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SOME ASPECTS OF THE CANADIAN EXPERIENCE WITH FLEXIBLE EXCHANGE RATES IN THE 1970'S

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Some Aspects of the Canadian Experience With Flexible Exchange Rates in the 1970s

ABSTRACT

In this study, the authors examine three aspects of the Canadian experience with flexible exchange rates in the 1970s: the movements in the Canadian dollar-U.S. dollar exchange rate, the sharp growth of external borrowings by Canadians in the 1974-76 period, and the real effects of relative price movements.

Several theoretical and empirical exchange rate models are found to have done poorly in explaining the movements of the value of the Canadian dollar over the decade.

In the examination of external borrowings in the mid-1970s, it is concluded that there was some response in borrower and lender behaviour to movements in nominal long-term interest rate differentials. Four sources of explanation for such behaviour are examined.

A three-sector model comprising non-tradable goods, resource-based tradable goods and non resource-based tradable goods, is used to study the effects of changes in raw material prices, domestic unit labour costs, and the exchange rate on various real variables in the Canadian economy.

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INTRODUCTION

The Canadian economy during the 1970s provides a fascinating study of how an economy responds to both real and nominal shocks[1] under flexible exchange rates. Under the heading of real shocks, one can categorize the sharp increase and almost as sharp decrease in the Canadian terms of trade and the divergence of Canada's cyclical position vis-à-vis the United States. The nominal shocks to the economy include the accelerating growth of the money supply in the early 1970s which was followed by the implementation in the latter half of 1975 of a policy of gradual deceleration of monetary growth.

As a result of both real and monetary movements, the exchange rate became progressively more overvalued (in purchasing-power-parity terms) over the mid-1970s, reaching a peak in the fourth quarter of 1976. This was followed by a depreciation of about 20 percent over the next two years, bringing the real exchange rate at the end of 1978 back to its 1971 level. The shifts in the terms of trade and the real exchange rate resulted in movements in real variables such as the relative outputs of different kinds of goods, income distribution and the real balance of trade. The response of interest rates to inflation and to the resulting anti-inflationary monetary policy was one of the factors leading to the sharp increase in Canadian external borrowing in 1975 and

1. Here, and throughout, the term "shock" is used in its conventional economic sense as a shift in an exogenous variable in the model under consideration.

1976, one of the most interesting episodes in the entire period.

In this paper we examine in detail certain aspects of the response of the Canadian economy to real and financial shocks over the 1970s. In each case we compare what theory tells us to expect with the actual outcome, using relatively simple regression equations to help us evaluate whether the data are consistent with the theory. Perhaps it should be noted that we are not attempting to account for everything that occurred in the Canadian economy in the 1970s[2] but rather, we are trying to see whether we can explain some of the more significant movements of the economy at that time with the intention of shedding some light on the operation of the flexible exchange rate system.

One of the continuing themes in our investigation is that the real world is very complex; a variety of shocks can occur at one time, thereby making analysis of what is happening at any given time difficult for the contemporary observer. Second, and following from this point, the problem of interpreting the effects of such shocks on the long-run value of the exchange rate has made it very difficult to forecast the exchange rate. Both the difficulty of interpreting shocks and the problem of forecasting exchange rates increase the over-all range of uncertainty. This can therefore result in behaviour that causes the adjustment to both real and nominal shocks to be much slower than one might have expected, with consequent real effects over the adjustment period.

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2. To do this would require substantially larger and more complicated empirical models than those we have used.

The structure of the paper is as follows. In Section 1 we sketch out very briefly the salient characteristics of the Canadian economy in the 1970s on which we wish to focus. Section 2 discusses the variety of exchange rate equations that have been developed to explain the movements of the Canadian dollar over the decade, and evaluates their ability to capture these movements. In this section we also examine the efficiency of the foreign exchange market during this period. In Section 3 we analyze the very sharp growth of external borrowing by Canadians in the 1974-76 period. Our attempt to explain this growth relies in part upon the existence of irrationality in the formation of long-run expectations in the bond market or exchange market or both. Finally, in Section 4 we turn to an analysis of the real effects resulting from the shocks to the system. In particular, we show that fluctuations in relative outputs, income distribution and trade balances can all be at least partly explained by relative price changes arising from terms of trade and exchange rate movements.

1 A SHORT HISTORICAL OVERVIEW

In this section of the paper we outline a brief overview of some of the principal forces at play in the Canadian economy in the 1970s.[3] Further details will be presented as required in the course of the discussion.

Canada had been on a fixed exchange rate since June 1962 (at a value of 92.5 cents U.S.), with official reserves roughly constant over the period at a level of between $2.5 and $3.1 billion.[4] The combination of an unusually strong current account and a normal-sized capital inflow resulted in a sharp increase in official reserves in the first half of 1970. Following the decision to float, (June 1, 1970), the Canadian dollar rose rapidly from 92.5 cents to nearly $1.00 U.S. In the early 1970s, monetary policy was influenced by the desire to prevent the Canadian dollar from rising much above parity with its U.S. counterpart as long as unemployment remained well above the levels that had prevailed in the latter half of the 1960s.[5]

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3. General discussions of the Canadian economy can be found in Courchene (1976), Freeman (1978), the Bank of Canada Annual Report, the Department of Finance Economic Review, and the OECD annual report on Canada. For a survey of the Canadian balance of payments over the 1970s see MacKay and Hannah (1979).
4. For part of the period, the maximum level of Canadian reserves was determined by an agreement with the United States.
5. One complicating factor for policy-makers throughout this period was the upward movement in the natural rate of unemployment as a result of demographic changes and government policy initiatives in the field of unemployment insurance.

A very important factor affecting the Canadian economy in the 1970s was the sharp movement in the relative world prices of raw materials and manufactured goods. Since Canada is a major exporter of raw materials, the relative price change was reflected in a very sharp increase in the Canadian terms of trade (Figure 1). Beginning with a slow increase in 1972 Q4, the terms of trade rose throughout 1973 and peaked at 1.187 in 1974 Q2. After declining to 1.092 by 1975 Q1, they hovered around 1.11 until the end of 1976 when they began a long downward slide that ended only in 1978 Q4. The improvements in the terms of trade in the 1972 to 1976 period increased real incomes in Canada quite substantially since Canadian output could be traded at very favourable rates for the product of the rest of the world. One measure of this gain (see Freedman (1977)) shows an increase in Canadian incomes and potential real expenditures arising from the terms of trade effect, of almost 0.6 percent per annum over the 1973-76 period. For example, in the peak year, 1974, real incomes rose by over 1.5 percent because of a 7.9 percent increase in the terms of trade in that year. A further indirect effect of the terms of trade improvement in the early part of the decade was the upward pressure that it exerted on the value of the Canadian dollar.

The 1970s was an unusual decade for the Canadian economy insofar as the behaviour of unemployment and inflation rates differed markedly from that in the United States. Whereas the U.S. economy entered into a sharp recession in 1974, the downturn in Canada was much less pronounced. Indeed, it was only late in

Figure 1

TERMS OF TRADE
1971=100

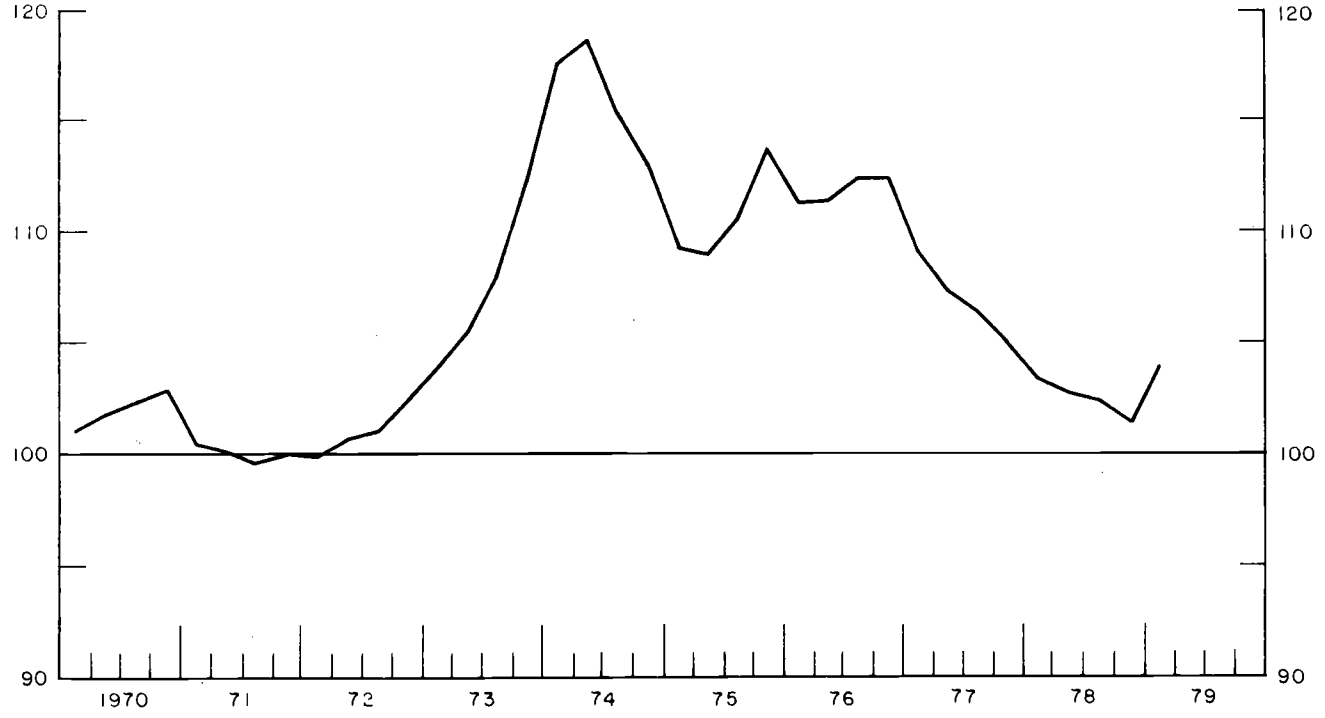
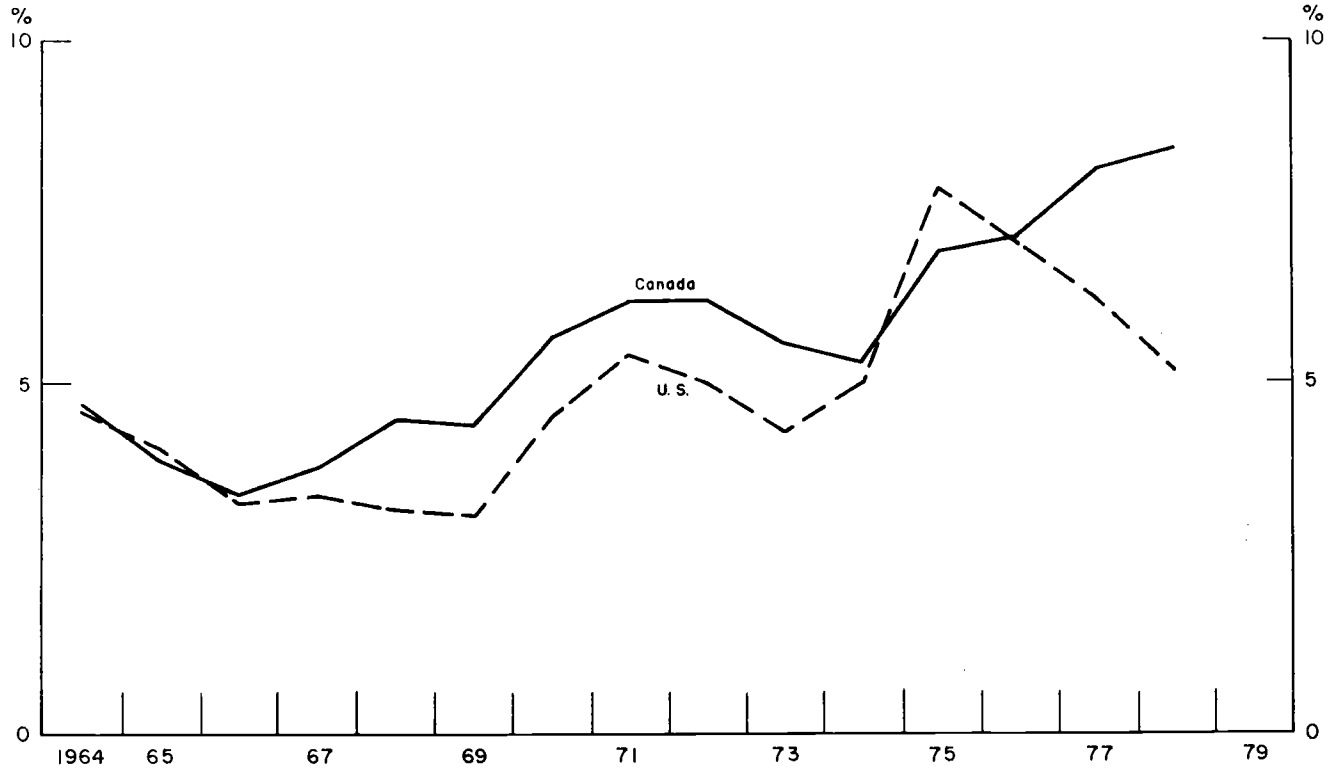


Figure 2

UNEMPLOYMENT RATES



1974 that the unemployment rate began to increase in Canada, rising gradually over the period from 1975 to mid-1978. In Figure 2, we present the unemployment rates in Canada and the United States over the period 1964-78. The sharp rise in the prices of internationally-traded goods and the high rates of growth of the money supply in Canada (Figure 3) contributed to a marked increase in the rate of price inflation both in absolute terms and relative to the United States (Figure 4). Since the exchange rate had no pronounced trend in the 1971-76 period, this increase in relative prices in Canada vis-à-vis the United States resulted in a sharp deterioration of the competitiveness of Canadian industry according to all the conventional measures.

In late 1975, the Governor of the Bank of Canada announced a target range of rates of growth for the narrow monetary aggregate (M1). The intent was to reduce the monetary growth rate gradually in order to bring down the rate of inflation over time. Not surprisingly, the attempt to slow the growth of the money supply resulted in increases in short-term interest rates. With U.S. long-term interest rates relatively low, an unusually large long-term interest rate differential vis-à-vis the United States developed and long-term borrowing abroad[6] increased to unprecedented levels in 1975 and 1976 (especially in the latter year). These capital flows put substantial upward pressure on the Canadian dollar.

