX 2 - Provincial Financial Enterprises

Sector XI - Provincial and Local Government (incl. Hospitals)

Sector XII - Canada & Quebec Pension Plan Investment Funds.

In the bygone era of privately-owned electric utilities, urban transit, and pension provision, the definition of the government universe was simply confined to federal, provincial and municipal departments. They taxed, spent, acquired liquid financial assets, borrowed directly, and guaranteed the debt of certain privately-owned entities.

Nowadays the definition of the government universe for debt study purposes must be expanded to include crown-owned enterprises and social security funds. Governments, relative to the economy, are more important in taxing, spending and the other types of transactions noted above. In addition their long-term financial intermediation has grown, taking the form of mortgage lending and loans to crown enterprises and others.

Since the early 1900's, there has been a progressing movement for state takeover and expansion of electric utilities and urban transit, and to a lesser extent, of telephone utilities and pension provision. Canadian Provincial and municipal governments now own all the electric utility industry, except in Alberta. Those in Quebec, British Columbia and Newfoundland were nationalized in the last fifteen years. The Canada and Quebec Pension Plan Investment funds only started in 1966. With Quebec's James Bay hydro-electric

project and oil-price-rise-spurred hydro and nuclear expansion elsewhere, electric utility debt issues have been evoking the image of the cuckoo pushing the parent out of the nest. Big spending has also been associated with Toronto and Montreal's subways, Prairie government telephones, and the Olympic Installations Board. Crown-owned enterprise investment, and its financing through user charges, parent-government loans and parent-guaranteed bond issues accelerated greatly in recent years. As implied above, parent-government direct deficit financing can be constrained by "pre-emptive" crown corporations borrowing on capital markets. Institutional investors tend to regard the bonds of most provinces and their enterprise offspring as very close substitutes. Treasury co-ordination with crown enterprise financing has become a major problem since the early 1970's. Crown Enterprise revenues in excess of operating expenditures can finance 20% of their annual investment in plant and equipment. Small wonder that provinces consider electricity rates, subway fares and other user charges to be fiscal instruments, and as such, effectively excluded them from regulation by the Anti-Inflation Board.

The interdependency of the Province of Ontario and Ontario Hydro is a useful illustration of the above point: "When Ontario Hydro issues debt in the Canadian or European markets, these issues are guaranteed by the Province and are noted as contingent liabilities in the Government's accounts. In addition, the Province normally borrows in the United States market on behalf of Ontario Hydro, with the net proceeds of each issue being recorded as an increase in

provincial debt offset by a loan to Ontario Hydro. Borrowing by Ontario Hydro in world capital markets thus directly affects the Province of Ontario's credit rating and ultimately its ability to raise funds from public sources. The relatively modest amounts raised by the Province for its own purposes thus can be misleading if one does not remember that the majority of the Province's borrowing from public sources is effectively made on behalf of Ontario Hydro. In 1976, to complement the Province's own program of expenditure restraint, the Treasurer of Ontario requested parallel measures of restraint from Ontario Hydro. The Province cannot reduce its effective dependence on public markets (and hence maintain or improve its credit standing) without corresponding restraint by Ontario Hydro. The magnitude of the Province's activities in behalf of Ontario Hydro must be emphasized. All (Hydro's) bonds and notes are guaranteed as to principal and interest by the Province of Ontario. To the extent that the Province is forced to borrow in public markets for its own purposes, its ability to do so on behalf of Ontario Hydro may be reduced." (Pesando, Foot et al, 1977).

For good-quality provincial and municipal bonded debt, the market's risk premiums are not significantly different for the (explicitly or implicitly) guaranteed form, in the case of crown-owned enterprises, than for the direct bonds of these parent-governments.

The argument for consolidation for debt study purposes should be extended beyond provinces, and their crown-owned enterprises,

to include municipalities and the Canada and Quebec Pension Plan Investment Fund.

Consolidation of provinces with crown enterprises, to the exclusion of local governments, would be misleading.

In provinces like New Brunswick and Prince Edward Island a much greater proportion of local government activities are carried out at the provincial level than elsewhere. Municipalities are of course the creatures of the province. Their operating budgets operate under provincial constraints. Debt issuance past a minimum annual threshold has to be accompanied by tax rate increases. Provincial audits keep municipal financial standards high. Where overextension does occur - the financing of Olympic facilities in Montreal - the province steps in, to the cost of local fiscal autonomy for a while.

While the Canada and Quebec Pension Plans can be viewed as a separate sector of government requiring joint Federal-provincial approval for its revenue, expenditure and investment, in reality, they are part of the provincial sector. Close to 100% of their still-considerable annual surplus goes into provincial direct and guaranteed bonds. Exclusion of the Canada and Quebec Pension Plans from the consolidation of provinces and municipalities and their crown enterprises would be misleading.

Having discussed the definition of the government universe, let us next briefly turn to budget and accounting concepts.

Underlying this thesis is a unified budget coverage concept is used in a National Accounts conceptual framework. No matter whether the accounting system for government transactions in Statistics Canada's intergovernmentally-comparable National Accounts of each of the 2,000 or so governments in Canada, it can be limited in coverage to the budgetary concept of revenues and expenditures excluding financial assets and liabilities, or broadened to the "unified" budget concept by also including net asset acquisition.

The broader the transactions coverage and the broader the government sector, definition, the less likely is the resulting time series likely to reflect "de-budgeting".