6. Capital flows between the United States and Canada are completely free of controls.

Figure 3

M1 GROWTH RATES

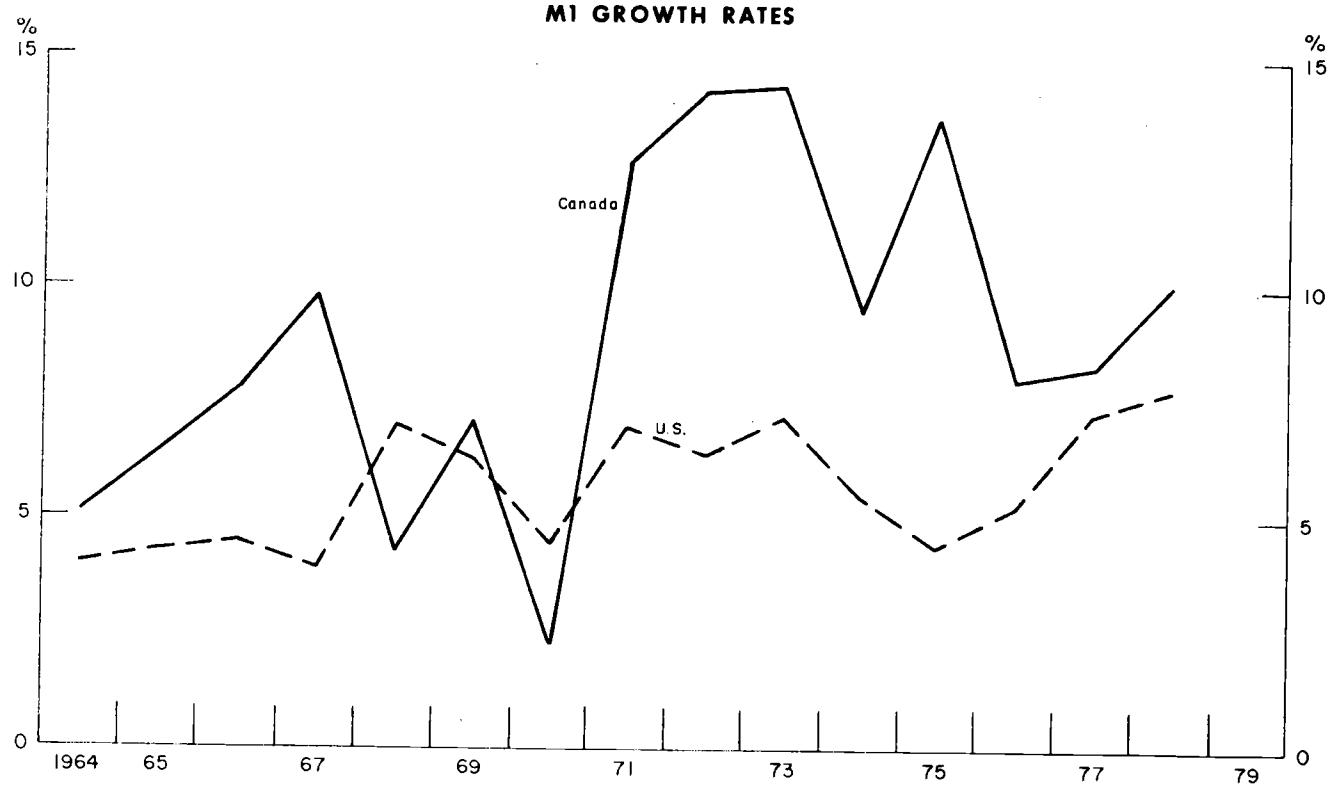
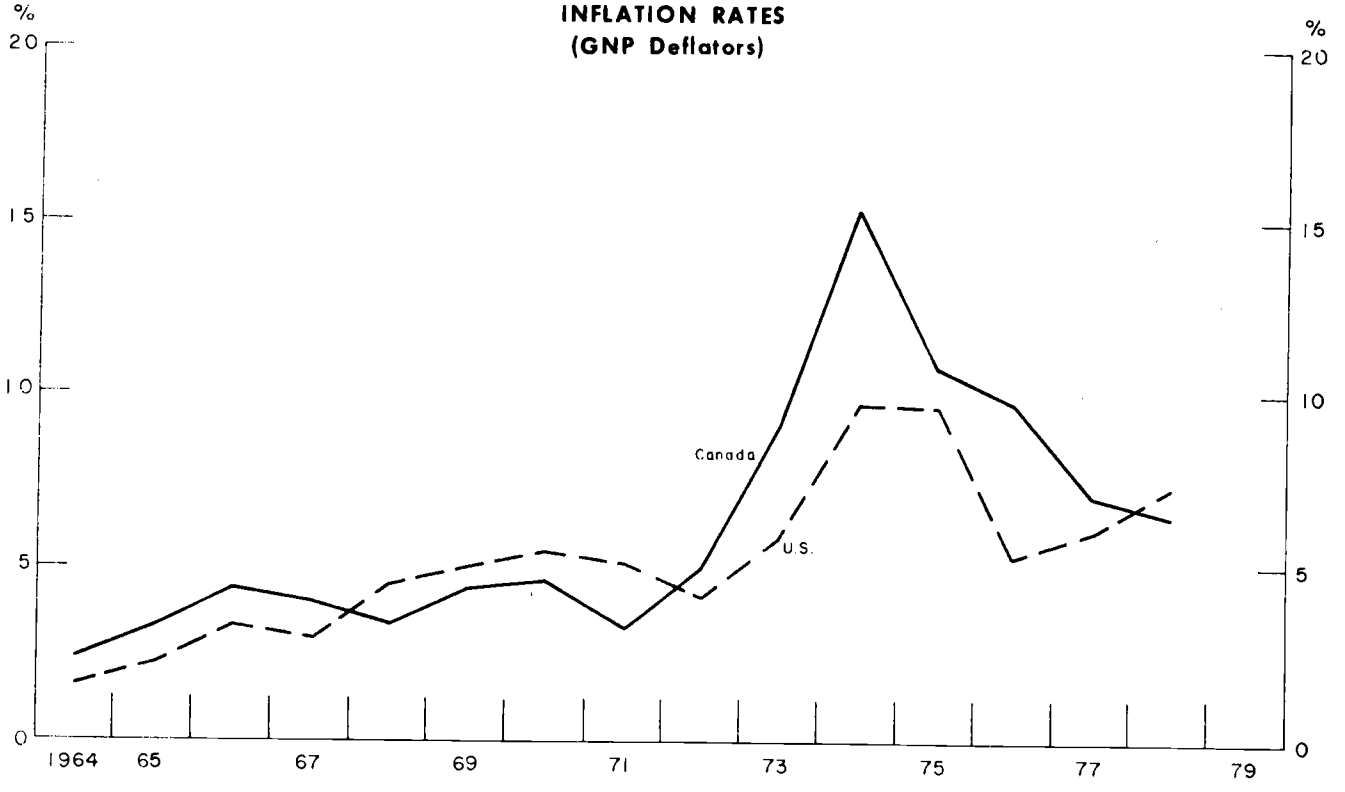


Figure 4

INFLATION RATES
(GNP Deflators)



In the fourth quarter of 1976 the Canadian dollar began its long downward slide. By the end of 1978, the 21 percent depreciation of the dollar was sufficient to bring the competitiveness of Canadian goods back to the 1971 level. However, although there was a not insignificant response in the output and net export of tradable goods in 1977 and 1978, improvements in the merchandise trade balance were slower than anticipated. The slowness of the response can be attributed, at least in part, to the fact that many tradable goods industries were operating at near to full capacity as a result of the sharp increase in output. The focus of attention therefore shifted to the actual and planned investment in these industries, in response to the capacity tightness situation resulting from the depreciation.

2 DETERMINATION OF THE CANADIAN DOLLAR-U.S. DOLLAR EXCHANGE RATE AND EXCHANGE MARKET EFFICIENCY

Several recent papers (Dornbusch (1978b), Isard (1978) and Schadler (1977)) have surveyed various theoretical models of exchange rate determination. In this section we examine how well the empirical counterparts of these models have done in explaining the movements of the Canadian dollar - U.S. dollar exchange rate[7] during the 1970s. Particular attention is paid to the concept of market efficiency, under which the exchange rate is assumed to reflect fully all available information. In the concluding part of Section 2 we examine the reasons why the empirical models have performed so poorly and why the exchange market appears to have been inefficient.

2.1 Models of exchange rate determination

Perhaps the simplest exchange rate theory is based on the concept of purchasing-power parity (PPP). In Figure 5, four measures of what the exchange rate (Canadian dollars per U.S. dollar) would have been had it followed purchasing-power parity are compared to an index of the actual exchange rate (1971=100).[8] The broad measures (based on consumer prices,

7. Since about 70 percent of Canada's foreign trade is with the United States, this is by far the most significant bilateral exchange rate for Canada.
8. We take 1971 as a representative base year rather than 1970 because Canada returned to floating rates only in mid-1970 and there was, in the remaining months of that year, a large appreciation which may be interpreted as a sign that the Canadian dollar had been undervalued.

Figure 5
PPP MEASURES OF THE EXCHANGE RATE
(Canadian Dollars per U.S. Dollar)
1971=100

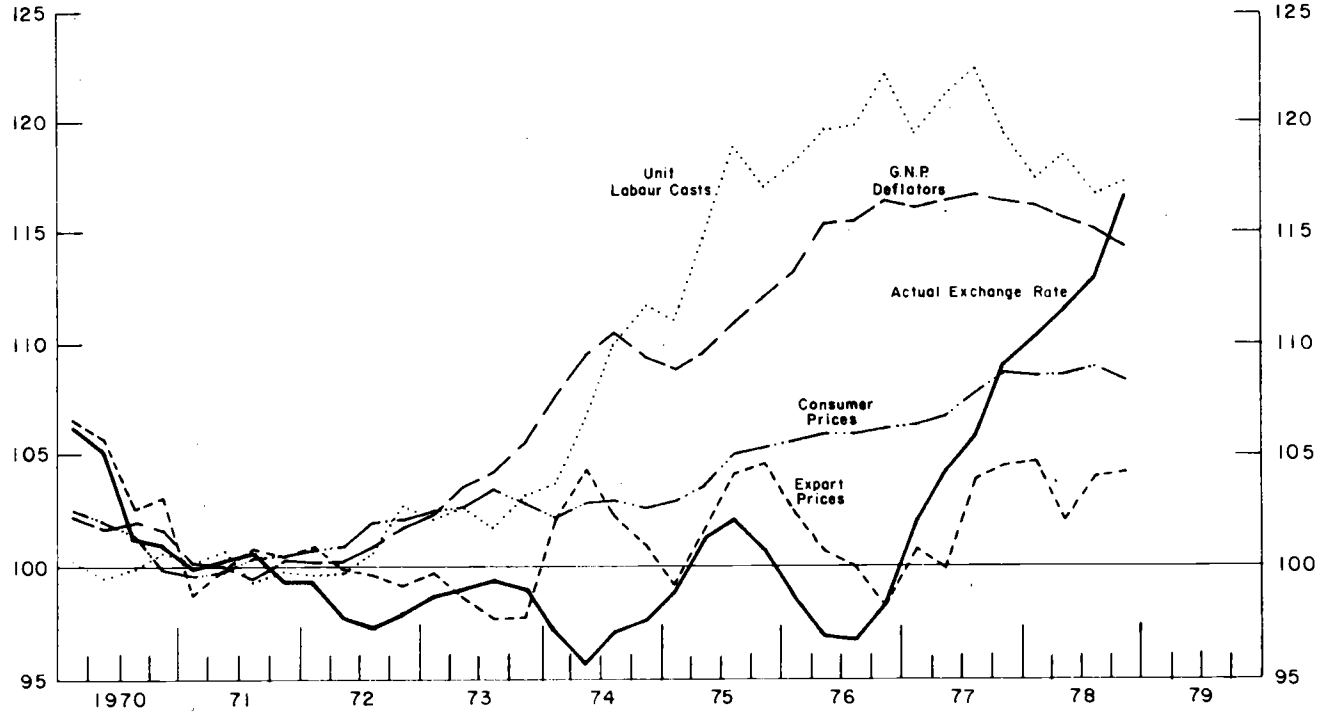
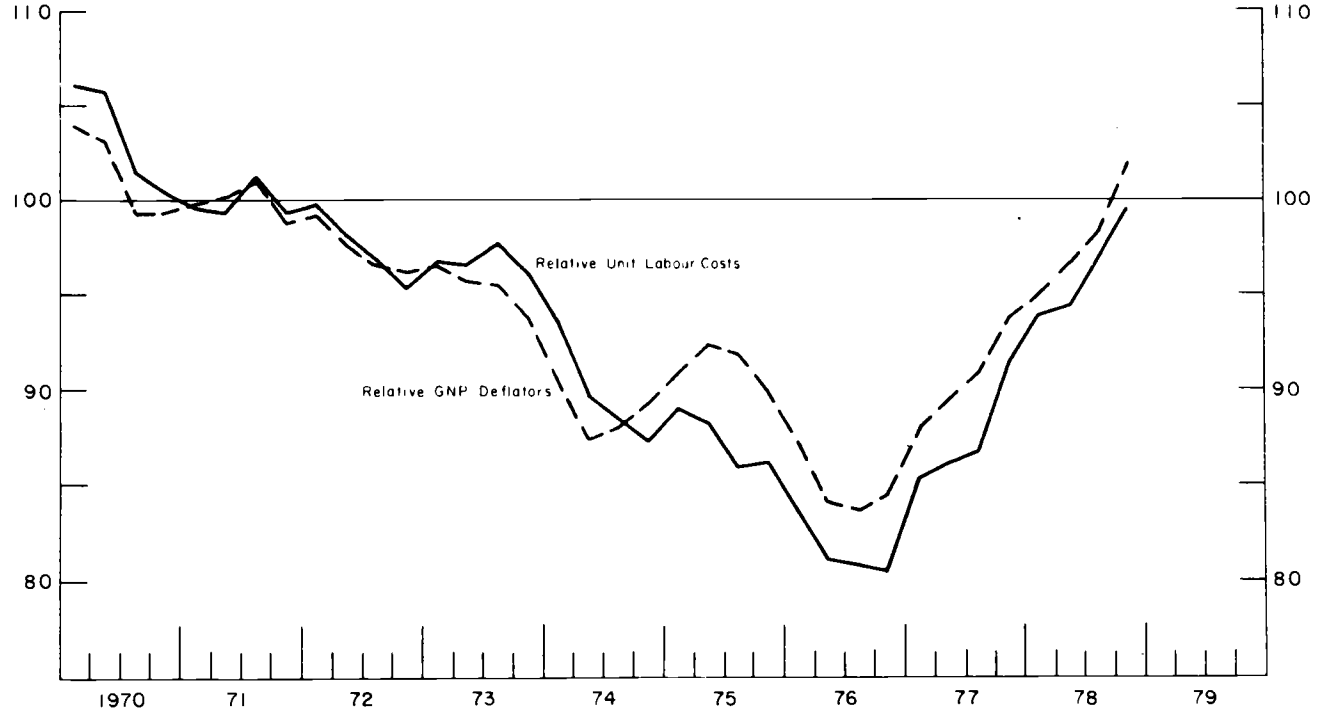


Figure 6
REAL EXCHANGE RATES
(Canadian Dollars per U.S. Dollar)
1971=100



unit labour costs and GNP deflators) do very poorly, especially for the 1974-77 period. The export price measure moves very little, even after 1976, which is quite surprising.[9]

As can easily be seen in Figure 5, real exchange rate movements during the period were very large. Figure 6 shows two measures of the real exchange rate - one based on relative unit labour costs and the other on relative GNP deflators. The 24 percent appreciation of the real exchange rate on a unit labour cost definition (18 percent on a GNP deflator definition) from 1971 to the fourth quarter of 1976, means that even exchange rate models that enforce purchasing-power parity with a medium-term lag cannot explain the movements of the nominal exchange rate for that period. The fact that the real exchange rate on either measure had returned to approximately its 1971 level by the end of 1978 suggests that if there were real factors that caused the appreciation of the real exchange rate, they were only of a temporary nature (or were balanced by shocks with an opposite effect). On the other hand, if the movements in the real exchange rate were due to a lagged adjustment to purchasing-power parity, the adjustment lags were much longer than expected.

9. If the law of one price had held, then relative export prices would have tracked the exchange rate exactly. Figure 5 shows that there is little difference prior to 1977. Subsequently, however, relative export prices do not follow the depreciating exchange rate.

Are there more complex empirical exchange rate models that will track the exchange rate accurately for both the 1970-76 period and for the more recent period without the use of ad hoc adjustments?[10] The answer appears to be no. Monetarist models, such as those of Girton and Roper (1977) and Sargen (1977), perform poorly because of their incorporation of the purchasing-power-parity assumption. The demand for short-term assets model of Haas and Alexander (1979) and the eclectic model of Freedman (1979a) track the period to the third quarter of 1976 fairly well, but require dummy variables for the subsequent period. The Freedman model contains some insights as to what moved the exchange rate in the earlier period, illustrating that the Canadian-U.S. interest rate differential, the Canadian terms of trade, relative prices, foreign borrowings and the unexpected change in the trade balance all had significant impacts. In this model, as in that of Haas and Alexander (and many other exchange rate models - see Freedman (1978)), a 1 percentage point change in the interest rate differential results, ceteris paribus, in a more than 1 percentage point change in the exchange rate, an effect that is larger than most theoretical models would suggest.

With portfolio balance models, difficulties appear to arise when a country is a net debtor in bonds denominated in foreign

10. An Appendix contains a number of estimated models of the Canadian dollar/U.S. dollar exchange rate.

currencies, a situation that is true for Canada. For in that case (see Branson (1978)), an exchange rate (Canadian dollars per U.S. dollar) that moves above equilibrium results in an excess demand for foreign exchange which puts further upward pressure on the exchange rate, moving the system away from equilibrium.[11] We can illustrate this point in a simple three asset case. With the home country demand for real balances (M), bonds (B) and foreign bonds (F) (EF in domestic currency) as functions of the domestic interest rate (r), the foreign interest rate (r*) and the expected rate of depreciation ($\dot{E}^e$), one has:

$$M = m(r,r^*,\dot{E}^e)(M+B+EF)$$

$$B = b(r,r^*,\dot{E}^e)(M+B+EF)$$

$$EF = f(r,r^*,\dot{E}^e)(M+B+EF)$$

Then $EF = \frac{f}{1-f}(M+B)$ since $m+b+f=1$

and $EdF+FdE = \frac{(M+B)df}{1-f} + \frac{f(M+B)}{(1-f)^2}df + \frac{f}{1-f}d(M+B)$

Now r is a function of r^*, $\dot{E}^e$, and M/B alone (Dornbusch (1978b)). Therefore with M and B unchanged, f is also unchanged and so:

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11. Similarly, an exogenous increase in the current account surplus will cause a decrease in net foreign liabilities and depreciation of the currency, which in turn will generate a larger current account surplus, again moving the system away from equilibrium.

$$\frac{dE}{dF} = \frac{-E}{F}$$

If $F < 0$, then $dE/dF > 0$, i.e., a decrease in net foreign liabilities (a rise in F) leads to a depreciation of the domestic currency.

There is a potentially large class of models (of the rational expectations type) that start from the balance of payments identity to determine the expected exchange rate. For example, assume that market participants form their expectations of the exchange rate such that, n periods into the future, the basic balance will be zero. Then, given the future values of the functional determinants of the current account and long-term capital flows, a unique exchange rate is determined. Current and past values of the variables could be used to forecast the future values. Also, the latest data on current and capital accounts could be compared to the forecast value based on the knowledge of the current values of the determinants to establish whether there has been an exogenous shift in demand or supply functions. An example of a particular functional form that may be useful in the approach is given in Longworth (1979a).

With this approach, a greater role is given to the current account, capital account, and their determinants, than in other exchange rate models and thus it is more in the spirit of the models of Mundell (1968) and Fleming (1962). It is much easier to

examine demand and relative price shocks in this type of model than in the monetarist model.

Consider, for example, a shock to the world price of raw materials relative to manufactured goods. If the exchange rate and domestic wages initially remain unchanged this will cause an improvement in the Canadian terms of trade and the current account. If this situation is expected to persist there must be an appreciation of the real exchange rate to restore the basic balance to its equilibrium level.

Freedman attempted to measure the effect of the Canadian terms of trade on the exchange rate. Although he did find a significant impact, the terms of trade improvement in Canada during the mid-1970s could only be one small part of the explanation for the appreciation of the real exchange rate. For example, although the terms of trade peaked in the second quarter of 1974, the real exchange rate appreciated until the fourth quarter of 1976 (at which time the terms of trade were 8 percent less than their peak value).

2.2 Exchange market efficiency

Both the Freedman and Haas-Alexander models employ lagged exchange rates as determinants of the current exchange rate. Thus, the world that they describe is not one of efficient markets in which the exchange rate properly incorporates all information as it becomes known, and in which lagged information should not play a significant role. If the exchange market is efficient,

then in the absence of a risk premium, the forward exchange rate should be an unbiased predictor of the future spot rate (see for example, Levich (1979)). Since the current spot rate is known at the same time as the forward rate, it is also true that the current forward premium should be an unbiased predictor of the change in the spot rate (Porter (1971), Levich (1979)). Longworth (1979a) has shown that the 30-day forward premium was a biased predictor of the change in the spot rate for the period January 1971 through October 1976; in fact, the two variables were strongly negative correlated. This apparent inefficiency could not have resulted from intervention in the exchange market by the authorities, since they appear to have been following a smoothing rule whereby the amount of intervention was proportional to the change in the exchange rate (Longworth (1979b)).

For the 1977-78 period, the forward premium again failed to be an unbiased predictor of the change in the spot rate; the constant term, which indicates a trend in the rate of depreciation unaccounted for by the forward premium, was significant in the regression of the change in the spot rate on the forward premium. Thus, at least at first glance, the exchange market appears to have been inefficient for this period as well.

The question arises as to what new information caused the exchange rate to move. In a study of changes in the exchange rate from month-end to month-end, Longworth (1979a) found that changes (which are assumed to be unexpected) in the interest rate differential and unexpected movements in foreign borrowing were

important in both sub-periods,[12] with the unexpected movement in the merchandise trade balance significant for the 1977-78 period. Although changes in relative prices, relative costs, relative money supplies and the terms of trade often had the correct sign, they were never significant.

2.3 Possible reasons why the market appears to have been inefficient

Since the Longworth efficient markets model has little explanatory power, one must assume either that some important economic indicators have been overlooked or that the significance of certain information is only appreciated with time - thus the lagged exchange rate in the Freedman model is indicative of a partial-adjustment mechanism. Why might one expect these lags?

Market participants must be able to distinguish between changes in nominal variables and changes in real variables, as well as between changes of a permanent and a temporary nature. It is perhaps possible that the market was concentrating on the nominal, rather than the real exchange rate. Since, as Mussa (1976) has pointed out, for many years the exchange rate remained very close to unity, this could have served as a strong anchor for expectations. For a time immediately after the dollar was allowed to float in 1970, the Bank of Canada was acting to reinforce

12. Given the important role ascribed to interest rate differentials and foreign borrowings in both the Freedman and Longworth models, they are discussed in Section 3 with special emphasis on the large borrowings observed during 1976.

expectations that the nominal exchange rate would not deviate much from the usual range. Thus the Bank of Canada Annual Report for 1970 (page 9) notes that "It is therefore still necessary to seek a mix of fiscal and monetary policy which encourages levels of interest rates in Canada that are consistent with the exchange rate staying within a suitable range."

Courchene (1976, page 161) has written, "after a full year of combatting inflation [1969-70] despite the fact that Canada was on a fixed exchange rate, when the rate floated and Canada was finally allowed the independence to pursue its own policies with respect to the behaviour of prices, the concern over inflation was immediately jettisoned in favour of ensuring that the exchange rate was set at an 'appropriate level' ..., the net result of attempting to obtain an 'appropriate' exchange rate was a very large increase in the rate of monetary expansion, the legacy of which is our current [1976] inflation rate." The rate of monetary expansion, after adjustment for the growth in demand for real money balances as a function of real income, was much faster than that in the United States for the first half of the decade. This contributed to more rapid growth of unit labour costs and prices in Canada than in the United States.

The exchange market appears to have largely ignored the significant appreciation of the real exchange rate. Also, because of lags in adjustment to the real exchange rate and because of the terms of trade improvement associated with the world-wide commodity boom, there was no immediate significant deterioration

in the nominal merchandise trade balance to alert the market.

Nor was there a strong signal from the basic balance in the 1970-76 period. The basic balance was positive from 1970 to 1973 and only slightly negative in 1974 and 1975. As the current account balance went negative in 1974 (-$1.46 billion) and 1975 (-$4.76 billion), long-term capital inflows increased from $1.04 billion in 1974 to $3.94 billion in 1975. Then, as long-term capital inflows more than doubled to $7.91 billion in 1976 and the merchandise trade balance strengthened (partly because of an improvement in the terms of trade), the basic balance reached an historical high of $4.11 billion.

In a rational framework for exchange rate determination, the terms of trade improvement and the high level of capital inflows would have to have been considered largely permanent for the value of the Canadian dollar to have remained at the high level that it did. Yet previous experience had shown that terms of trade improvements, which in Canada are primarily associated with an increase in the world price of raw materials relative to the world price of manufactured goods (Longworth (1979a)), tended to reverse themselves - the Korean War boom being a case in point. As well, large increases in long-term capital inflows, such as the 40 percent increase in 1969 over 1968, also tended to be temporary - e.g., in 1970 capital inflows fell below the 1968 figure.

When most of the variation in a series is typically due to temporary disturbances, then it is rational to assume that any particular change in that series is due to a temporary shock that

will reverse itself. If exchange rate determination is based upon an examination of underlying fundamentals, the Canadian case appears to be very puzzling. On the other hand, if market participants were in fact concentrating on the nominal exchange rate and viewed deviations from unity as being temporary, the behaviour of the exchange rate from 1971 to 1976 is more easily understood.

Such behaviour would require the absence of a large number of speculators basing their decisions on underlying economic determinants. As McKinnon (1976) has observed, there may not be a large pool of capital available for speculation over long periods of time. Although there is a good deal of speculation over periods of hours or days or weeks, there seems to be insufficient capital to smooth the real exchange rate so that it reflects economic fundamentals.

3 CANADIAN EXTERNAL BORROWING IN THE MID-1970s

One of the very interesting aspects of economic behaviour over the 1970s was the movement of long-term capital flows and, more specifically, the movement of gross new issues abroad by Canadian provinces, municipalities and corporations. As the aggregate data show (Table 1, column 1), after remaining at levels of between $1 and $2 billion between 1964 and 1973, gross new issues abroad virtually doubled in 1974, doubled again in 1975, and almost doubled again in 1976 before falling off in 1977 and 1978. In this section, after examining the data more closely, we look at the determinants of long-term capital inflows in terms of the expected cost over time of borrowing in different markets.[13]

In the course of the analysis some simple models of interest rate and exchange rate determination are used to focus on the relationship between the expectation of future inflation incorporated in the long-term interest rate, and that incorporated in the expected exchange rate. One of the puzzles underlying the entire discussion is why Canadian borrowers issued enormous

13. In terms of a portfolio choice framework, we would expect the amount of borrowing in a given market to be a function of the cost of borrowing in that market relative to the cost of borrowing in other markets, and the relative risks of borrowing in the two markets. That is, we assume that long-term borrowers are risk-averse and require a reduction in the relative cost of borrowing in external markets to offset the extra risk involved in issuing more securities denominated in foreign currencies.

Table 1

GROSS NEW ISSUES

	(1) Total issues abroad by provinces, municipalities & corporations (millions of dollars)	(2) Total issues abroad/GNP (%)	(3) Issues abroad/ total issues, provinces (%)	(4) Issues abroad/ total issues, municipalities (%)	(5) Issues abroad/ total issues, corporations (%)	(6) Issues abroad/ total issues, provinces, municipalities & corporations (%)
1964	1,035	2.06	29.9	21.4	23.8	25.8
1965	1,188	2.15	19.8	12.5	31.2	24.5
1966	1,376	2.23	20.0	23.3	42.8	28.9
1967	1,250	1.88	27.3	20.3	17.7	23.4
1968	1,562	2.15	34.0	23.4	35.4	33.2
1969	1,837	2.30	39.9	22.1	35.1	36.2
1970	1,134	1.32	20.4	9.1	24.9	20.9
1971	1,142	1.21	22.3	5.1	10.7	16.0
1972	1,654	1.57	28.8	18.7	10.3	21.2
1973	1,271	1.03	23.2	15.2	7.0	16.7
1974	2,395	1.62	34.0	27.2	13.9	26.7
1975	4,906	2.97	41.5	37.7	19.7	34.6
1976	8,813	4.60	46.4	51.1	57.6	50.4
1977	5,658	2.69	35.6	24.6	38.4	35.6
1978	3,911	1.69	26.6	10.8	31.4	27.2

amounts of foreign-pay securities in 1976 at a time when high Canadian interest rates were believed to reflect (at least in part) inflationary expectations, and when the Canadian dollar was widely believed to be overvalued.

3.1 A closer look at the data

In column 2 of Table 1, we present the total gross new issues to foreigners by provinces, municipalities and corporations over the 1964-78 period, scaled by nominal GNP. As can be seen from the data in columns 1 and 2, the reduction of foreign borrowing in the early 1970s was more than reversed in the mid-1970s, and inflows reached historically unprecedented levels in 1976.

Another way to look at the data is to examine external borrowing by provinces, municipalities and corporations as a share of their total borrowing (see columns 3 to 6, Table 1). Once again the pattern of sharp increases in the mid-seventies stands out. These were years of very substantial deficits for the provinces and municipalities and large total issues by all three types of borrowers, a very considerable share of which was financed abroad.

An important element in modelling long-term capital flows rests on the question of who bears the exchange risk -- the foreign lender or the domestic borrower. In contrast to most theoretical models in which the foreign lender purchases domestic currency bonds issued by a domestic borrower and hence takes on

the exchange risk, in Canada it is traditionally the domestic borrower who takes on the exchange risk by issuing foreign-pay bonds. Until the mid-1970s the only important exception to this pattern was the federal Government, some of whose outstanding Canadian dollar obligations have been purchased by foreigners.[14] Thus, almost all the foreign holdings of provincial, municipal and corporate bonds were in the form of foreign-pay bonds specifically issued to tap foreign markets. In the mid-1970s, however, with the growth of the Euro-Canadian dollar market, there were some issues of Canadian dollar obligations abroad in which the lender took on the exchange risk. In Table 2, we present the data for 1970-78, dividing issues abroad by Canadian provinces, municipalities and corporations into Canadian dollar issues, U.S. dollar issues, Euro-U.S. dollar issues, Euro-Canadian dollar issues, and other foreign currency issues. In the last five columns of the Table, we present the share of total domestic and foreign issues represented by each category of bonds.[15] The growth of issues abroad in 1975 and 1976 was substantially larger than the rise in foreign-pay issues over this period because of the large issues of Euro-Canadian dollar bonds in 1975 by provincial governments, and in 1976, by

14. This ignores purchases of corporate equity by foreigners which at times have been substantial. We restrict the discussion that follows to bond issues.
15. We assume throughout that the proportion of these foreign-pay bonds held by Canadians can safely be ignored.

Table 2

GROSS ISSUES BY PROVINCES, MUNICIPALITIES, AND CORPORATIONS

	Absolute amounts (millions of dollars)						Percentage of total				
	Cdn.$	U.S.$	Euro-U.S.$	Euro-Cdn.$	Other	Total	Cdn.$	U.S.$	Euro-U.S.$	Euro-Cdn.$	Other
1970	4,442	979	158	-	38	5,618	79.1	17.4	2.8	-	0.7
1971	5,610	767	101	-	201	6,680	84.0	11.5	1.5	-	3.0
1972	5,568	920	69	-	511	7,068	78.8	13.0	1.0	-	7.2
1973	5,503	830	30	-	244	6,607	83.3	12.6	0.5	-	3.7
1974	6,290	1,743	128	377	51	8,588	73.2	20.3	1.5	4.4	0.6
1975	8,774	3,158	267	910	374	13,483	65.1	23.4	2.0	6.7	2.8
1976	8,479	5,328	1,451	1,377	404	17,039	49.8	31.3	8.5	8.1	2.4
1977	10,276	2,996	901	740	1,040	15,952	64.4	18.8	5.6	4.6	6.5
1978	10,547	2,361	848	5	727	14,488	72.8	16.3	5.9	0.0	5.0

corporations.[16] Nonetheless, the share of issues denominated in foreign currencies still showed a substantial increase in the mid-1970s.

The traditional explanation of these borrowings focussed on interest rate differentials between the domestic market and foreign markets (see Figure 7). Thus, for example, Caves and Reuber (1971) regressed net inflows of long-term capital on Canadian and U.S. long rates, the Canadian long-short differential and some measure of financial requirements. Similar equations were used by Helleiner (1962), Officer (1968), Lee (1969) and Freedman (1970).[17] These studies differed in their use of stock or flow data and in their incorporation of exchange rate expectations.

In Table 3 we present the results of a very simple regression for the period 1964 Q4 to 1978 Q4 in which the proportion of bonds issued abroad (EXTSHARE) (including Euro-Canadian dollar bonds) to total bonds issued (TOTISSUE), is first regressed on the differential between Canadian and U.S. long-term interest rates (INTDIFF),[18] and then alternatively, on the ratio

16. In the main it was financial corporations that issued Euro-Canadian dollar bonds over the period. The amount issued by non-financial corporations was relatively small.
17. For a survey of studies on long-term capital flows, see Spitaller (1971).
18. In principle one should compare the rate on Canadian bonds issued in the United States with the rate on bonds issued in Canada by the same Canadian borrower. Because of data constraints we have used the differential between the

Figure 7

LONG-TERM INTEREST RATE DIFFERENTIAL

Yield on Canadian Provincial Bonds Less Yield on U.S. Corporate AAA Bonds

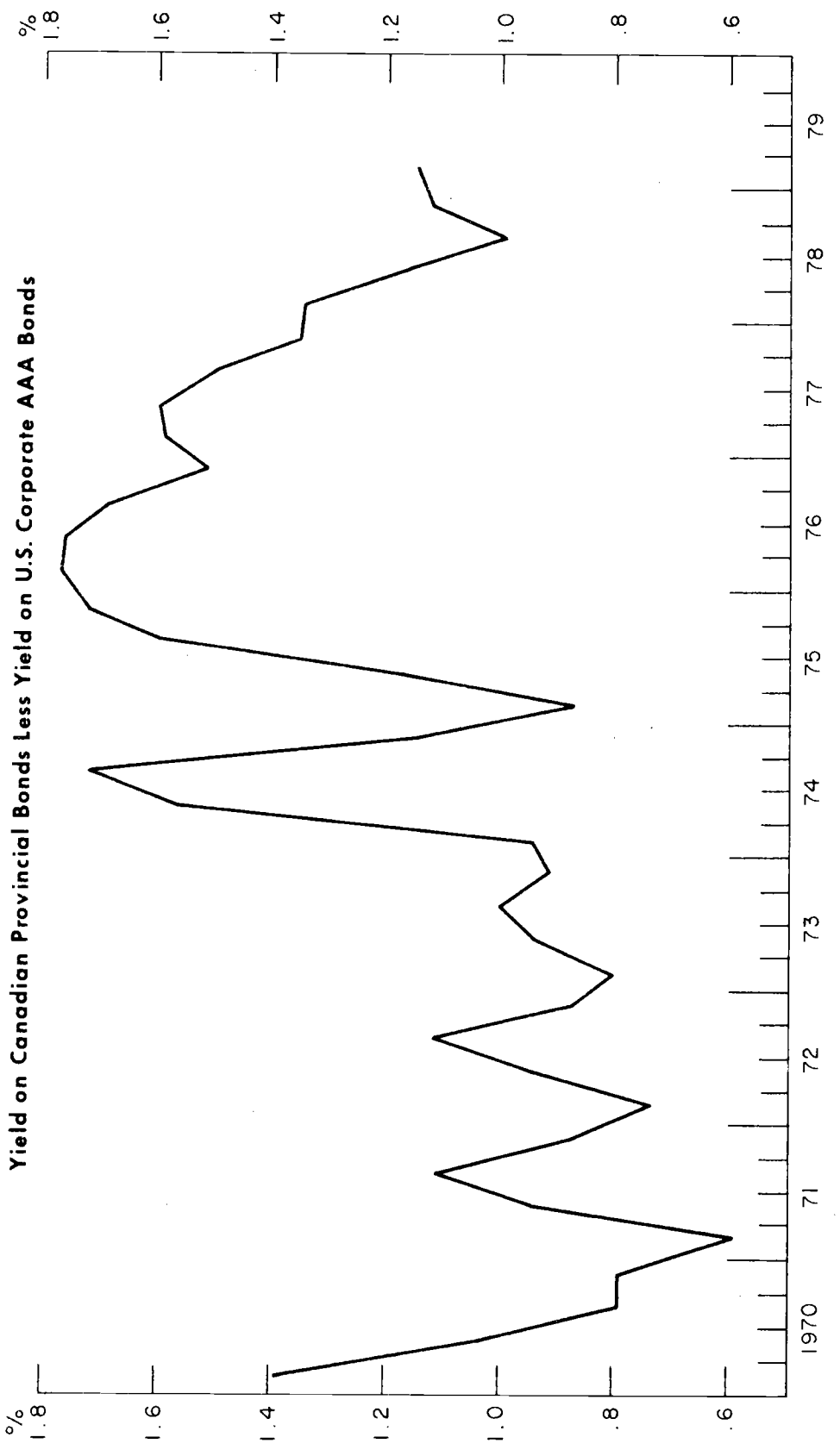

Table 3

SOME SIMPLE REGRESSIONS

Provincial

(1) EXTSHARE = .123 + .179 (INTDIFF) R^2 = .158 D.W. = 2.12
(2.3) (3.3)

(2) EXTSHARE = .161 + .117 (INTRATIO) R^2 = .002 D.W. = 1.65
(0.5) (0.4)

(3) EXTSHARE = - .048 + .136 (INTDIFF) + 5.74 (TOTISSUE/GNP) R^2 = .385 D.W. = 2.23
(0.7) (2.8) (4.6)

Municipal

(1) EXTSHARE = - .076 + .227 (INTDIFF) R^2 = .168 D.W. = 1.77
(0.9) (3.4)

(2) EXTSHARE = - .325 + .448 (INTRATIO) R^2 = .020 D.W. = 1.35
(0.7) (1.1)

(3) EXTSHARE = - .212 + .234 (INTDIFF) + 15.49 (TOTISSUE/GNP) R^2 = .272 D.W. = 1.54
(2.3) (3.7) (2.9)

Corporate

(1) EXTSHARE = - .104 + .311 (INTDIFF) R^2 = .302 D.W. = 1.13
(1.4) (5.0)

(2) EXTSHARE = - 1.37 + 1.39 (INTRATIO) R^2 = .167 D.W. = 0.93
(2.9) (3.4)

(3) EXTSHARE = - .189 + .317 (INTDIFF) + 3.14 (TOTISSUE/GNP) R^2 = .323 D.W. = 1.27
(1.9) (5.1) (1.3)

of Canadian to U.S. long rates (INTRATIO).[19]

Although the results of the former equation are much better than those of the latter, they explain only about 20 percent of the variations. Furthermore, the movement of interest rates in 1975-76 is not sufficiently large to explain the increase in borrowing during this period. However, the main objection to this type of simple regression is that it ignores the possibility that the exchange rate expected to prevail at the time of interest payments and principal repayment may not be the same as the current exchange rate. That is, the use of the nominal interest rate differential uncorrected for expected changes in exchange rates is very questionable during a period of differing inflation rates and floating exchange rates.