The distinction between disbursements on goods and services and on financial assets can be misleading. They are often both "real". A "soft" loan to the under-privileged can turn out to be a transfer payment. A province can pay for new university plant and equipment directly, or by "loaning" funds to a Universities financing foundation. These loans are "rolled over" at each successive maturity date in perpetuity. Emphasis on the latter treatment can falsely minimize a government's budgetary deficit. However, the cash requirements to be financed in capital markets are the same under either budgetary concept. The "budgetary"-non-budgetary" distinction has some

validity if the financial asset acquisition of the latter is confined to genuine liquid assets and "hard" longer-term claims on private sector entities. (eg mortgages).

The distinction between "non-budgetary" loans to government-owned enterprises and parent-guaranteed bond issues by the latter can also be misleading. The cash requirements of the parent government can be made to appear lower by the curtailment of direct loans and the substitution of guaranteed bond issues. This reinforces the earlier argument that government sector definitions in debt studies consolidate governments with government-owned enterprises..

Data constraints prevented modelling of non-federal government debt finance by province. Intergovernmentally-comparable Financial Flow and Stock Accounts by province are not published. Annual balance sheet and flows data on Statistics Canada's Financial Management basis are available on a consistently defined basis, but only from 1969 to 1975.

Provincial-local direct and guaranteed bonds acquired by Canadian residents, US residents and other non-residents are the 3 categories modelled in this study. The unmodelled remainder consists mostly of short-term bank loans and paper. However, in 1976, foreign medium-term bank loans appeared as a significant new form of liability. Incompleteness of time series on debt outstanding by year of maturity prevented the separate modelling of the short and longer-term components of Canadian and foreign-held debt.

This study does not consolidate federal and non-federal government debt, nor does it consolidate non-federal government debt with private sector industrial corporate debt.

This thesis asserts that, for debt study purposes, provincial and municipal direct and guaranteed bonds are sufficiently different, from either those of the federal government or those of the non-government-guaranteed private sector, as to warrant separate investigation. Somewhat less justifiably it also conveniently assumes that the systematic risk differences between the government sector bonds of Canadian provinces are smaller than the differences between any one of them and either federal or corporate bonds or mortgages. This point will not be laboured by exhaustive description of the greater revenue base of the federal government and its exclusive access to central bank financing. No provinces or municipalities have defaulted since the Great Depression, while corporations have gone bankrupt on occasion. The point is that while they do fall into several classes of risk, it has not proved feasible to disaggregate non-federal government bonds into differing risk classes, some of which are inferior to the best corporates.

APPENDIX II
MNEMONIC KEY AND DATA BASE

KEY TO STANDARDIZED NOTATION THROUGHOUT THESIS

<u>MNEMONIC</u>	<u>DESCRIPTION</u>	<u>MEASUREMENT UNIT</u>
B^C	Par value stock of Canadian provincial and local government direct and guaranteed bonds owned by Canadian residents.	\$ Cdn millions
B^{EQ}	Ditto for non-residents' other than in the US, multiplied by the dummy described in C^{EQ} below.	\$ Cdn millions
B^F	Par value stock of Canadian provincial and local government direct and guaranteed owned by all non-residents.	\$ Cdn millions
B^T	Ditto for all holders.	\$ Cdn millions
B^U	Ditto for US residents.	\$ Cdn millions
ΔB^C	Net new holdings of Canadian provincial and local government direct and guaranteed bonds by Canadian residents.	\$ Cdn millions
ΔB^E	Ditto for non-residents other than in the US.	\$ Cdn millions
ΔB^F	Ditto for all non-residents.	\$ Cdn millions
ΔB^T	Ditto for all holders.	\$ Cdn millions
ΔB^U	Ditto for US holders.	\$ Cdn millions
C^{EQ}	Dummy variable denoting the resumption of large-scale European purchases of foreign securities after 4Q67. (Variable = 0 for 1Q62-4Q69 and 1 for 1Q68-4Q77).	Units
Q^1	Seasonal dummy variable for 1st calendar quarter.	Units
Q^2	Ditto for 2nd quarter.	Units
Q^3	Ditto for 3rd quarter.	Units
r^{CM}	Average conventional mortgage interest rate on prime residential real estate in Canada.	% points
r^{CP}	Average yield on Canadian-pay provincial bonds.	% points
r^{CPQ}	r^{CP} multiplied by dummy described in C^{EQ} .	% points

MNEMONIC	DESCRIPTION	MEASUREMENT UNIT
r^{EQ}	Average yield on Swiss Federal Government bonds multiplied by dummy described in C^{EQ} .	% points
r^{ESQ}	Average 90-day Eurodollar deposit rate times (C^{EQ}).	% points
r^U	Average yield on US corporate bonds.	% points
r^{US}	Average 90-day treasury bill rate.	% points
σ^C	Canadian bond risk variable denoting inter-governmental wrangling over Olympic financing and the heightened prominence of the national unity question (Variable = 0 for the period 1Q62 - 1Q76 and 1 thereafter).	Units
σ^{EQ}	North American exchange rates risk variable $C=0$ for 1Q62-2Q78 and 1	Units
σ^U	US bond risk variable denoting the effects of the New York City fiscal crisis (Variable = 1 for the period 4Q74 - 1Q77 and zero elsewhere).	Units
w^C	Canadian private household wealth.	\$ Cdn millions
w^{EQ}	Proxy for non-resident wealth other than of US residents. (Variable = German, Japanese and Saudi Arabian nominal GNE (multiplied by dummy described in C^{EQ}).	\$ US billions
w^U	US private household wealth.	\$ US billions