In order to examine the magnitude of exchange rate risk, we turn next to an analysis of the mathematics of bond prices. Although couched in terms of borrower behaviour, the following analysis can also be used to examine the behaviour of a foreign lender taking on the risk of exchange rate change, as in the case of Euro-Canadian dollar issues.

McLeod, Young, Weir average bond rate for the particular borrower in Canada and the Moody's corporate bond industrial average rate in the United States. For the later part of the period it would be appropriate to enter in addition, the differential between Canadian rates and Euro-bond rates, because of the growing importance of the Euro-markets as shown in Table 2.

19. For the moment ignore the third regression in each section of the Table.

3.2 Some simple mathematics of bond prices

In this section, the following notation is used:

RLC - interest rate on long-term Canadian dollar bonds;

RLU - interest rate on long-term U.S. dollar bonds;

n - term to maturity;

S(t) - exchange rate at time t, defined as Canadian dollar price of one U.S. dollar;

i - yield to maturity;

rlc - real long-term interest rate in Canada;

rlu - real long-term interest rate in the United States;

πc - rate of inflation in Canada; and

πu - rate of inflation in the United States.

When a Canadian borrower issues a $1 U.S. bond abroad, he receives $S(0) in Canadian funds at the time of issue. In return he pays $(RLU) S(t) interest at time t, and $1S(n) principal repayment in Canadian funds at time n (where RLU, the U.S. long rate is equal to the coupon on U.S. dollar bonds). The yield to maturity on such a bond can be calculated by solving the following equation:

$$S(0) = \int_0^n (RLU)S(t)e^{-it}dt + S(n)e^{-in} \qquad (1)$$

Traditionally, Canadian borrowers have determined the protection against a depreciation afforded by lower U.S. interest

rates by calculating the amount of the depreciation that would result in the bond yield being equal to the cost of borrowing in Canada, or RLC. There is a variety of possible exchange rate movements that one could postulate in carrying out this calculation; the most common one used is one in which a once-and-for-all depreciation of the Canadian currency occurs immediately after the issue of the bond. That is, $S(1) = S(2) = \ldots = S(n) \neq S(0)$. The equation then becomes

$$S(0) = \int_0^n (RLU)S(1)e^{-it}dt + S(1)e^{-in} \qquad (1')$$

To determine the S(1) that would raise the cost of borrowing in the United States to the cost of borrowing in Canada, we may rewrite equation (1') as:

$$S(0) = \int_0^n (RLU)S(1)e^{-RLCt}dt + S(1)e^{-RLCn} \qquad (2)$$

$$\frac{S(0)}{S(1)} = \frac{RLU}{RLC}\left[1 - e^{-RLCn}\right] + e^{-RLCn} \qquad (2')$$

In the case of a perpetuity, n approaches infinity and $S(0)/S(1) = RLU/RLC$. For example, if RLU were 8 percent and RLC were 9 percent and S(0) were 1.00, then the immediate depreciation that would wipe out the gains from borrowing in the United States would be an increase in S to 1.125 in period 1, i.e., a fall in

the value of the Canadian dollar to 88.9 cents U.S. Note that it is the ratio between the two interest rates, and not the differential, that is relevant to the calculation in the case of a perpetuity. In the more general case of the term bond, one can analyze the effect on S(1) of changes in RLU, RLC, and n by differentiating the expression with respect to these parameters. Since the results do not yield a great deal of intuitive understanding, it is perhaps more useful to illustrate the magnitude of the effect by the examples in Table 4.[20]

Table 4

VALUES OF EXCHANGE RATE RATIOS (S(1)/(S(0)) WHICH WILL EQUATE BORROWING COSTS IN THE TWO CURRENCIES

	RLU	RLC	n(term to maturity) 1-year	5-year	10-year	20-year	Perpetual
(1)	4	5	1.010	1.046	1.085	1.145	1.250
(2)	8	9	1.010	1.042	1.071	1.102	1.125
(3)	8	10	1.019	1.085	1.145	1.209	1.250

By comparing lines 1 and 3, one can see that for equal proportional differences in interest rates, the rise in the exchange rate that wipes out the gain to the borrower is the same

20. A similar table can be found in Caves and Reuber (1971), p. 40.

in the case of a perpetuity but quite different for a term bond. Also, by comparing lines 1 and 2, one can see that for the equal absolute differences in interest rates, the depreciation protection is virtually the same for bonds of short maturity, but differs substantially for bonds of long maturity. The reason for these results is that the longer the maturity, the larger the role that interest payments play compared to the principal repayment. With short maturities the cost of the depreciation operates mainly through the increase in the cost of the principal repayment. With long maturities, it operates in substantial part via its effect on raising the Canadian dollar value of the interest payments.

The results shown in Table 4 indicate that for a bond of 20-year maturity, the protection factor can neither be expressed only in terms of the interest rate differential nor only in terms of the ratio of interest rates. It is, therefore, perhaps somewhat surprising that the regressions discussed above and presented in Table 3 all indicate that the differential performs substantially better than the ratio of interest rates.

The exercise we have carried out thus far has been a fairly mechanical one illustrating the relationship between rates in Canada and the United States and the depreciation that would wipe out the gain to the Canadian borrower. However, there are also economic relationships between interest rate differentials and expected exchange rate changes. For instance, take a simple pair of assumptions that are characteristic of a strong monetarist

position: (a) long-term interest rates are equal to a real rate plus the expected rate of inflation over the term to maturity, i.e., the Fisher effect always holds; and (b) movements in exchange rates are the result of a difference in inflation rates in the two countries. This gives

$$RLC = rlc + \pi c \tag{3}$$

$$RLU = rlu + \pi u \tag{4}$$

$$S(t) = S(0)e^{(\pi c - \pi u)t} \tag{5}$$

Substituting these expressions into equation (1) to calculate the cost of foreign borrowing, we have

$$S(0) = \int_0^n (RLU)S(0)e^{(\pi c - \pi u)t} e^{-it} dt + S(0)e^{(\pi c - \pi u)n} e^{-in} \tag{6}$$

$$1 = \int_0^n (RLU)e^{[-i+\pi c-\pi u]t} dt + e^{(-i+\pi c-\pi u)n}$$

$$= RLU \frac{e^{(-i+\pi c-\pi u)n} - 1}{-i+\pi c-\pi u} + e^{(-i+\pi c-\pi u)n} \tag{7}$$

$$[1 - e^{(-i+\pi c-\pi u)n}] \left[1 - \frac{RLU}{i-\pi c+\pi u}\right] = 0 \tag{8}$$

Hence

$$i - \pi c + \pi u = RLU \tag{9}$$

$$i = RLU + \pi c - \pi u \tag{10}$$

$$= rlu + \pi u + \pi c - \pi u$$

$$= rlu + \pi c$$

Now the cost of borrowing in Canada is RLC or $rlc + \pi c$. Thus, the difference in the cost of borrowing in the United States and in Canada is simply $rlc - rlu$. Whatever the long-run differential in real interest rates is, it is by assumption unaffected by changes in rates of inflation and nominal interest rates and, hence, the decision as to whether to borrow in the United States or Canada should not be a function of nominal differentials. To put it slightly differently, the nominal interest rate in each country incorporates an inflationary premium. If the only reason for a change in nominal interest rates were the change in this inflationary premium (i.e., real rates were always constant), then any change in interest rate differentials would be solely the result of a change in inflationary expectations for Canada vis-à-vis the United States. But this change should be reflected in the expected exchange rate over the life of the bond and, therefore, should not result in any change in the borrowing decision.[21]

21. In this discussion we have ignored the once-and-for-all change in the level of the exchange rate brought about by the change in the rate of growth of the money supply that is

3.3 Possible explanations of observed patterns of borrowing

Since observed movements in external borrowing over the mid-1970s clearly imply some response in borrower or lender behaviour to movements in nominal rates, one or more of the assumptions made above must be invalid.[22] We will examine the possible sources of the observed behaviour under the following four headings:

i) Expectations of future inflation are formed differently in the bond market and the foreign exchange market.

ii) The Fisher effect does not always hold in the bond market.

iii) Purchasing-power parity does not always hold in the foreign exchange market.

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the cause of the change in the interest rate and inflation rate. In a model with perfect foresight this level change would take place at the instant the change in money growth was announced and hence would not affect any transactions that occurred thereafter, such as borrowing that takes place at the new interest rates. Since this level change cannot be anticipated there is no way in which any transactor can take advantage of its occurrence. In Figure 8A we present the effects on the exchange rate, interest rate, and prices, of a decline in the rate of growth of the Canadian money supply below that of the U.S. money supply, under the assumption of rational expectations. The value S(0) in the text is the level of the exchange rate in the instant after the change in money supply growth is announced. For a general discussion of the level change in the case of a closed economy see Bailey (1971).

22. For a similar analysis of short-term money markets, see Aliber (1976).

iv) Other factors are also important in determining the location of borrowing.

3.3(i) Inconsistent expectations in bond markets and foreign exchange markets

There is relatively little of an analytic nature that can be said about this possibility. Given the long history of the Canadian dollar being relatively close in value to one U.S. dollar, it may have been difficult for borrowers to envisage a situation in which the two currencies diverge continuously over time.[23] Indeed, borrowers may have been influenced by parity psychology whereby the Canadian dollar is perceived to be roughly equal to the U.S. dollar over the long run. Nonetheless, if the best estimates of relative long-run inflationary movements are reflected in the differential between bond rates in the two countries, one would expect these same estimates to be used in the calculation of the expected exchange rate. Thus, one would have to assume a substantial amount of irrationality if one argued that there were inconsistent expectations in the two markets.

3.3(ii) The Fisher effect does not always hold in the bond market

There are two sub-cases in this instance. First, the long rate is determined by the expectations theory of the term

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23. For example, the implication of a one percentage point differential between Canadian and U.S. rates of inflation over twenty years is a 22 percent depreciation of the Canadian dollar over that period. Even if the former seemed possible, the latter may not have seemed plausible to Canadians.

structure, but the short rate does not always move one-to-one in response to the rate of inflation. Thus, for example, Friedman (1968) has argued that in response to a decrease in the rate of growth of the money supply, there are liquidity, income, and inflationary effects on the interest rate. Short-term interest rates thus rise initially and then fall back to their original level before falling to a level consistent with the new, lower rate of inflation brought about by the decline in money supply growth. Most empirical work now suggests that the time required before the short rate reaches its new equilibrium level can be rather long.

The effect of such a divergence from equilibrium of short rates can give rise to substantial divergences in the movements of the long rate from the full Fisher effect, at least in the short run. For example, suppose that in response to a slowing in the rate of growth of the money supply of one percentage point, one had the following annual short-term interest rates starting from an initial level of 6 percent -- 6.30, 6.00, 5.50 and 5.00 thereafter. If the long-term interest rate had originally also been 6 percent, and if the expectations theory of the term structure held exactly, the 20-year long rate would take the following values -- 5.21 percent in the first period, 5.11 percent in the second period, 5.04 percent in the third period, and 5.00 percent thereafter.[24] Note that when the market foresees

24. In making these calculations we used the Shiller approximation, as developed in Modigliani and Shiller (1973) and Shiller (1979).

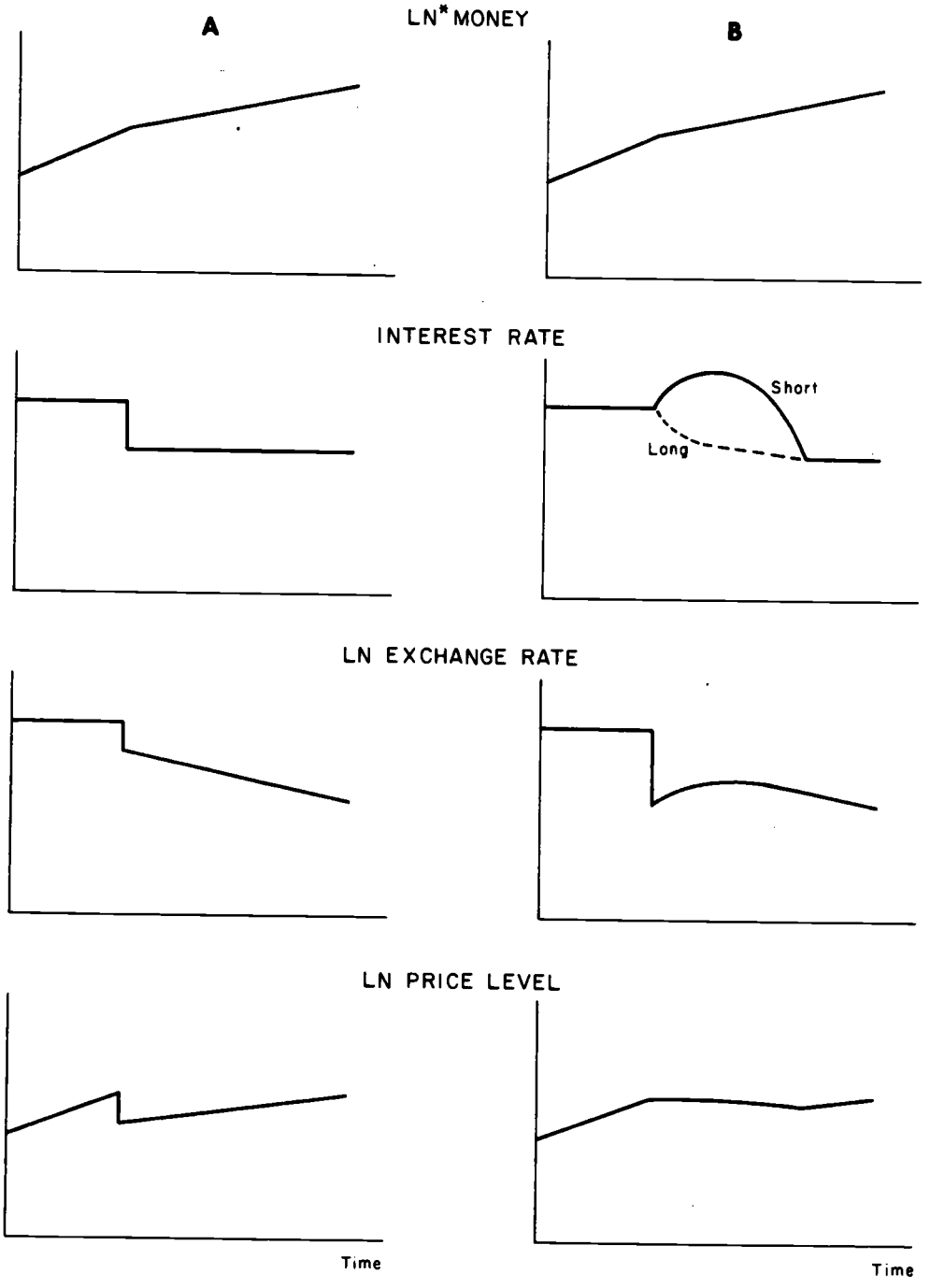
correctly the eventual decline of the short-term interest rate, one has divergent movements in the short run, with the short rate increasing and the long rate falling substantially. Despite the fact that the long rate remains above its new equilibrium level for a period of time, there will be no gain to borrowing abroad after the announcement of the decline in the money supply growth, if one assumes that the exchange market responds rationally to the expected movements in interest rates.[25]

If U.S. interest rates remained at 6 percent, then as shown in Figure 8B, there would be an immediate appreciation of the Canadian dollar, followed by a gradual movement back to the long-run equilibrium as determined by purchasing-power-parity considerations. Thus, if in the very long run, Canadian rates are 1 percentage point below U.S. rates and the Canadian dollar appreciates by 1 percent per year in an offsetting fashion, in the period after the announcement, Canadian long rates would be only 79 basis points below U.S. rates, but the expected appreciation of the Canadian dollar over the 20-year period in which the bond is outstanding, would be less than 1 percent per year, thereby again equalizing returns. In effect, there would be a sharp

25. Here we define rationality in the sense of Dornbusch (1976, 1978a), where the current spot rate is equal to the expected spot rate discounted by the interest rate differential plus one. We treat the expected spot rate in the distant future as determined by PPP considerations, and use the product of one plus the short rates in the discount factor. In a case in which the expectations theory of the term structure holds, this is the same as discounting using one plus the long rate.