DATA BASE

	B ^C	B ^E	B ^F	B ^T	
621	10031.00	138.0000	2774.000	12805.00	621
622	10306.00	138.0000	2773.000	13079.00	622
623	10420.00	138.0000	2810.000	13230.00	623
624	10676.00	138.0000	2949.000	13625.00	624
631	10936.00	137.0000	3211.000	14147.00	631
632	11407.00	136.0000	3288.000	14695.00	632
633	11469.00	135.0000	3343.000	14812.00	633
634	11884.00	134.0000	3308.000	15192.00	634
641	12165.00	135.0000	3357.000	15522.00	641
642	12546.00	136.0000	3515.000	16061.00	642
643	12609.00	138.0000	3541.000	16150.00	643
644	12857.00	139.0000	3785.000	16642.00	644
651	13132.00	139.0000	3813.000	16945.00	651
652	13356.00	140.0000	3941.000	17297.00	652
653	13380.00	141.0000	4029.000	17409.00	653
654	13700.00	142.0000	4081.000	17781.00	654
661	14040.00	146.0000	4214.000	18254.00	661
662	14520.00	150.0000	4383.000	18903.00	662
663	14928.00	154.0000	4456.000	19384.00	663
664	15595.00	158.0000	4504.000	20099.00	664
671	16154.00	164.0000	4727.000	20881.00	671
672	16708.00	170.0000	4925.000	21633.00	672
673	17172.00	175.0000	5168.000	22240.00	673
674	17643.00	192.0000	5257.000	22900.00	674
681	17877.00	254.0000	5475.000	23352.00	681
682	18240.00	312.0000	5629.000	23869.00	682
683	18758.00	454.0000	5872.000	24630.00	683
684	19215.00	467.0000	6043.000	25258.00	684
691	19583.00	668.0000	6370.000	25953.00	691
692	20000.00	772.0000	6584.000	26584.00	692
693	20341.00	899.0000	6888.000	27229.00	693
694	20715.00	926.0000	7004.000	27719.00	694
701	21232.00	990.0000	7212.000	28444.00	701
702	21805.00	1069.000	7252.000	29057.00	702
703	22411.00	1059.000	7361.000	29772.00	703
704	23032.00	1068.000	7335.000	30367.00	704
711	23488.00	1113.000	7388.000	30876.00	711
712	24410.00	1070.000	7368.000	31778.00	712
713	25142.00	1077.000	7381.000	32423.00	713
714	25966.00	1191.000	7513.000	33479.00	714
721	26678.00	1121.000	7570.000	34248.00	721
722	27326.00	1444.000	8146.000	35472.00	722
723	28033.00	1660.000	8332.000	36365.00	723
724	28648.00	1983.000	8730.000	37378.00	724
731	29114.00	2145.000	9008.000	38122.00	731
732	29993.00	2238.000	9198.000	39191.00	732
733	30727.00	2073.000	9135.000	39862.00	733
734	31593.00	2153.000	9394.000	40987.00	734
741	32441.00	2182.000	9853.000	42294.00	741
742	33527.00	2195.000	10071.000	43598.00	742
743	34251.00	2386.000	10399.000	44650.00	743
744	35641.00	2655.000	11000.000	46641.00	744
751	36548.00	2716.000	11571.000	48114.00	751
752	37975.00	2794.000	12358.000	50333.00	752
753	39094.00	3108.000	12958.000	52050.00	753
754	40485.00	3731.000	14463.000	54948.00	754
761	41454.00	4018.000	16547.000	58001.00	761
762	42870.00	4349.000	17298.000	60168.00	762
763	43871.00	4760.000	18634.000	62506.00	763
764	45541.00	4027.000	19525.000	65066.00	764
771	47500.00	5263.000	20179.000	67679.00	771
772	48877.00	5677.000	20849.000	69726.00	772
773	50325.00	6286.000	22012.000	72337.00	773
774	51917.00	6557.000	22387.000	74304.00	774
781	53243.00	6650.000	22690.000	75933.00	781
782	55152.00	7236.000	23702.000	78854.00	782
783	56619.00	7345.000	23885.000	80504.00	783
784	57743.00	7310.000	23934.000	81677.00	784