Figure 8

EFFECT ON INTEREST RATE, EXCHANGE RATE AND PRICE LEVEL OF A CHANGE IN MONEY SUPPLY GROWTH RATE



Rational expectations in both markets.

Friedman – type movements in interest rates and rational expectations in the exchange market.

* LN denotes natural logorithm.

appreciation of the Canadian dollar in response to the unanticipated announcement of a decline in the rate of growth of the money supply and thereafter there would be equalization of borrowing costs internationally. Thus, even when the Fisher effect does not hold in the short run, there will be no response in external borrowing to a nominal interest rate change, provided that the expectations theory of the term structure holds, the spot exchange rate adjusts to interest rates and, in the long run, PPP holds.

The second sub-case to be considered is one in which the expectations theory of the term structure does not provide an explanation of movements in long-term interest rates. Recent studies for the United States (see Shiller (1979)) and Canada (Freedman (1979b)) suggest that the long-term bond rate is more volatile than it would be under the pure expectations theory. Thus, when short rates rise, long rates tend to rise as well and by more than anticipated on the basis of pure expectations. However, the long rate tends to rise less than would be expected if the short-term rate were a martingale. For example, the rise in short rates from 6 percent to 6.30 percent might be expected to lead to a rise in long rates from 6 percent to, say, 6.05 percent. Since long-term interest rates rise rather than fall in response to a decline in the rate of growth of the money supply, real long-term interest rates would be substantially higher in this instance than in the first sub-case for the period of adjustment. Not surprisingly, this would lead to substantial borrowing in

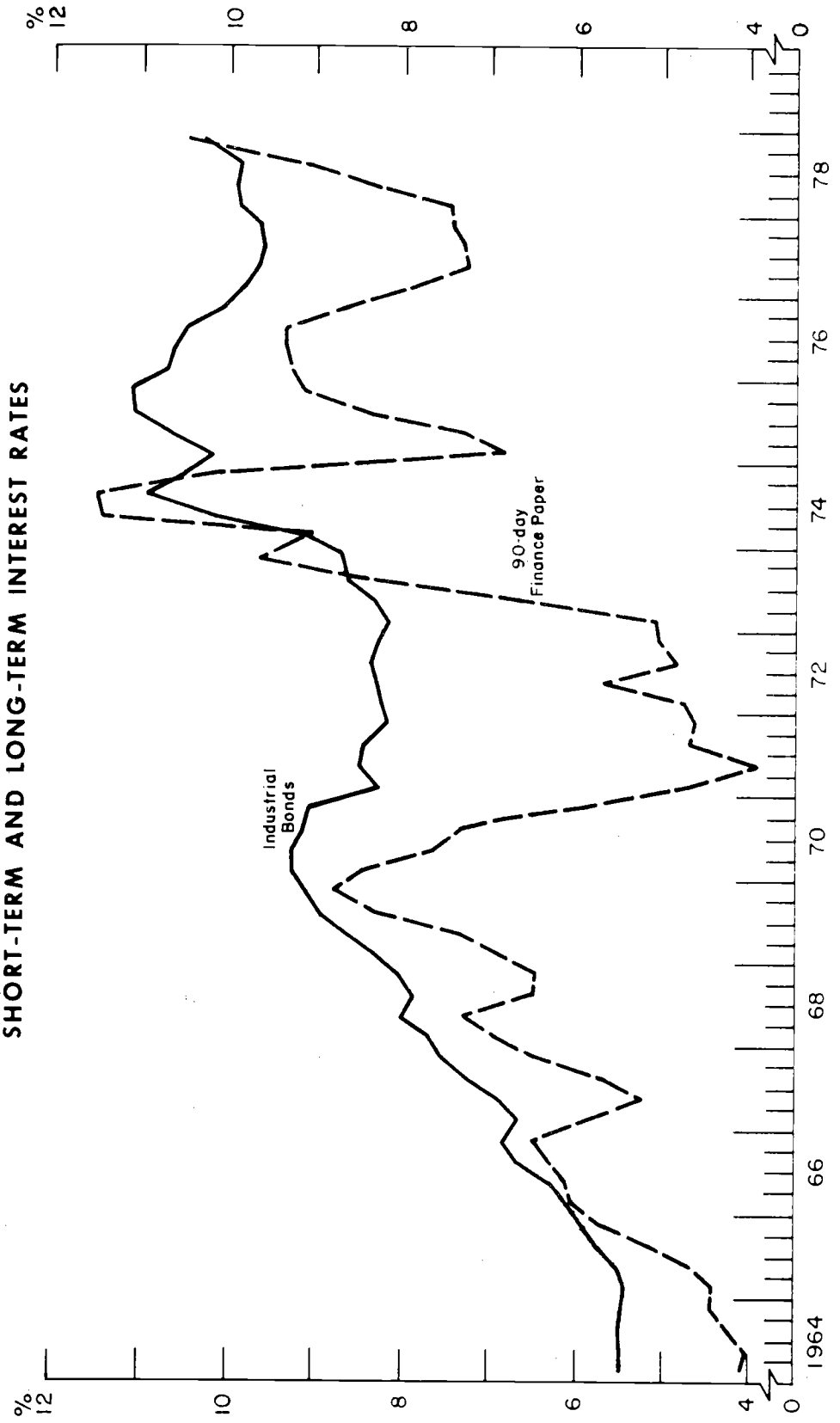
foreign markets. In this sub-case, the element of rationality in long-term borrowing decisions stems from the "irrationality" in the setting of long-term interest rates whereby long-term real rates can move quite markedly in response to a change in money supply growth.

On average, experience in Canada tends to accord with the notion that long rates move in the same direction as short rates but with a response coefficient of about 0.2. However, the movements of interest rates in 1976 seem to be more consistent with the first model than with the second; short rates tended to rise somewhat in 1976 while long rates fell substantially (Figure 9). To the extent that Canadian long rates fell in response to the fall in expected inflation rates in Canada, one would have expected a corresponding rise in the expected long-run value of the Canadian dollar. However, since U.S. long rates fell by about the same amount as Canadian long rates over 1976, interest rate differentials remained unchanged - although by historical standards they were at a high level. If the fall in the U.S. rate had been a response to a decline in inflationary expectations in the United States, then the relative positions of the two currencies and the relative expected inflation rates would have remained unchanged in 1976, thereby leaving open the question as to why external borrowing grew so rapidly in 1976.[26]

26. There is a view that Canadian long rates move in sympathy with U.S. long rates (Lynch (1979)). Although this model breaks the link between long rates and expected rates of domestic inflation, it leaves unexplained changes in the differential between Canadian and U.S. long rates.

Figure 9

SHORT-TERM AND LONG-TERM INTEREST RATES



3.3(iii) Purchasing-power parity does not always hold

As noted above, the period leading into 1976 was characterized by an increasing divergence of the exchange rate from purchasing-power parity. However, this should have acted in the direction of reducing borrowing even at large real interest rate differentials, since over the long term one might have expected PPP to be re-established. Hence, the protection factor was substantially less than might have appeared to be the case, given the overhang of "overvaluation" (in PPP terms). On the other hand, if the market believed that the Canadian dollar was high because of some real change that was permanent, then relative PPP would hold from that point in time. In this case, we would be back in the situation described earlier in which borrowers incorporate notions of expected future rates of inflation into both exchange rate expectations and long-term interest rates.

The purchase of five-year Euro-Canadian dollar instruments by foreigners is even more difficult to understand from this perspective. As was demonstrated earlier, a five-year instrument provides relatively little protection against a depreciation, even at fairly substantial interest rate differentials. And, given the overvaluation of the Canadian dollar in PPP terms, the degree of protection was even less. It can perhaps be argued that the market was overly impressed by Canada's position as a producer of resources, leading it to ignore the indications that the Canadian dollar was much more likely to fall in value than to rise.

3.3(iv) Other factors

An assertion is sometimes made that Canadian issuers have to place a greater proportion of their borrowings abroad in periods of large borrowing requirements because of the inability of the Canadian market to absorb them fully. The third equation in each section of Table 3 (page 29) represents a simple attempt to evaluate this thesis by regressing the share of bonds issued abroad (EXTSHARE) by each borrower on the interest rate differential (INTDIFF), and on total bond issues of that borrower (TOTISSUE), divided by nominal GNP. In the case of provinces and municipalities, this "market pressure" variable is significant, while in the case of the corporate sector, although it has the correct sign, it is insignificant. The estimated coefficients indicate that between 1973 and 1976 the total issue variable would account for increases of 13.7, 3.6 and 3.0 percentage points, respectively, in the share of provincial, municipal, and corporate borrowing abroad. By way of comparison, the movements of interest rates between the same two years would account for 7.8, 15.4 and 26.0 percentage points of the increase in the shares issued abroad.

There were also two policy changes in 1975 that contributed to the increase in external borrowing. First, the official request made late in 1970 to major borrowers to consider the domestic market carefully before entering foreign markets, was withdrawn early in 1975. Second, in mid-1975 the 15 percent

federal withholding tax on interest payments was removed on new corporate bond issues having maturities of five years and over. Although both these changes acted in the direction of increasing external borrowing, they were clearly not sufficient by themselves to explain the massive increases in 1975 and 1976.

3.4 Some implications

When deciding in which market to issue bonds, borrowers are forced to make forecasts of exchange rates into the distant future. Given the enormous uncertainty regarding these forecasts, it is not surprising that at times the decisions taken can, with hindsight, be seen to have been at least questionable. In the theoretical analysis above, we have argued that there was some inconsistency between the expectation as to the future behaviour of prices incorporated in bond interest rates, and that incorporated into expected exchange rates. It is probably the case that there was an element of truth in all the arguments discussed above: (i) borrowers were still influenced by parity psychology, or at least they were unwilling to believe that a continually depreciating Canadian dollar was possible; (ii) increases in long-term rates reflected in part increases in real rates of interest and not solely inflationary premia; and (iii) perceptions as to the absorptive capacity of Canadian markets affected at least some borrowers.

The result of these factors was the enormous borrowing abroad in the mid-1970s. The movement of the U.S. dollar from a high of

1.04 in August 1975 to a low of .9626 in June 1976, and its consequent pause on a plateau at about .975 until November 1976, are at least in part attributable to the massive capital inflows from 1975 Q4 through 1976 Q4.

If the Canadian authorities should succeed in bringing the Canadian inflation rate down below the U.S. inflation rate for any length of time, there may be some transitional complications caused by a reduction in borrowing abroad by Canadian residents. With long-term nominal interest rates in Canada lower than those in the United States, Canadian borrowers may reduce their borrowing abroad despite the fact that the expected appreciation of the Canadian dollar would offset the extra cost of borrowing abroad. The depreciation of the Canadian dollar that would follow would complicate to some extent efforts to achieve better price performance in Canada vis-à-vis the United States. The crucial point is that as long as a fixed-rate psychology, at any given exchange rate, continues to affect the way long-run exchange rate expectations are formed, the Canadian dollar may go through periods of overvaluation and undervaluation as long-term capital flows respond to nominal rather than real interest rate differentials. Furthermore, the problem will be compounded on the way to equilibrium by the tendency of long rates to move more than the expectations theory of the term structure would suggest. Thus, international capital flows may present some difficulties in achieving a lower inflation rate in Canada than in the United States. However, when the market is convinced that such a result can be achieved, then these adjustment problems will disappear.

4 REAL EFFECTS: THE ALLOCATION OF RESOURCES

In this section we examine the effects of movements in the terms of trade and the real exchange rate on the allocation of resources[27] and the distribution of income.

A change in the relative price of raw materials has an impact on the relative outputs of resource-based industries and non-resource-based manufacturing. Movements in the relative price of raw materials, the real exchange rate (on a unit labour cost basis) and U.S. GNP affect the allocation of resources between the tradable and non-tradable goods sectors of the economy and thus the merchandise trade balance (both on a nominal and real basis). Real exchange rate movements also have implications for the distribution of income between wages and profits. Finally, changes in the terms of trade and the real exchange rate affect the perceived profitability of business fixed investment.

If we believed that Canada could be adequately modelled as a small open economy, then our analysis would proceed along the lines of Salter (1959), Swan (1960), and Dornbusch (1974, 1975). However, there is evidence presented in Longworth (1979a) that Canada is not a price-taker for manufactured goods, especially in the short run, and Appelbaum and Kohli (1979) come to the

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27. The empirical approach is exploratory in nature, differing from the usual approach of estimating export and import equations directly. Our interest is with shifts of resources between identifiable sectors rather than just the trade balance.

conclusion that Canada cannot be modelled as a small open economy for its exports. There has been little success in estimating export supply curves at any level of aggregation. Most studies therefore follow the Dornbusch-Krugman (1976) approach of estimating export price equations as functions of foreign output prices and domestic input costs. Export demands are then estimated as a function of relative prices and foreign income, as in RDX2, the Bank of Canada's econometric model (Bank of Canada (1976)).

In modelling the effects of changes in the relative price of raw materials and the real exchange rate, we choose to deal with a three-sector model. Suppose that the three sectors of the economy are: resource-based tradable goods (denoted by subscript R); non-resource-based tradable goods (denoted by subscript NR); and non-tradable goods including services (denoted by subscript NT). We assume that wages are the same across sectors and do not attempt to build a dynamic model of wage movements. Labour is the only variable input in the resource-based and non-tradable goods sectors, but both labour and resources are used in the non-resource-based tradable goods sector.

We assume that the law of one price holds for resources. If the industry were characterized by perfect competition, then one could write the supply function in logarithmic form as:

$$s_R = a_0 + a_1(p_R - w) + a_2 k_R \qquad (11)$$

where s is the log of supply,
k is the log of the capital stock,
p is the log of the price, and
w is the log of unit labour costs.

All the coefficients are positive. From the law of one price:

$$p_R = p_R^* + e$$

where * denotes a foreign variable, and
e is the log of the exchange rate.

If there were oligopolistic elements in the industry, as there may be in some mining industries and the newsprint industry, then the reduced-form output equation may include foreign demand as well:

$$s_R = a_0 + a_1(p_R - w) + a_2 k_R + a_3 y^* \qquad (11')$$

For the non-resource-based tradable goods industry (which we define as manufacturing other than pulp and paper, wood and primary metals), prices in the rest of the world are assumed to depend on the costs of the two inputs, resources and labour:

$$p_{NR}^{*} = \lambda p_{R}^{*} + (1-\lambda)(w^{*}) \qquad (12)$$

The domestic country's price equation is a modified Dornbusch-Krugman equation that expresses domestic prices as a weighted average of the foreign price and domestic costs:

$$p_{NR} = \sigma(p_{NR}^{*}+e) + (1-\sigma)(\lambda p_{R} + (1-\lambda)w) \qquad (13)$$

$$= \lambda p_{R} + (1-\lambda)[\sigma(w^{*}+e) + (1-\sigma)w] \qquad (13')$$

This price equation implicitly defines supply behaviour. Foreign demand is assumed to be of the form:

$$d_{NR}^{*} = d_{0} + d_{1}(p_{NR}^{*}+e-p_{NR}) + d_{2}y^{*} \qquad (14)$$

Thus from equations (12), (13') and (14):

$$d_{NR}^{*} = d_{0} + d_{1}(1-\lambda)(1-\sigma)(w^{*}+e-w) + d_{2}y^{*} \qquad (15)$$

which relates foreign demand to the real exchange rate in terms of unit labour costs ($w^{*}+e-w$). Domestic demand for domestically-produced tradable goods will also be positively related to ($w^{*}+e-w$), as well as to domestic real income, which will be a function of the terms of trade and foreign income y^{*}. If the two

demands are summed, the reduced-form output of non-resource-based tradables (q_{NR}) will be a positive function of the real exchange rate, foreign income, and (p_R-w) if the latter acts as a proxy for income gains resulting from improvements in the terms of trade:[28]

$$q_{NR} = q_{NR}(w^*+e-w,\ y^*,\ p_R-w) \qquad \begin{matrix}(+)\ (+)\ (+)\end{matrix} \qquad (16)$$

Equilibrium in the market for non-tradable goods is assumed to hold when demand, which is a function of real income (yr) and the price of non-tradables relative to the price of tradables, is equal to supply, which is a function of the capital stock and the price of non-tradables relative to unit labour costs.

$$q_{NT} = d_{NT}(yr,\ p_{NT}-p_T) = s_{NT}(k_{NT},\ p_{NT}-w) \qquad (17)$$

In particular one might assume

$$d_{NT} = e_0 + e_1 yr - e_2(p_{NT}-p_T) \quad \text{and} \qquad (17')$$

28. If output were solely determined by price-taking suppliers, p_{NR}^* were determined by equation (12), and input proportions were the same in the two countries, then one would have

$$s_{NR} = c_0 + c_1(w^*+e-w) + c_2 k_{NR} .$$

$$s_{NT} = e_3 + e_4 k_{NT} + e_5(p_{NT}-w) \qquad (17')$$

from which

$$p_{NT} = \frac{e_1 yr}{e_2+e_5} - \frac{e_4 k_{NT}}{e_2+e_5} + \frac{e_2 p_T}{e_2+e_5} + \frac{e_5 w}{e_2+e_5} + \frac{e_0-e_3}{e_2+e_5} \qquad (17'')$$

and so

$$q_{NT} = \frac{e_5 e_1}{e_2+e_5} yr + \frac{e_2 e_4}{e_2+e_5} k_{NT} + \frac{e_2 e_5}{e_2+e_5}(p_T-w) + \frac{e_0 e_5+e_2 e_3}{e_2+e_5} \qquad (17''')$$

where p_T is an appropriately weighted average of p_R, p_{NR}, and $p^*_{NR}+e$.[29]

In the type of simple model proposed above we have neglected a number of influences, particularly domestic monetary and fiscal policy. We assume to a first approximation that these exert equal impact on all sectors and so we concentrate on the ratios of outputs in the various sectors (particularly since this is how one can easily measure changes in the allocation of resources). Since the effect of changes in relative prices on output is likely to

29. If, on the other hand, prices were determined by a markup on wages equation, then with equation (17') as the demand equation, reduced form output would be an increasing function of yr and $p_{NT}-w$.

dominate the effects of induced real income, the model predicts that the ratio of output in resource industries to output in the non-resource-based tradable goods industry would be related directly to the price of resources relative to unit labour costs, inversely to the real exchange rate and, with indeterminate sign, to U.S. GNP. The ratio of the output of tradables to the output of non-tradables is predicted to be directly related to the price of resources relative to unit labour costs, the real exchange rate, and U.S. GNP.[30]

In the following sections, the preceding model is applied to the Canadian economy during the period 1971-78. Specific emphasis is placed on:

- The composition of industrial production between resource-based and non-resource-based industries.
- The division of output between tradables and non-tradables.
- The merchandise trade balance.
- Income distribution.
- Investment behaviour.