	B^U	ΔB^C	ΔB^E	ΔB^F	
621	2636.000	171.0000	2.000000	5.000000	621
622	2635.000	282.0000	-7.000000	-8.000000	622
623	2672.000	113.0000	0	38.00000	623
624	2811.000	252.0000	1.000000	143.0000	624
631	3074.000	250.0000	0	191.0000	631
632	3152.000	408.0000	-2.000000	55.00000	632
633	3208.000	61.00000	-3.000000	38.00000	633
634	3174.000	344.0000	1.000000	-24.00000	634
641	3222.000	276.0000	2.000000	54.00000	641
642	3379.000	366.0000	1.000000	173.0000	642
643	3403.000	62.00000	1.000000	27.00000	643
644	3646.000	224.0000	2.000000	268.0000	644
651	3674.000	267.0000	4.000000	34.00000	651
652	3801.000	214.0000	0	136.0000	652
653	3888.000	19.00000	-1.000000	92.00000	653
654	3939.000	317.0000	0	54.00000	654
661	4058.000	325.0000	11.00000	149.0000	661
662	4233.000	464.0000	4.000000	181.0000	662
663	4302.000	409.0000	-1.000000	73.00000	663
664	4346.000	666.0000	3.000000	51.00000	664
671	4563.000	539.0000	6.000000	243.0000	671
672	4755.000	638.0000	6.000000	216.0000	672
673	4893.000	452.0000	4.000000	155.0000	673
674	5065.000	453.0000	19.00000	207.0000	674
681	5221.000	225.0000	54.00000	227.0000	681
682	5317.000	352.0000	61.00000	164.0000	682
683	5418.000	514.0000	138.0000	247.0000	683
684	5576.000	467.0000	-9.000000	161.0000	684
691	5702.000	445.0000	137.0000	283.0000	691
692	5812.000	401.0000	133.0000	260.0000	692
693	5989.000	370.0000	102.0000	306.0000	693
694	6078.000	336.0000	74.00000	177.0000	694
701	6222.000	471.0000	76.00000	259.0000	701
702	6183.000	612.0000	54.00000	5.000000	702
703	6302.000	572.0000	-3.000000	148.0000	703
704	6267.000	631.0000	12.00000	-33.00000	704
711	6269.000	356.0000	143.0000	147.0000	711
712	6298.000	887.0000	-66.00000	5.000000	712
713	6304.000	703.0000	19.00000	33.00000	713
714	6322.000	825.0000	74.00000	120.0000	714
721	6449.000	630.0000	-12.00000	122.0000	721
722	6702.000	750.0000	180.0000	446.0000	722
723	6672.000	713.0000	192.0000	160.0000	723
724	6747.000	598.0000	313.0000	392.0000	724
731	6823.000	500.0000	111.0000	183.0000	731
732	6860.000	795.0000	57.00000	187.0000	732
733	7052.000	689.0000	-70.00000	27.00000	733
734	7241.000	816.0000	49.00000	218.0000	734
741	7671.000	619.0000	50.00000	503.0000	741
742	7876.000	876.0000	27.00000	243.0000	742
743	8013.000	566.0000	193.0000	337.0000	743
744	8345.000	1092.000	266.0000	616.0000	744
751	8455.000	855.0000	88.00000	806.0000	751
752	9564.000	1414.000	67.00000	787.0000	752
753	9848.000	1124.000	289.0000	578.0000	753
754	10732.00	1495.000	592.0000	1490.000	754
761	12529.00	918.0000	340.0000	2137.000	761
762	12949.00	1468.000	275.0000	695.0000	762
763	13874.00	1053.000	433.0000	1388.000	763
764	14498.00	1686.000	267.0000	891.0000	764
771	14846.00	1846.000	276.0000	664.0000	771
772	15172.00	1273.000	453.0000	739.0000	772
773	15726.00	1375.000	664.0000	1218.000	773
774	15430.00	1550.000	271.0000	375.0000	774
781	16040.00	1326.000	93.00000	303.0000	781
782	16466.00	1909.000	586.0000	1012.000	782
783	16540.00	1467.000	109.0000	183.0000	783
784	16624.00	1842.000	-35.00000	50.00000	784

	Δ_B^T	Δ_B^U	C^{EQ}	Q^1	
621	175.0000	3.000000	0	1.000000	621
622	274.0000	-1.000000	0	0	622
623	151.0000	38.00000	0	0	623
624	195.0000	142.0000	0	-1.000000	624
631	441.0000	191.0000	0	1.000000	631
632	463.0000	57.00000	0	0	632
633	99.00000	41.00000	0	0	633
634	320.0000	25.00000	0	-1.000000	634
641	330.0000	52.00000	0	1.000000	641
642	539.0000	172.0000	0	0	642
643	89.00000	26.00000	0	0	643
644	242.0000	266.0000	0	-1.000000	644
651	301.0000	30.00000	0	1.000000	651
652	360.0000	136.0000	0	0	652
653	111.0000	9.000000	0	0	653
654	371.0000	54.00000	0	-1.000000	654
661	474.0000	138.0000	0	1.000000	661
662	450.0000	177.0000	0	0	662
663	482.0000	74.00000	0	0	663
664	717.0000	48.00000	0	-1.000000	664
671	782.0000	237.0000	0	1.000000	671
672	752.0000	210.0000	0	0	672
673	607.0000	151.0000	0	0	673
674	660.0000	188.0000	0	-1.000000	674
681	452.0000	169.0000	1.000000	1.000000	681
682	517.0000	104.0000	1.000000	0	682
683	761.0000	109.0000	1.000000	0	683
684	628.0000	170.0000	1.000000	-1.000000	684
691	728.0000	146.0000	1.000000	1.000000	691
692	661.0000	127.0000	1.000000	0	692
693	676.0000	204.0000	1.000000	0	693
694	513.0000	193.0000	1.000000	-1.000000	694
701	730.0000	183.0000	1.000000	1.000000	701
702	617.0000	-49.00000	1.000000	0	702
703	720.0000	151.0000	1.000000	0	703
704	598.0000	-45.00000	1.000000	-1.000000	704
711	503.0000	43000000	1.000000	1.000000	711
712	892.0000	71.00000	1.000000	0	712
713	736.0000	14.00000	1.000000	0	713
714	945.0000	46.00000	1.000000	-1.000000	714
721	752.0000	134.0000	1.000000	1.000000	721
722	1146.0000	266.0000	1.000000	0	722
723	873.0000	-32.00000	1.000000	0	723
724	990.0000	79.00000	1.000000	-1.000000	724
731	683.0000	72.00000	1.000000	1.000000	731
732	682.0000	130.0000	1.000000	0	732
733	416.0000	97.00000	1.000000	0	733
734	1034.0000	169.0000	1.000000	-1.000000	734
741	1122.0000	453.0000	1.000000	1.000000	741
742	1119.0000	216.0000	1.000000	0	742
743	903.0000	144.0000	1.000000	0	743
744	1708.0000	350.0000	1.000000	-1.000000	744
751	1461.0000	518.0000	1.000000	1.000000	751
752	2201.0000	720.0000	1.000000	0	752
753	1702.0000	289.0000	1.000000	0	753
754	2985.0000	898.0000	1.000000	-1.000000	754
761	1055.0000	1797.0000	1.000000	1.000000	761
762	2163.0000	420.0000	1.000000	0	762
763	2411.0000	925.0000	1.000000	0	763
764	2577.0000	624.0000	1.000000	-1.000000	764
771	2560.0000	388.0000	1.000000	1.000000	771
772	2012.0000	286.0000	1.000000	0	772
773	2593.0000	554.0000	1.000000	0	773
774	1925.0000	104.0000	1.000000	-1.000000	774
781	1629.0000	210.0000	1.000000	1.000000	781
782	2921.0000	426.0000	1.000000	0	782
783	1650.0000	74.00000	1.000000	0	783
784	1892.0000	85.00000	1.000000	-1.000000	784