30. There may be a considerable asymmetry in the system, however, because in the short run the supply of tradables can drop considerably, but since it takes time to increase the capital stock, the supply cannot increase appreciably unless the economy is initially operating at low levels of capacity utilization.

Particular attention is paid to three distinct sub-periods:

Period I 1972 Q1 - 1974 Q2 - a period associated with a merchandise terms of trade improvement of 18 percent.

Period II 1974 Q3 - 1976 Q4 - a period associated with a lower terms of trade and a steady worsening of Canada's competitive position (in terms of relative unit labour costs).

Period III 1977 Q1 - 1978 Q4 - a period associated with a steady devaluation of the Canadian dollar and a steady improvement in Canada's competitive position.

4.1 The composition of industrial production between resource-based and non-resource-based industries

A rise in the price of resources (raw materials) relative to manufactured goods should cause output in resource-based industries to increase more rapidly than in non-resource-based industries - not only because the output price has risen for resource industries but possibly because the foreign output price for non-resource-based tradables may not have risen sufficiently to cover the increased costs of the inputs of raw materials.

By classifying forestry, mining, pulp and paper, wood and primary metals as resource-based industries, and other manufacturing as non-resource-based industry, one can then look at the ratios of the real domestic product indices for these two groups as presented in Figure 10. In Figure 10 one can see the increased relative output effect of the rise in the relative price of raw materials in the 1972 Q4 - 1973 Q4 period. After that,

Figure 10

OUTPUT IN RESOURCE-BASED INDUSTRIES
RELATIVE TO OUTPUT IN NON-RESOURCE-BASED MANUFACTURING
1971=100

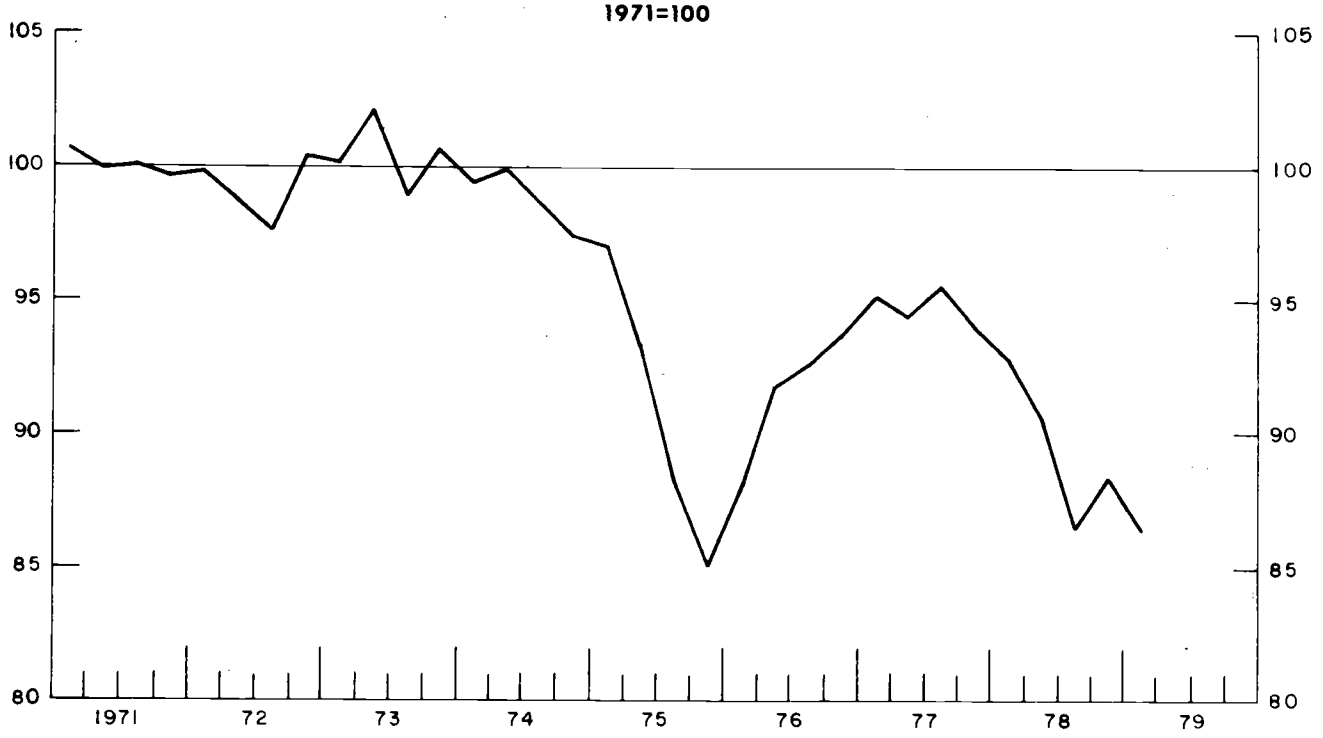
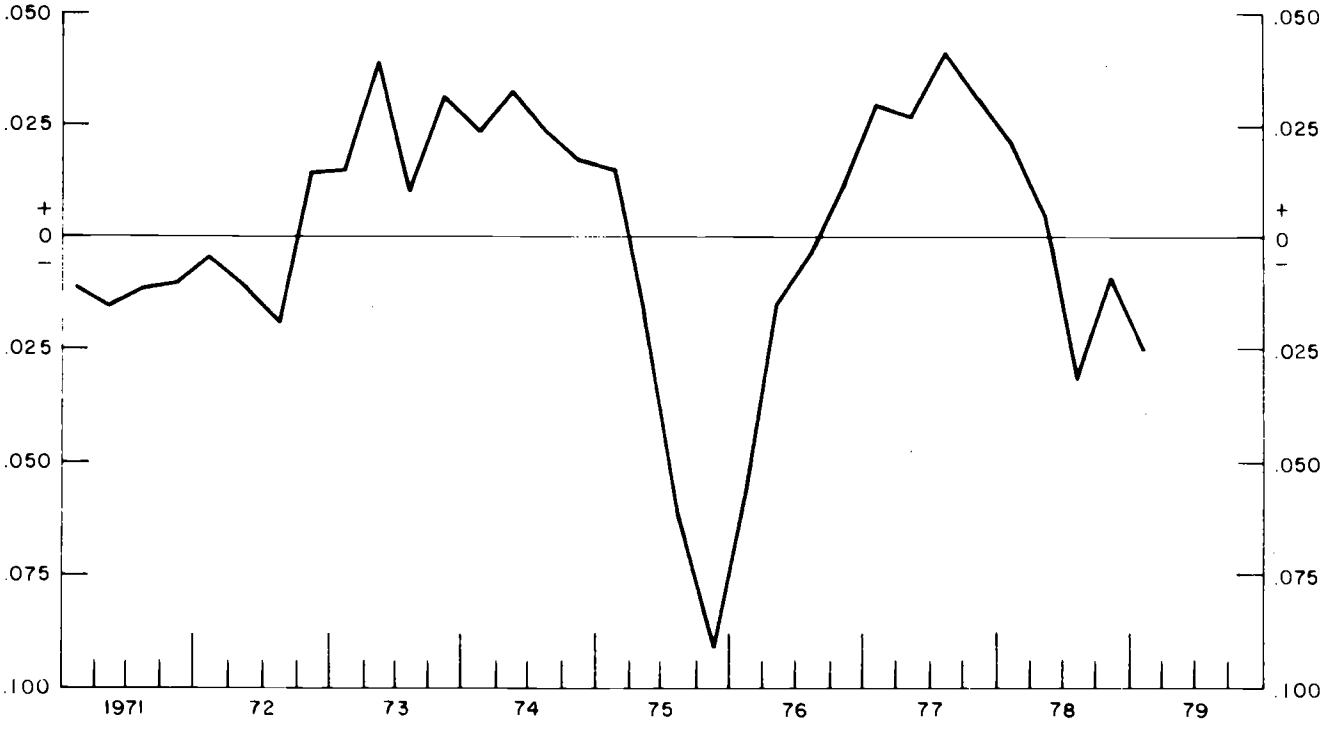


Figure 11

THE RATIO OF OUTPUT IN RESOURCE-BASED INDUSTRIES
TO OUTPUT IN NON-RESOURCE-BASED MANUFACTURING RELATIVE TO TREND



output in the resource-based industries declines relative to that of other manufacturing. However, if one abstracts from the trend decline in the output of resource-based industries relative to the others one notes that production in resource-based industries (see Figure 11), was above trend from 1972 Q4 to 1975 Q1, generally the period that raw material prices were high relative to unit labour costs (Figure 12). One reason for the downward trend in relative outputs may be the low level of investment in many sectors of the mining industry, where it appears it may often be more profitable to establish new mines in developing countries rather than in Canada.

As raw material prices declined and manufacturing prices increased, the ratio fell below trend from 1975 Q2 to 1976 Q3. The loss of competitiveness defined in terms of unit labour costs appears to have affected the non-resource-based industries more strongly in the 1976 Q4 - 1977 Q4 period. Similarly, the recovery in competitiveness since then may have had more of an effect on the production of non-resource-based goods.

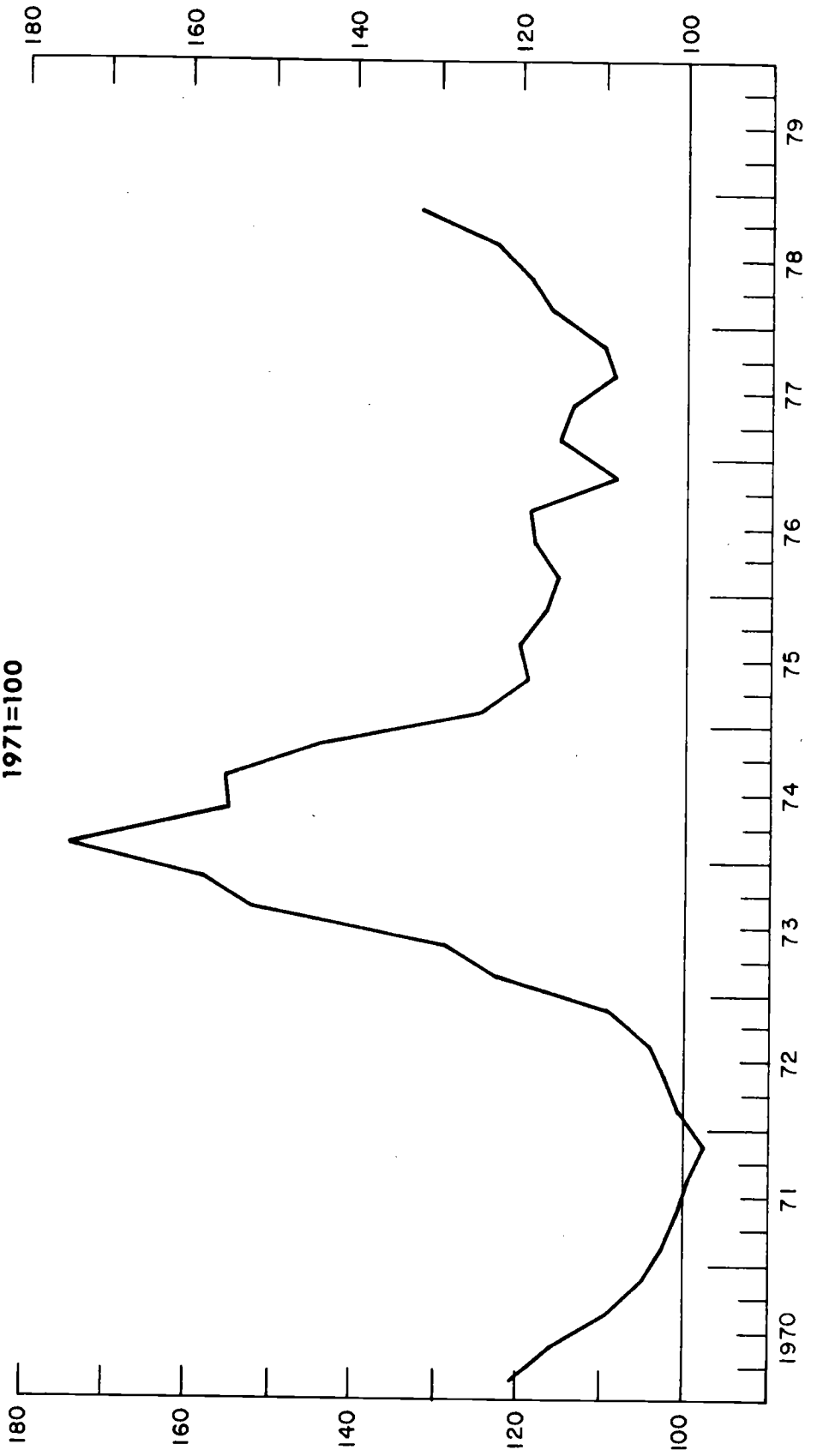
The model presented in the preceding section suggests that the ratio of the output of resource-based industries (rdpres) relative to that of non-resource-based tradable goods industries (rdpnre), should vary directly with the ratio of the price of resources (proxied by the price of raw materials -- prm) to domestic unit labour costs (w), and inversely with the real exchange rate (w^*+e-w), given prm and w.[31] If the movement

31. Note that $prm-w=prm^*-w^*+w^*+e-w^*$ and thus holding the foreign relative price prm^*-w^* constant, the sign of the real exchange rate is indeterminate in the model.

Figure 12

RATIO OF THE PRICE OF RAW MATERIALS TO CANADIAN UNIT LABOUR COSTS

1971=100



in relative capital stocks is captured by a time trend, then we can estimate the following equation for 1971 Q1 - 1978 Q4:

(t-statistics are in brackets)

$$\text{rdpres-rdpnre} = \underset{(.99)}{.013} + \underset{(1.73)}{.067}(\text{prm-w}) - \underset{(6.80)}{.003}(\text{TIME})$$

$\bar{R}^2 = .590$ S.E.R. = .033 D.W. = .54

or, with correction for first-order correlation:

$$\text{rdpres-rdpnre} = \underset{(.71)}{.019} + \underset{(.17)}{.010}(\text{prm-w}) - \underset{(3.04)}{.0042}(\text{TIME})$$

$\rho = .762$ $\bar{R}^2 = .194$ S.E.R. = .022 D.W. = 1.45

The real exchange rate variable did not enter significantly in preliminary regressions and therefore was deleted. The evidence is also very weak concerning the effect of the ratio of the price of raw materials to domestic unit labour costs.

4.2 The division of output between tradable and non-tradable goods

One can write the relative price of domestically-produced tradables to non-tradables as:

$$\frac{(P_T/E)E}{P_{NT}}$$

where P_T is the domestic price of tradables (a geometrically weighted average of the price of resources and the price of non-resource-based tradables),

E is the exchange rate, and

P_{NT} is the price of non-tradables.

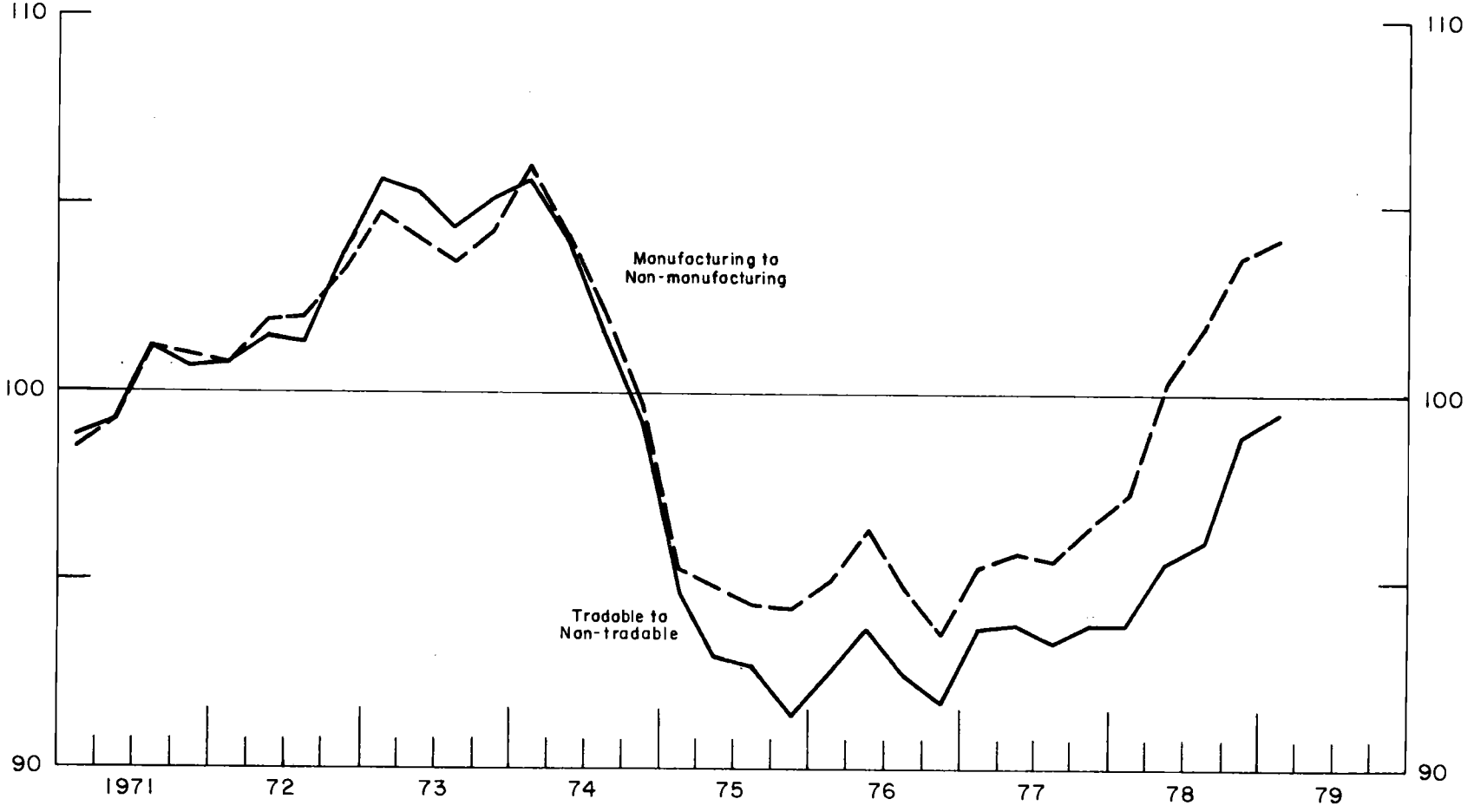
If the law of one price holds, $P_T = P_T^*/E$. However, in our model we do not assume that this law holds for non-resource-based tradable goods; thus P_T^* is only a major determinant of the movements of P_T/E.

The stylized facts for the 1970s are as follows: In Period I, P_T^* and P_T/E were rising relative to P_{NT} with E showing little variation; in Period II, P_T^* and P_T/E were falling relative to P_{NT} and E was again exhibiting little change; and in Period III, E was rising. Relative outputs moved as expected given the changes in relative prices, with the output of tradables rising relative to the output of non-tradables in Periods I and III, and falling in Period II. These results are shown in Figure 13 using two different definitions for tradable goods. The first definition encompasses forestry and mining as well as manufacturing. In the second case we concentrate on manufacturing alone.

If foreign demand affects output directly in addition to its impact via prices, then the growth in the U.S. economy in 1972-73 and 1977-78 likely contributed to the increased output of the

Figure 13

OUTPUT OF TRADABLE GOODS RELATIVE TO OUTPUT OF NON-TRADABLE GOODS
1971=100



tradable goods sector in those years. The pattern of the U.S. decline in 1974 and recovery in 1975-76 is not accurately mirrored in the pattern of tradable goods production in Canada in the 1974-76 period, however, and thus cannot be the sole explanatory variable.

The theory presented above suggests that the ratio of tradables production to non-tradables production (rdptra-rdpntr) should be positively related to the price of raw materials relative to unit labour costs, the real exchange rate (w*+e-w) and U.S. GNP (gnp*) relative to trend.[32] Since manufactured goods constitute the majority of tradable goods, a similar equation should hold for the split between manufactured (rdpman) and non-manufactured goods (rdpnm). The following simple regressions were estimated for 1971 Q1 - 1978 Q4:

$$\begin{aligned} \text{rdptra-rdpntr} = &- 5.58 + .109(\text{prm-w}) + .133(\text{w*+e-w}) \\ &\quad (5.12) \quad (4.18) \qquad\quad (2.09) \\ &- .0083(\text{TIME}) + .799(\text{gnp*}) \\ &\quad (6.63) \qquad\quad (5.13) \end{aligned}$$

$$\rho = .654 \qquad \bar{R}^2 = .773 \qquad \text{S.E.R.} = .010 \qquad \text{D.W.} = 1.58$$

$$\begin{aligned} \text{rdpman-rdpnm} = &- 4.80 + .092(\text{prm-w}) + .173(\text{w*+e-w}) \\ &\quad (4.13) \quad (3.24) \qquad\quad (2.51) \\ &- .0051(\text{TIME}) + .685(\text{gnp*}) \\ &\quad (4.14) \qquad\quad (4.13) \end{aligned}$$

$$\rho = .715 \qquad \bar{R}^2 = .640 \qquad \text{S.E.R.} = .010 \qquad \text{D.W.} = 1.43$$

32. Throughout, small letters denote logarithms.

The equations strongly bear out the expected positive impacts of increased raw materials prices and the real exchange rate.[33] In the second equation the coefficient on TIME is approximately the negative of the coefficient on gnp* times the trend increase per quarter in gnp*; thus only deviations in gnp* from trend affect the output split. In the case of rdptra-rdpntr, there is a slight downward trend independent of the effect of the trend in gnp*.

4.3 The merchandise trade balance

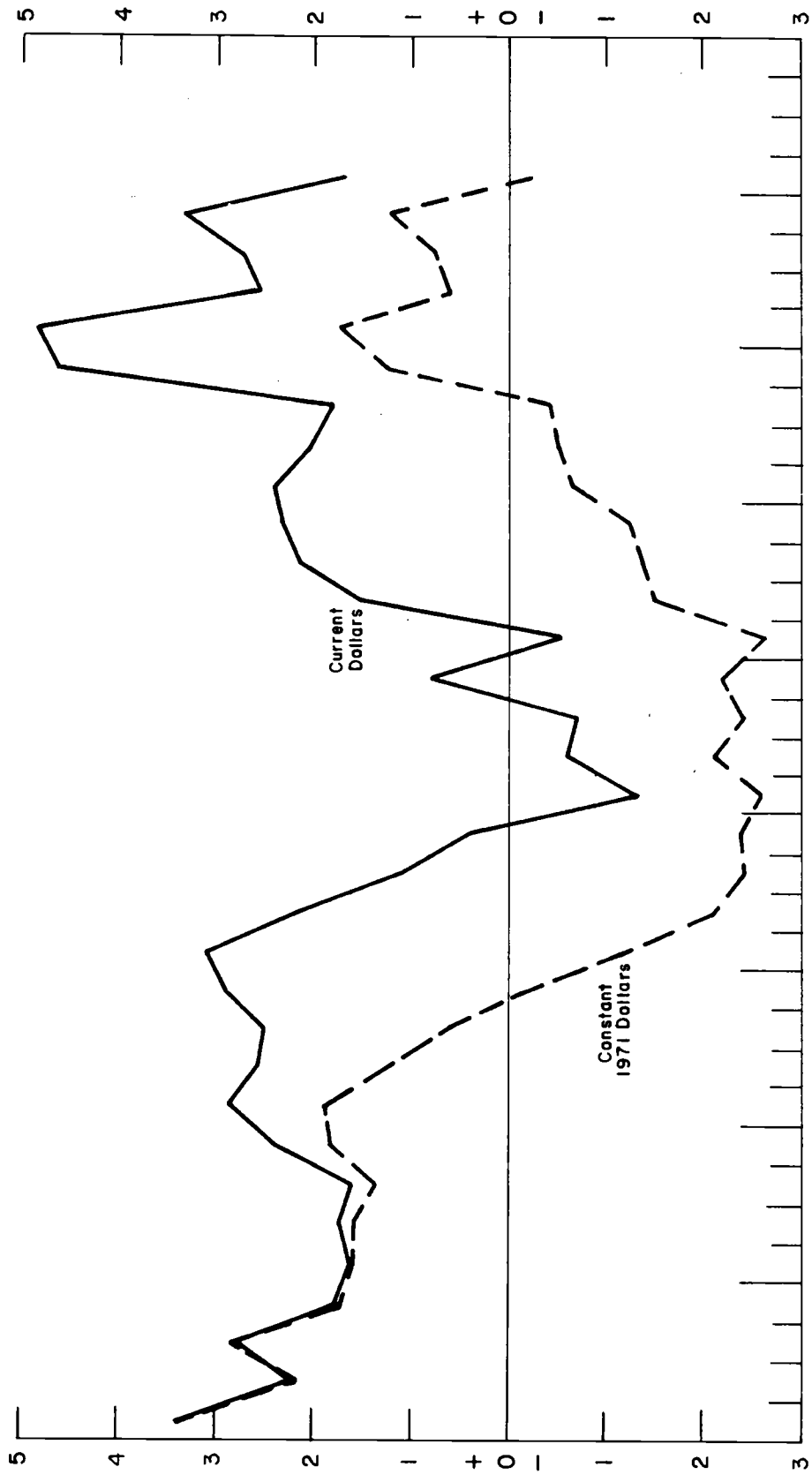
The merchandise trade balance (in volume terms) is determined by the difference between the domestic output of tradables and the domestic demand for tradables. In this preliminary study we have provided an explicit model only for the output of tradables, leaving the domestic demand for tradables to future research. One may note, however, that there is a resemblance, however rough, between the path of the relative output of tradable goods in Figure 13 and the constant dollar merchandise trade balance in Figure 14.

To the extent that the domestic demand for tradables varies inversely with the ratio of tradable goods prices to wages, an increase in the real exchange rate, i.e., a depreciation, should both increase the supply of tradables and decrease the domestic demand for them, increasing the trade balance. To the extent that

33. When the levels of rdptra and rdpman alone are the dependent variables, the coefficients on (w*+e-w) are surprisingly low. This puzzle remains to be explained.

Figure 14

MERCHANDISE TRADE BALANCE
Seasonally Adjusted at Annual Rates - Billions of Dollars



at the same time an exogenous terms of trade improvement causes real income gains, these decreased demand effects may be partially offset.

The exogenous increase in the price of tradables relative to the price of non-tradables led to a steady improvement in the current dollar merchandise trade balance in Period I to a peak of $3.1 billion in 1974 Q1 (see Figure 14). However, since Canada had experienced real income gains because of the terms of trade improvement, domestic demand for tradables outstripped the increased output of tradables. Thus there was a steady worsening of the constant dollar merchandise trade balance from $1.9 billion in 1973 Q1 to -$2.1 billion in 1974 Q2.

Period II can be divided into three sub-periods. From 1974 Q3 - 1975 Q1, the constant dollar trade balance worsened from -$2.4 billion to -$2.6 billion because of the appreciation of the real exchange rate and the U.S. recession; the current dollar trade balance deteriorated even more because of an exogenous decline in the terms of trade. From 1975 Q2 - 1976 Q1, both the current and constant dollar trade balances remained at very low levels. Even though the relative output of tradables was falling in 1976 Q2 - 1976 Q4, there was a slight improvement in both the current and constant dollar trade balances, perhaps because of the effect of the U.S. recovery.

The 1977-78 period shows a significant response of the constant dollar trade balance to the depreciation. The current dollar trade balance did not improve as significantly because of a

decline in the terms of trade which stemmed both from the depreciation and a decline in the price of raw materials relative to the price of manufactured goods.

4.4 Income distribution

If output prices rise relative to the prices of variable inputs, profits per unit of output will increase. Since Canada is a net exporter of resources, a rise in the price of raw materials relative to wages should increase profits. If the prices of non-resource-based tradable goods are at least in part related to foreign prices of such goods, which are in turn related to foreign unit labour costs, profits will be positively related to the real exchange rate. This can be derived in a more rigorous manner as follows. Let P be the GNP deflator. From the nominal gross national product identity:

$$(P)(GNP) = PROFITS + WAGES + MISCELLANEOUS$$

$$1 = \frac{PROFITS}{(P)(GNP)} + \frac{WAGES}{(P)(GNP)} + \frac{MISC}{(P)(GNP)}$$

$$\frac{PROFITS}{(P)(GNP)} = (1 - \frac{MISC}{(P)(GNP)}) - \frac{W}{P}$$

where W is unit labour costs.

Then, if the miscellaneous components to nominal GNP ratio follows a time trend, a log-linear approximation to the above equation is provided by

$$\pi - gnp = a + bTIME + c(p-w)$$

where small letters represent logarithms and π is the log of real corporate profits.

The output price is a geometric weighted average of domestic unit labour costs, foreign unit labour costs (in domestic currency) and the price of raw materials. Thus

$$p = \alpha w + \beta (w^*+e) + (1-\alpha-\beta)prm$$

and

$$\pi - gnp = a + bTIME + c'(w^*+e-w) + c''(prm-w)$$

where $c' = \beta c$ and $c'' = c(1-\alpha-\beta)$

Table 5 shows that with increasing relative prices of tradable goods in Periods I and III, real profits (i.e., in terms of the GNP deflator) both in manufacturing (as a proxy for tradable goods) and in the economy as a whole, rose, whereas the decreasing relative prices in Period III contributed to their decline.[34] The following regression was estimated for 1971 Q1 - 1978 Q4:

34. The share of profits in GNP can be found in Table 7.

Table 5

REAL CORPORATE PROFITS BEFORE AND AFTER TAXES, SEASONALLY ADJUSTED (millions of 1971 dollars)

	Total Economy		Manufacturing	
	Before taxes	After taxes	Before taxes	After taxes
1971-1	7,618	4,585	N.A.	463
2	8,365	5,095	N.A.	538
3	9,296	5,656	N.A.	577
4	9,422	6,039	N.A.	555
1972-1	9,649	6,095	N.A.	660
2	10,133	6,456	N.A.	654
3	10,213	6,569	N.A.	578
4	11,122	7,129	N.A.	608
1973-1	12,557	8,233	1,298	709
2	12,840	8,592	1,223	792
3	13,604	9,376	1,322	825
4	14,713	9,860	1,524	922
1974-1	15,766	10,511	1,595	978
2	15,666	10,252	1,549	958
3	15,364	9,888	1,645	953
4	14,049	8,896	1,389	791
1975-1	13,209	8,281	1,365	802
2	13,135	8,064	1,335	806
3	13,640	8,410	1,314	740
4	13,757	8,587	1,284	719
1976-1	12,614	7,871	1,243	733
2	13,037	8,416	1,205	721
3	12,871	8,131	1,117	650
4	11,521	7,584	1,014	617
1977-1	13,072	8,467	1,119	658
2	12,646	8,349	1,128	674
3	12,798	8,854	1,100	703
4	13,136	8,829	1,271	748
1978-1	13,605	9,766	1,103	710
2	13,540	9,611	1,213	797
3	14,370	9,864	1,401	860
4	15,535	10,742	1,644	1,046
1979-1	17,080	12,082	N.A.	N.A.

$$\pi\text{-gnp} = \underset{}{-2.414} + \underset{(24.77)}{.531}(prm-w) + \underset{(4.36)}{.392}(w^*+e-w) + \underset{(1.19)}{.0067}(TIME) \quad \underset{(1.49)}{}$$

$$\rho = .909 \quad \bar{R}^2 = .456 \quad S.E.R. = .042 \quad D.W. = 2.07$$

The signs are correct and the magnitudes in the expected range (less than one), but the coefficient on the real exchange rate is imprecisely estimated.

The movement in the price of raw materials relative to unit labour costs was the major contributing factor in the increase in corporate profits from 9.0 percent of GNP in 1970 to 13.6 percent of GNP in 1974. A worsening of competitiveness (a decrease in the real exchange rate) and a decline in the price of raw materials relative to unit labour costs caused a decline in corporate profits to 10.6 percent of GNP in 1976. The depreciation (increase) of the nominal and real exchange rates caused a recovery of profits to 11.2 percent of GNP in 1978.[35]

4.5 Business fixed investment

In modelling business fixed investment, we first suppose that the desired capital stock depends on expected output and the relative prices of capital and labour. We further suppose that expected output is influenced by the current level and rate of change of output and the expected real exchange rate. It is

35. Corden (1977) has a good discussion of the effects of a depreciation on income distribution.

likely that the rate of adjustment of the actual capital stock to the desired capital stock will be influenced by the current rate of capacity utilization and perhaps a corporate liquidity variable, such as corporate profits.

Given the large depreciation, both in nominal and real terms over the 1977-78 period, and the resultant increase in the production of tradable goods, and therefore, in the rate of capacity utilization in the tradable goods industry, one would have expected a significant increase in busines fixed investment during 1978. However, such investment increased by only 1 percent in 1978 over 1977, while real corporate profits increased by 14.4 percent, real domestic product (RDP) increased by 3.4 percent, and the real exchange rate depreciated by 9 percent (see Table 6).

A closer examination (see Table 7) does show that from the very weak investment level in 1978 Q1, real investment steadily increased by 8 percent over the course of the next four quarters. Thus investment has been increasing, but perhaps not as quickly as one would expect given the depressed level from which it was starting (only in 1978 Q3 was the 1975 Q3 level surpassed).