	Q ²	Q ³	r ^{CM}	r ^{CP}	
621	0	0	7.000000	5.313333	621
622	1.000000	0	6.880000	5.429997	622
623	0	1.000000	7.000000	5.804665	623
624	-1.000000	-1.000000	7.000000	5.453328	624
631	0	0	7.000000	5.373331	631
632	1.000000	0	6.920000	5.289998	632
633	0	1.000000	6.970000	5.536661	633
634	-1.000000	-1.000000	7.000000	5.523331	634
641	0	0	7.000000	5.586664	641
642	1.000000	0	6.900000	5.536661	642
643	0	1.000000	6.960000	5.549997	643
644	-1.000000	-1.000000	7.000000	5.443329	644
651	0	0	6.860000	5.379994	651
652	1.000000	0	6.830000	5.436666	652
653	0	1.000000	7.100000	5.706665	653
654	-1.000000	-1.000000	7.310000	5.833328	654
661	0	0	7.430000	5.979995	661
662	1.000000	0	7.520000	6.106664	662
663	0	1.000000	7.770000	6.439997	663
664	-1.000000	-1.000000	7.910000	6.519995	664
671	0	0	7.880000	6.216664	671
672	1.000000	0	7.820000	6.519999	672
673	0	1.000000	8.060000	6.829996	673
674	-1.000000	-1.000000	8.510000	7.236664	674
681	0	0	8.880000	7.489995	681
682	1.000000	0	9.200000	7.616663	682
683	0	1.000000	9.100000	7.496663	683
684	-1.000000	-1.000000	9.070000	7.786661	684
691	0	0	9.460000	7.989995	691
692	1.000000	0	9.560000	8.179997	692
693	0	1.000000	10.000000	8.466664	693
694	-1.000000	-1.000000	10.340000	8.976659	694
701	0	0	10.570000	9.279993	701
702	1.000000	0	10.570000	9.173325	702
703	0	1.000000	10.380000	9.013330	703
704	-1.000000	-1.000000	10.260000	8.706659	704
711	0	0	9.650000	7.806665	711
712	1.000000	0	9.260000	8.303329	712
713	0	1.000000	9.510000	8.313326	713
714	-1.000000	-1.000000	9.300000	7.691329	714
721	0	0	8.980000	7.961327	721
722	1.000000	0	9.190000	8.219995	722
723	0	1.000000	9.400000	8.323323	723
724	-1.000000	-1.000000	9.290000	8.013326	724
731	0	0	9.060000	8.019994	731
732	1.000000	0	9.320000	8.253326	732
733	0	1.000000	9.920000	8.589996	733
734	-1.000000	-1.000000	10.080000	8.559998	734
741	0	0	10.020000	8.836659	741
742	1.000000	0	11.110000	9.929993	742
743	0	1.000000	11.830000	10.696666	743
744	-1.000000	-1.000000	11.980000	10.156666	744
751	0	0	11.140000	9.583328	751
752	1.000000	0	10.960000	10.043332	752
753	0	1.000000	11.600000	10.506666	753
754	-1.000000	-1.000000	12.000000	10.526666	754
761	0	0	11.850000	10.326666	761
762	1.000000	0	11.980000	10.293333	762
763	0	1.000000	11.820000	10.136666	763
764	-1.000000	-1.000000	11.480000	9.689992	764
771	0	0	10.420000	9.619995	771
772	1.000000	0	10.330000	9.606664	772
773	0	1.000000	10.350000	9.439997	773
774	-1.000000	-1.000000	10.340000	9.446660	774
781	0	0	10.320000	9.786667	781
782	1.000000	0	10.390000	9.833333	782
783	0	1.000000	10.430000	9.736667	783
784	-1.000000	-1.000000	11.240000	10.146667	784