In the above sections of the paper we have discussed the reasons for the depressed state of the tradable goods industry in 1975-76 (and hence of investment in the industry in the 1976-77 period). We now turn to the possible reasons for the slow pick-up in investment activity after the recovery in tradable goods production in 1977-78:

(a) Initially, output is increased through heightened short-run productivity, then through the hiring of additional labour, and

Table 6

ANNUAL REAL BUSINESS FIXED INVESTMENT
(millions of 1971 dollars unless otherwise indicated)

	1971	1972	1973	1974	1975	1976	1977	1978
Total	12,230	12,751	14,667	15,802	17,031	16,965	17,166	17,337
(% increase)	3.4	4.3	15.0	7.7	7.8	-.4	1.2	1.0
Manufacturing	2,994	2,849	3,374	3,965	3,896	3,591	3,716	3,484
(% increase)	-10.4	-4.8	18.4	17.5	-1.7	-7.8	3.5	-6.2
Real corporate profits	5,344	6,562	9,015	9,887	8,335	8,000	8,740	9,996
(% increase)	11.4	22.8	37.4	9.7	-15.7	-4.0	9.3	14.4
Real manufacturing profits (% increase)	2,134	2,497	3,257	3,670	3,062	2,716	2,814	3,421
	30.6	17.0	30.4	12.7	-16.6	-11.3	3.6	21.6
R.D.P.*	100.0	105.6	113.4	118.1	119.0	125.2	129.0	133.4
(% increase)	5.5	5.6	7.4	4.1	.8	5.2	3.0	3.4
Real exchange rate	100.0	97.5	96.7	89.7	87.3	81.4	87.3	96.1
(1971=100) (% increase)	-3.3	-2.5	-.8	-7.3	-2.7	-6.8	7.2	10.0

* Real Domestic Product (1971=100)

Table 7

REAL BUSINESS FIXED INVESTMENT AND SOME RELATED VARIABLES
1971 TO 1979
(millions of 1971 dollars unless otherwise indicated)

	Real investment	Real corporate profits (after tax)	Profit share in GNP (%)	Capacity utilization (%)	Real exchange rate (1971=100)
1971-1	11,760	4,585	8.3	87.4	99.7
2	12,108	5,095	9.0	89.1	99.5
3	12,332	5,656	9.7	91.2	101.3
4	12,720	6,039	9.7	91.1	99.4
1972-1	12,696	6,095	9.9	89.8	99.8
2	12,860	6,456	10.1	91.1	98.1
3	12,740	6,569	10.1	91.2	96.7
4	12,708	7,129	10.8	92.9	95.3
1973-1	13,748	8,233	11.8	94.9	96.6
2	14,248	8,592	12.0	94.4	96.5
3	14,936	9,376	12.6	93.0	97.7
4	15,736	9,860	13.3	94.9	96.0
1974-1	15,964	10,512	14.1	96.3	93.6
2	15,576	10,252	14.0	94.2	89.6
3	15,720	9,888	13.8	91.7	88.4
4	15,948	8,896	12.6	88.6	87.3
1975-1	16,548	8,281	11.8	84.0	89.1
2	16,996	8,064	11.7	83.3	88.3
3	17,388	8,410	12.0	83.4	85.9
4	17,192	8,586	12.0	83.2	86.1
1976-1	17,020	7,871	10.7	84.1	83.5
2	17,328	8,416	10.9	85.4	81.0
3	16,484	8,131	10.8	83.9	80.8
4	17,028	7,584	9.6	82.6	80.5
1977-1	17,272	8,467	10.8	83.9	85.3
2	17,108	8,349	10.4	83.4	86.1
3	17,284	8,854	10.5	83.0	86.6
4	17,000	9,289	10.6	83.4	91.3
1978-1	16,712	9,766	10.9	83.8	93.8
2	17,228	9,611	10.8	85.5	94.3
3	17,584	9,864	11.3	86.5	97.0
4	17,824	10,742	12.2	87.6	99.4
1979-1	18,052	12,082	13.1	87.9	N/A

then through new capital investment.

Rates of capacity utilization in manufacturing did not begin to pick up significantly until the second quarter of 1978. On an over-all measure, capacity utilization was not exceptionally high until the fourth quarter of 1978. Output had risen because of increases in short-run productivity and the expanded hiring of workers.

(b) There are long lags from the time of an increase in the desired stock of capital until the new investment is put into place.

The severely depressed period that manufacturing industries had come through in 1976-77 might have meant that expansion plans were not ready. Much of the machinery and equipment needed is produced to order and occasionally the waiting times until delivery can be considerable.

(c) There is much uncertainty over the permanence of the depreciation.

Discussions in some quarters concentrate on the effects of movements in the nominal exchange rate alone on Canada's competitive position instead of looking at all the factors that affect the real exchange rate. There may still be a notion that the Canadian dollar will perhaps return towards parity with the U.S. dollar. If this were the case then exporters would see their gains in competitiveness as temporary and potential investment would not seem as profitable. The longer that the exchange rate remains at a depreciated level, however, the more likely it is

that the depreciation will be looked upon as permanent.

(d) A depreciation may cause a lower desired capital to labour ratio since a high percentage of machinery and equipment is imported.

This consideration certainly cannot be overlooked from a theoretical point of view, but we tend to think that it is unimportant empirically, relative to the large changes in the expected profitability of new investment.

(e) Real corporate profits per unit of output were starting from a very low level: balance sheets had to be "adjusted" before the higher profits resulted in increased investment.

There may be more jargon than theory involved here. If projects are expected to be highly profitable, external financing can be sought. However, it is true that during times of low profitability, firms may run down their liquid assets because they cannot borrow at what they perceive to be reasonable rates. Also, stock prices were low when profits were low and so debt/equity ratios increased. A run of profits may be necessary before firms can return to their desired debt/equity ratio.

Our over-all impression is that, particularly in the light of the severe profit squeeze faced by the tradable goods industries in 1975-76, one could expect the lags from the perceived increased profitability of investment projects to the actual investment to be long, perhaps longer than normal. This, in addition to any lag in perception that the real depreciation is indeed likely to be

permanent, may be enough to explain the small increase in investment activity in 1978.

APPENDIX

FOUR EMPIRICAL MODELS OF THE EXCHANGE RATE: 1971-76

In this Appendix we present a simple monetarist model, the Haas-Alexander model, and two other models that are presently available only in unpublished form. The following common notation is used:

BB-OP - The basic balance less official purchases of foreign exchange, measured in U.S. dollars.

BORR - Net long-term capital inflows relative to Canadian GNP.

BR - The Canadian Bank Rate less the U.S. discount rate.

CA - The Canadian current acccount balance.

D - Zero in the 1950s float; one in the 1970s float.

F - The 30-day forward exchange rate.

GNBIA - Gross Canadian new borrowing (issues sold abroad).

L - Net stock of Canadian short-term liabilities to foreigners (measured in U.S. dollars).

M - M1.

MTB - Canadian merchandise trade balance.

P - Price level (GNE deflator).

R - The 90-day interest rate (finance paper or commercial paper).

RES - Canadian stock of foreign exchange reserves.

RU - The rate of unemployment.

S - Spot exchange rate (Canadian dollars per U.S. dollar).

Se - Expected spot exchange rate:

$$s^e = \hat{s}_{t+1} = .2342 + 1.3542s_{t-1} - .3542s_{t-2} - .2342(RES_t/RES_{t-1})$$

TOT - Canadian terms of trade (ratio of export to import prices).

W - Wealth.

Y - GNP.

In the following equations:

(a) small letters denote logarithms,

(b) unstarred variables are Canadian,

(c) starred variables are U.S., and

(d) a "u" superscript denotes unexpected.

Absolute values of t-statistics are in brackets.

(1) Monetarist (Quarterly 1971 Q1 - 1974 Q1, 1974 Q3 - 1975 Q3, 1976 Q1 - 1976 Q3)[36]

$$s = \underset{(3.31)}{4.27} + \underset{(2.97)}{.403}(m-m^*) - \underset{(2.21)}{.434}y - \underset{(.78)}{.118}y^* - \underset{(1.74)}{.0040}(R-R^*)$$

$\rho = .278 \quad \bar{R}^2 = .340 \quad$ S.E.R. = .0104 D.W. = 1.69

36. Omitted quarters in 1974 and 1975 are due to Canadian postal strikes that caused M1 to expand.

(2) Haas-Alexander (1979) (Quarterly 1953 Q3 - 1961 Q4, 1971 Q1 - 1975 Q2)

$$S = \underset{(2.04)}{.166} + \underset{(4.02)}{.058}D - \underset{(2.14)}{.108}(.0001)(BB-OP) - \underset{(1.95)}{.00467}(R-R^*)$$

$$+ \underset{(8.53)}{.772}Se + \underset{(2.41)}{.001}(W^*/W) + \underset{(3.22)}{.109}(.0001)L_{-1}$$

$\bar{R}^2 = .828$ S.E.R. = .0083 D.W. = 2.29

(3) Freedman (1979a) (Quarterly 1971 Q1 - 1976 Q3)

$$S = \underset{(1.4)}{.206} + \underset{(4.5)}{.451}(P_{-1}/P^*_{-1}) - \underset{(1.8)}{.406}BORR_{-1} - \underset{(4.4)}{.347}TOT_{-1}$$

$$- \underset{(6.4)}{.012}(RU_{-1} - RU^*_{-1}) - \underset{(1.8)}{6.12}(10^{-6})CA^u$$

$$- \underset{(6.6)}{.0093}(R-R^*) + \underset{(6.2)}{.711}S_{-1}$$

$\rho = .711$ $\bar{R}^2 = .954$ S.E.R. = .0048 D.W. = 2.56

(4) Longworth (1979a) (Monthly 1972 M1 - 1976 M10)

$$\Delta s = \underset{(.44)}{.0004} - \underset{(2.32)}{1.149}(f_{t-1} - s_{t-1}) - \underset{(2.44)}{2.871}\Delta(f_t - s_t)$$

$$- \underset{(2.44)}{.83 \times 10^{-5}}\,\Delta^u(GNBIA) - \underset{(.76)}{.50 \times 10^{-5}}\,\Delta^u(MTB)$$

$$+ \underset{(.20)}{.07}\,\Delta BR$$

$\bar{R}^2 = .207$ S.E.R. = .0063 D.W. = 1.51

REFERENCES

Aliber, Robert Z. "Equilibrium and Disequilibrium in the International Money Market." Welwirtschaftliches Archiv, 73-90, 1976.

Appelbaum, Elie and Kohli, Ulrich R. "Canada-United States trade: tests for the small-open-economy hypothesis." Canadian Journal of Economics, February 1979, vol. 12, no. 1, pp. 1-14.

Bailey, Martin J. National Income and the Price Level; a study in macroeconomic theory. New York, McGraw-Hill, 1971.

Bank of Canada. Annual Report of the Governor to the Minister of Finance for the Year 1970. Ottawa, Bank of Canada, 1971.

Bank of Canada. The Equations of RDX2 Revised and Estimated to 4Q72. Ottawa, Bank of Canada, 1976. (Bank of Canada Technical Report 5).

Branson, William H. "Discussion of Dornbusch". Managed Exchange-Rate Flexibility: The Recent Experience, Boston, Federal Reserve Bank of Boston Conference Series No. 20, 1978, pp. 123-6.

Caves, Richard E. and Reuber, Grant L. Capital Transfers and Economic Policy: Canada, 1951-62. Cambridge, Harvard University Press, 1971.

Corden, W.M. Inflation, Exchange Rates, and the World Economy. Oxford, Clarendon Press, 1977.

Courchene, Thomas J. Money, Inflation, and the Bank of Canada. Montreal, C.D. Howe Research Institute, 1976.

Dornbusch, Rudiger. "Real and Monetary Aspects of the Effects of Exchange Rate Changes" in Aliber, R.Z. (ed.) National Monetary Policies and the International Financial System, Chicago, University of Chicago Press, 1974.

Dornbusch, Rudiger. "Alternative Price Stabilization Rules and the Effects of Exchange Rate Changes." The Manchester School, no. 3, September 1975, pp. 275-292.

Dornbusch, Rudiger. "Expectations and Exchange Rate Dynamics." Journal of Political Economy, December 1976, vol. 84, no. 6, pp. 1161-1176.

Dornbusch, Rudiger (1978a) "Discussion of Bilson." American Economic Review (Papers and Proceedings), May 1978, vol. 68, no. 2, pp. 412-413.

Dornbusch, Rudiger (1978b) "Monetary Policy Under Exchange-Rate Flexibility." Managed Exchange-Rate Flexibility: The Recent Experience, Boston, Federal Reserve Bank of Boston Conference Series No. 20, 1978, pp. 90-122.

Dornbusch, Rudiger and Krugman, Paul. "Flexible Exchange Rates in the Short Run." Brookings Papers on Economic Activity 3, 1976, pp. 537-84.

Fleming, J. Marcus. "Domestic Financial Policies Under Fixed and Floating Exchange Rates." IMF Staff Papers, November 1962, vol. 9, no. 3, pp. 369-80.

Freedman, Charles (1970). Long-Term Capital Flows Between the United States and Canada, unpublished M.I.T. Ph.D. thesis.

Freedman, Charles. "Recent growth in productivity, real experience per capita and real income per capita: Accounting for the differences." Bank of Canada Review, August 1977, Ottawa, Bank of Canada, pp. 3-15.

Freedman, Charles. "Discussion of Hernandez-Cata et al." Managed Exchange-Rate Flexibility: The Recent Experience, Boston, Federal Reserve Bank of Boston Conference Series No. 20, 1978, pp. 143-47.

Freedman, Charles (1979a). "The Canadian Dollar, 1971-76: An Exploratory Investigation of Short-Run Movements", NBER Working Paper No. 380.

Freedman, Charles (1979b). "Long-Term Bond Rates, Martingales and Efficient Markets", Bank of Canada mimeo.

Freeman, George E. "Recent Developments in Canadian Monetary Policy." Kredit und Kapital, 1978, no. 2, pp. 145-58.

Friedman, Milton. "The Role of Monetary Policy." American Economic Review, March 1968, vol. 58, no. 1, pp. 1-17.

Girton, L. and Roper, D. "A Monetary Model of Exchange Market Pressure Applied to the Postwar Canadian Experience." American Economic Review, September 1977, vol. 64, no. 4, pp. 537-48.

Haas, Richard D. and Alexander, William E. "A Model of Exchange Rates and Capital Flows: The Canadian Floating Rate Experience." Journal of Money, Credit & Banking, November 1979, vol. 11, no. 4, pp. 467-82.

Helleiner, Gerald K. "Connections Between United States' and Canadian Capital Markets, 1952-1960." Yale Economic Essays (Fall) 1962, vol. 2, no. 2, pp. 350-400.

Isard, Peter. Exchange-Rate Determination: A Survey of Popular Views and Recent Models, Princeton Studies in International Finance, no. 42, May 1978.

Lee, C.H. "A Stock-Adjustment Analysis of Capital Movements: The United States - Canadian Case." Journal of Political Economy, July/August 1969, vol. 77, no. 4, pp. 512-23.

Levich, Richard M. "On the Efficiency of Markets for Foreign Exchange" in Dornbusch, R. and Frenkel, J.A. (eds.) International Economic Policy: Theory and Evidence, Baltimore, Johns Hopkins University Press, 1979, pp. 246-66.

Longworth, David (1979a). Floating Exchange Rates: The Canadian Experience, unpublished M.I.T. Ph.D. thesis.

Longworth, David (1979b). "Canadian Intervention in the Foreign Exchange Market: A Note." Review of Economics and Statistics, (forthcoming).

Lynch, Kevin (1979). "Efficiency and the Canadian Bond Market: A Comment on Pesando", Bank of Canada mimeo.

MacKay, Ian and Hannah, Robert. "Canada's balance of payments in the 1970s: A perspective." Bank of Canada Review, March 1979, Ottawa, Bank of Canada, pp. 3-15.

McKinnon, Ronald I. "Floating Foreign Exchange Rates 1973-74: The Emperor's New Clothes" in Brunner, K. and Meltzer, A.H. (eds.) Institutional Arrangements and the Inflation Problem, Carnegie-Rochester Conference Series on Public Policy, vol. 3, North Holland Publishing Co., 1976, pp. 79-114.

Modigliani, Franco and Shiller, Robert J. "Inflation, Rational Expectations and the Term Structure of Interest Rates." Economica, February 1973, vol. 40, no. 157, pp. 12-43.

Mundell, Robert. International Economics. New York, Macmillan Company, 1968.

Mussa, Michael. "Our Recent Experience with Fixed and Flexible Exchange Rates: A Comment" in Brunner, K. and Meltzer, A.H. (eds.) Institutional Arrangements and the Inflation Problem, Carnegie-Rochester Conference Series on Public Policy, vol. 3, North Holland Publishing Co., 1976, pp. 123-41.

Officer, Lawrence H. An Econometric Model of Canada Under the Fluctuating Exchange Rate. Cambridge, Harvard University Press, 1968.

Porter, Michael G. "A Theoretical and Empirical Framework for Analyzing the Term Structure of Exchange Rate Expectations." IMF Staff Papers, November 1971, vol. 18, no. 3, pp. 613-45.

Salter, W.E.G. "Internal and External Balance - The Role of Price and Expenditure Effects." Economic Record, August 1959, vol. 35, pp. 226-38.

Sargen, N.P. "Exchange Rate Flexibility and Demand for Money." Journal of Finance, May 1977, vol. 32, no. 2, pp. 531-44.

Schadler, Susan. "Sources of Exchange Rate Variability: Theory and Empirical Evidence." IMF Staff Papers, July 1977, vol. 24, no. 2, pp. 253-96.

Shiller, Robert J. "The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure." Journal of Political Economy, December 1979, vol. 87, no. 6, pp. 1190-1219.

Spitaller, E. "A Survey of Recent Quantitative Studies of Long-Term Capital Movements." IMF Staff Papers, March 1971, vol. 18, no. 1, pp. 189-220.

Swan, T.W. "Economic Control in a Dependent Economy." Economic Record, March 1960, vol. 36, pp. 51-66.