	CPQ	ESQ	EQ	U	
621	0	0	0	4.410000	621
622	0	0	0	4.300000	622
623	0	0	0	4.340000	623
624	0	0	0	4.260000	624
631	0	0	0	4.200000	631
632	0	0	0	4.220000	632
633	0	0	0	4.290000	633
634	0	0	0	4.330000	634
641	0	0	0	4.370000	641
642	0	0	0	4.410000	642
643	0	0	0	4.410000	643
644	0	0	0	4.430000	644
651	0	0	0	4.420000	651
652	0	0	0	4.440000	652
653	0	0	0	4.500000	653
654	0	0	0	4.610000	654
661	0	0	0	4.810000	661
662	0	0	0	5.000000	662
663	0	0	0	5.320000	663
664	0	0	0	5.380000	664
671	0	0	0	5.120000	671
672	0	0	0	5.260000	672
673	0	0	0	5.620000	673
674	0	0	0	6.040000	674
681	7.489995	5.800000	4.440000	6.130000	681
682	7.616663	6.810000	4.350000	6.250000	682
683	7.496663	6.010000	4.350000	6.080000	683
684	7.786661	6.980000	4.350000	6.240000	684
691	7.989995	8.000000	4.460000	6.700000	691
692	8.179997	9.930000	4.650000	6.890000	692
693	8.466664	10.75000	5.190000	7.060000	693
694	8.976659	10.17000	5.300000	7.470000	694
701	9.279993	9.210000	5.620000	7.890000	701
702	9.173325	9.040000	6.030000	8.140000	702
703	9.013330	8.380000	5.910000	8.220000	703
704	8.706659	7.120000	5.710000	7.910000	704
711	7.806665	5.440000	5.510000	7.220000	711
712	8.303329	6.630000	5.330000	7.470000	712
713	8.313329	7.650000	5.280000	7.560000	713
714	7.693329	6.500000	4.950000	7.300000	714
721	7.963327	5.150000	4.710000	7.230000	721
722	8.219995	5.020000	4.980000	7.280000	722
723	8.323323	5.400000	4.960000	7.210000	723
724	8.013326	5.850000	5.220000	7.140000	724
731	8.019994	7.880000	5.330000	7.220000	731
732	8.253326	8.670000	5.380000	7.310000	732
733	8.589996	11.21000	5.600000	7.590000	733
734	8.559998	10.39000	6.070000	7.650000	734
741	8.836659	9.110000	5.740000	7.900000	741
742	9.429993	12.02000	7.280000	8.360000	742
743	10.69666	13.08000	7.330000	8.990000	743
744	10.15666	10.40000	7.230000	9.020000	744
751	9.583328	7.560000	6.770000	8.710000	751
752	10.04332	6.500000	6.710000	8.870000	752
753	10.50666	7.290000	6.270000	8.910000	753
754	10.52666	6.560000	5.990000	8.810000	754
761	10.32666	5.550000	5.280000	8.560000	761
762	10.29333	6.020000	5.170000	8.530000	762
763	10.13666	5.710000	4.990000	8.460000	763
764	9.689992	5.270000	4.500000	8.180000	764
771	9.619995	5.210000	3.490000	8.030000	771
772	9.606664	5.650000	4.290000	8.010000	772
773	9.439997	6.380000	4.080000	7.950000	773
774	9.446660	7.110000	3.820000	8.100000	774
781	9.786667	7.380000	3.530000	8.450000	781
782	9.833333	8.020000	3.420000	8.670000	782
783	9.736667	9.040000	3.310000	8.750000	783
784	10.14667	11.38000	3.040000	9.030000	784

	US	σ^c	σ^{EQ}	σ^U	
621	2.720000	0	0	0	621
622	2.710000	0	0	0	622
623	2.840000	0	0	0	623
624	2.810000	0	0	0	624
631	2.910000	0	0	0	631
632	2.930000	0	0	0	632
633	3.290000	0	0	0	633
634	3.500000	0	0	0	634
641	3.530000	0	0	0	641
642	3.480000	0	0	0	642
643	3.500000	0	0	0	643
644	3.680000	0	0	0	644
651	3.890000	0	0	0	651
652	3.870000	0	0	0	652
653	3.860000	0	0	0	653
654	4.160000	0	0	0	654
661	4.600000	0	0	0	661
662	4.580000	0	0	0	662
663	5.030000	0	0	0	663
664	5.200000	0	0	0	664
671	4.510000	0	0	0	671
672	3.660000	0	0	0	672
673	4.290000	0	0	0	673
674	4.740000	0	0	0	674
681	5.040000	0	0	0	681
682	5.510000	0	0	0	682
683	5.200000	0	0	0	683
684	5.580000	0	0	0	684
691	6.090000	0	0	0	691
692	6.190000	0	0	0	692
693	7.010000	0	0	0	693
694	7.350000	0	0	0	694
701	7.120000	0	0	0	701
702	6.860000	0	0	0	702
703	6.330000	0	0	0	703
704	5.350000	0	0	0	704
711	3.840000	0	0	0	711
712	4.240000	0	0	0	712
713	5.000000	0	0	0	713
714	4.230000	0	0	0	714
721	3.440000	0	0	0	721
722	3.770000	0	0	0	722
723	4.220000	0	0	0	723
724	4.860000	0	0	0	724
731	5.700000	0	0	0	731
732	6.600000	0	0	0	732
733	8.320000	0	0	0	733
734	7.500000	0	0	0	734
741	7.620000	0	0	0	741
742	8.150000	0	0	0	742
743	8.190000	0	0	0	743
744	7.360000	0	0	1.000000	744
751	5.750000	0	0	1.000000	751
752	5.390000	0	0	1.000000	752
753	6.330000	0	0	1.000000	753
754	5.630000	0	0	1.000000	754
761	4.920000	0	0	1.000000	761
762	5.160000	1.000000	0	1.000000	762
763	5.150000	1.000000	0	1.000000	763
764	4.670000	1.000000	0	1.000000	764
771	4.630000	1.000000	0	1.000000	771
772	4.840000	1.000000	0	0	772
773	5.500000	1.000000	0	0	773
774	6.110000	1.000000	0	0	774
781	6.390000	1.000000	0	0	781
782	6.480000	1.000000	0	0	782
783	7.310000	1.000000	1.000000	0	783
784	8.570000	1.000000	1.000000	0	784

	W ^c	W ^u	W ^{EQ}	
621	139276.5	2140.300	0	621
622	130630.7	2052.000	0	622
623	131013.3	2106.800	0	623
624	136719.7	2166.700	0	624
631	139922.1	2220.700	0	631
632	142425.5	2256.500	0	632
633	144073.8	2283.500	0	633
634	147525.1	2346.600	0	634
641	153722.4	2390.400	0	641
642	161346.1	2446.800	0	642
643	165688.6	2496.900	0	643
644	169187.0	2517.700	0	644
651	174754.1	2574.400	0	651
652	172373.5	2545.300	0	652
653	175620.1	2673.900	0	653
654	178850.7	2721.600	0	654
661	181890.5	2742.400	0	661
662	183150.1	2757.700	0	662
663	176843.7	2772.400	0	663
664	184022.4	2872.000	0	664
671	194324.2	2962.400	0	671
672	198840.6	2979.500	0	672
673	204440.0	3076.400	0	673
674	204383.5	3069.600	0	674
681	197047.5	3098.300	264.5140	681
682	208962.6	3274.700	270.2490	682
683	217312.6	3345.500	282.4140	683
684	224766.3	3436.400	300.8330	684
691	228475.5	3461.900	296.3560	691
692	227669.9	3458.600	311.1750	692
693	228062.2	3484.700	325.9960	693
694	233819.0	3533.100	357.9690	694
701	239317.0	3553.700	362.9990	701
702	224114.6	3417.400	383.7860	702
703	236977.3	3515.200	395.5740	703
704	247478.6	3565.400	404.1800	704
711	255765.6	3659.400	414.8710	711
712	258190.6	3701.600	433.4310	712
713	261626.0	3788.700	462.5170	713
714	270042.2	3888.800	489.1840	714
721	281114.7	4003.700	513.3430	721
722	284914.2	4057.000	545.0770	722
723	301314.0	4124.000	563.6910	723
724	313318.7	4263.600	584.5780	724
731	320277.1	4294.700	677.3770	731
732	323539.1	4336.400	789.0650	732
733	343694.1	4521.100	811.9230	733
734	347570.1	4572.600	788.4880	734
741	361987.5	4649.400	807.9100	741
742	354621.2	4634.600	856.4800	742
743	348891.1	4558.000	842.9810	743
744	361319.7	4674.700	849.7840	744
751	391085.4	4865.400	919.7430	751
752	411483.6	5030.300	943.7400	752
753	411443.4	5014.100	902.1580	753
754	422324.3	5108.100	924.9350	754
761	450662.6	5273.100	969.3580	761
762	466198.5	5418.800	997.8140	762
763	476635.9	5585.200	1059.610	763
764	490340.0	5722.400	1086.640	764
771	502784.1	5806.200	1121.900	771
772	520060.7	5926.000	1187.670	772
773	526700.0	6024.800	1236.970	773
774	549370.4	6134.200	1371.380	774
781	563104.7	6287.600	1405.660	781
782	577182.3	6444.700	1440.810	782
783	591611.8	6605.900	1476.830	783
784	606402.1	6771.000	1513.750	784

NOTES

CHAPTER 1

- (1) The primary intent is to contribute to the embedding of similarly-specified equations in forecasting models of non-federal government sector finance and of the international long-term portfolio capital flows of the Canadian economy.

A secondary intent is to re-explore for federal policy evaluation purposes the sensitivity, to Canada - US differentials in expected interest rates, of the provincial-local bond component of the long-term capital inflow in Canada's international balance of payments.

CHAPTER 2

- (1) Tsiang (1975) has pointed out that under certain assumptions even a stock model can be approximated by a flow function:

$$\Delta B^d - \Delta B^f = \left(\frac{B^{f*}}{W^d} \right) (r^d - r^f) \Delta W^d - \left(\frac{B^{d*}}{W^d} \right) (r^f - r^d) \Delta W^f$$

which alternatively is:

$$\Delta B^d - \Delta B^f = (r^d - r^f) \left(\frac{B^{f*}}{W^f} \right) \Delta W^d + \left(\frac{B^{d*}}{W^f} \right) \Delta W^f$$

which, where $\frac{B^{f*}}{W^d}$ is very small, reduces to:

$$\Delta B^d = (r^d - r^f) \left(\frac{B^{d*}}{W^f} \right) \Delta W^f$$

In effect, Tsiang is saving that this simple flow function (without lagged stock term) is likely to perform well empirically if B/W is small.

where: ΔB^d is the change in the foreign country's holdings of home country bonds.

ΔB^f is the change in the home country's holdings of foreign bonds,

r^d is the home country's interest rate,

r^f is the foreign country's interest rate,

ΔW^d is the change in home country wealth,

W^f is the change in foreign country wealth, and

$\frac{B^{d*}}{W^f}$ is the ratio of home country bonds over foreign wealth desired by foreigners.

$\frac{B^{d*}}{W^f}$ could be incompletely adjusted to or instantaneously adjusted to in each time period.

CHAPTER 3

(1) See Chapter 5, footnote (1).

CHAPTER 4

- (1) In equation (8) we ignore a possible interaction between interest rates and wealth. Inclusion of the cross-products between interest rates and wealth were not found to be significant.
- (2) Again we are ignoring interactions between interest rates and wealth.
- (3) Statistics Canada's Financial Flows section has outlined its reasons for not publishing seasonally adjusted financial flow accounts (Statistics Canada, Quarterly Financial Flows, fourth quarter, 1975)
- (4) The mortgage yield is best specified as an unconstrained zero-degree Almon lag distributed over the current and preceding calendar quarter. The institutional rationale is that while mortgage commitments on "second-hand" real estate involve immediate disbursement, mortgage approvals on new planned structures may not involve disbursement of progress payments until 3 months or so have passed. The weighted lag on new and "second-hand" real estate may be less than 3 months. A one quarter lag fits better than no lag or one longer than one calendar quarter. The argument here is that institutions decide on, and adhere to, allocations of wealth growth between financial instruments on the basis of current risk-adjusted yields, with the exception of mortgages, where the basis is the expected yield within the next calendar quarter when most current commitments would be honoured by actual disbursements.
- (5) No matter how accurate any observations on current yield could be made, one could be faced with the assumption that they are the best proxy for the expected yields over the expected holding periods of the bonds. Expected yields and expected holding periods are not directly observable. Even actual holding-period data is for the most part unavailable. It was suggested in Chapter III that most provincial and local bonds are held by one owner from origination to maturity. Some are traded in secondary markets. Whatever the holding period, it is assumed that no capital gain or loss is expected from changes in interest rates or foreign exchange rates.
- (6) In principle, all competing assets should be included in each equation. Inevitable multicollinearity between financial yields compels one to limit modelling of the process to only the closest substitutes, based partly on initial experimentation and partly on judgment arising from institutional knowledge.

- (7) This argument for inclusion of the short-term interest rate infers that short-term instruments are somewhat of a competitor for the funds of long-term investors both in normal times, and more so in periods of heightened anticipation of yield increases. This side-steps the problem of joining this bond demand model with one which would model the determination of US interest rates by expectational and flow of funds factors, and relate them back to Canadian yields. Inter alia, this could involve a synthesis (Data Resources Inc., 1977) of the "segmented" market approach (Culbertson, 1957) and the term-structure approach (Dobson, Sutch and Vanderford, 1976). The term structure approach, for example, typically models the long-term bond yield as a weighted average of short rates, with no specific modelling of demand and supply, determinants of the sectors active in the market for the particular financial instrument. The segmented markets model holds that the presence of transactions costs and/or uncertainty limits the degree of substitutability; an investor requires an allowance for a premium over the yield on a bond of a maturity matching his holding period, before accepting any other investment program. Introduction of the premium makes operational the equality of returns postulated, but necessarily deliverable, by the classical mechanism alone. Both approaches are superior to the classical expectations model which stresses the high degree of substitutability between bonds of different maturities. A synthesis of the two approaches would not ignore expectations on alternative yields, but would stress sectoral sources and uses of funds, while including some arbitrage between sectors to prevent undue segmentation.
- (8) In the sixties, which culminated an era in which government bond supply was much more straightforward to model than nowadays, McGouldrick (1967) found that in the reduced form of structural supply and demand equations for the bonds of US state and local governments, the responsiveness of bond supply to interest changes was swamped, in the opposite direction, by the interest elasticity of bond demand. McGouldrick cited Morris (1960) who had argued similarly.

The above diagram of our argument is heuristic. For more rigorous discussion of this problem see standard econometrics texts

(e.g. Maddala, 1977), in which the treatment of this problem uniformly derives from an article by Jean Bronfenbrenner (1953). It is straightforward to give proofs of the direction of (large-sample) simultaneity basis for simple two-equation models with only one or two regressors each. Such proof in the presence of the several regressors of our bond demand equations would compel the complex formal derivation of an expression for the probability limit for the provincial interest rate variable, etc. Then one would have to make assumptions about the true covariances involved, which are of course not necessarily approximated by those in the calculated variance-covariance matrix for each of the three market equations.

CHAPTER 5

- (1) Time series of net new bond sales by province in the seventies suggest that the perceived risks from Canadian disunity cost the provincial-local sector around \$1,200 million annually in US bond sales net in 1977 and 1978. The quarterly specification whose estimated Canadian bond risk coefficient comes closest to \$300 million is the following for combined US and Eurobond market demand:

$$\Delta B^U + \Delta B^{EQ} = 350.42 r^{CP} - 434.57 r^U - 70.22 r^{US} + 150.45 W^U + 550.71 W^{EQ} - 375.87 \sigma^C + 394.28 \sigma^U - 398.36 \sigma^{EQ}$$

(2.98) (-3.57) (-2.07) (1.45) (2.81) (-2.26) (3.64) (-2.00)

$$\bar{R}^2 = .67536; \quad DW = 2.0458; \quad SEE = 225.11; \quad \text{Normalized SEE} = .7093$$

- (2) See Appendix I for data limitations preventing uniform modelling by province of bond demand.
- (3) The combined foreign equation is given in footnote (1). The "base case" assumptions are as follows:

	<u>1Q79</u>	<u>2Q79</u>	<u>3Q79</u>	<u>4Q79</u>
r^{CP} (%)	10.45	10.65	10.60	10.60
r^{CM} (%)	11.54	11.74	11.69	11.69
r^U (%)	9.34	9.45	9.45	9.44
r^{US} (%)	9.45	9.71	9.63	9.34
σ^C (units)	0.50	0.50	0.50	0.50
σ^{EQ} (units)	-	-	-	-
σ^U (units)	-	-	-	-
W^C (\$ billions)	622	637	653	669
W^U (\$ billions)	6,940	7,114	7,282	7,444
W^{EQ} (\$ billions)	1,512	1,590	1,630	1,671

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