July 1997

Note: This is a draft working paper circulated for technical consultation. It reflects the personal analysis of the author, and it should not be construed as in any way representing the official policy of the Ontario Government. Comments would be most welcome.

## Introduction

The developed economies of the world are characterized by instantaneous communications. Nowhere is this more evident than in financial markets, where events in the United States are immediately reflected in the pricing of assets in other countries. Observation of these co-movements gives rise to a view that financial markets have become highly integrated. Sometimes, it is claimed that the economic and financial policies of smaller countries like Canada are no longer important in determining their own economic destinies.

The degree of financial market integration is an important question that can only be answered by empirical analysis. There is no doubt that there is near-perfect integration among countries and regions that use a common currency. However, integration is likely to be less than perfect where different currencies are involved.

Canadian interest rates usually move in the same direction as U.S. interest rates when the latter change substantially. However, there is also a considerable amount of independent variation in Canadian interest rates. This differential can vary widely from year to year.

The purpose of this paper will be to estimate how much this differential is influenced by changes in Canada's current account balance. The current account represents the total amount that Canada must finance through capital inflows (either in the form of debt or equity). It is the best summary indicator of the total pressure on financial markets from the demand for capital in Canada.

## The Relationship between the Current Account Deficit and Government Deficits

The current account balance is the outcome of all saving, borrowing and investment decisions in the Canadian economy. Hence, it is influenced by monetary policy, by total government borrowing, and by private sector saving and investment.

It overcomes some of the difficulties that have been experienced in past attempts to measure the effects of government deficits on interest rates. Other things equal, higher demand for credit due to a higher government deficit leads to higher interest rates. However, on many occasions this is obscured by offsetting changes in private sector borrowing, or changes in monetary policy that increase or decrease the quantity of credit.

This ambiguity of the effect of government deficits on interest rates was highlighted by Evans (1985), who found that, for the United States, there was a historical tendency for higher deficits to be associated with lower interest rates. Contrary to Evans, Spiro (1990) found that interest rates rose in response to a higher debt to GDP ratio. However, a similar analysis by Ford and Laxton (1995) using a shorter, more recent sample period found that the debt to GDP ratio is statistically insignificant even for a large country like the United States. Siklos (1988) and Darrat and Suliman (1991) found no effect of Canadian deficits on interest rates. Other recent studies, such as Orr, Edey and Kennedy (1995) and Fillion (1996) reported some statistically significant results, but only by imposing constraints on their models, some of which may be unrealistic. Ford and Laxton (1995) found that the combined debt to GDP ratio of all the industrial countries raises the "world real interest rate." For each individual country they looked at, they found that its debt ratio was not significant at explaining its interest rates. They concluded that this is an indication of a high degree of international capital market integration. However, Ford and Laxton used data on domestic debt, so their findings may not address the issue of capital market integration. Changes in the total debt of a country need not be highly correlated with changes in its foreign debt. Only if interest rates are insensitive to changes in foreign debt can one conclude that international capital flows are perfectly elastic.

The relationship between government deficits and the current account balance is sometimes misunderstood. In some cases, an increase in the government deficit is quickly matched by the current account deficit. This appears to have been the case in the United States in the 1980s, and gave rise to the "twin deficits" hypothesis. It is, of course, also possible for a country to have a large current account deficit while having a government budget surplus (as was the case in Mexico in 1995, prior to its financial crisis); or a current account surplus with a large government deficit, as has occurred in some years for Belgium and Italy. Looking at the historical Canadian data, there have been periods when there was relatively little correlation between government deficits and the current account balance, as noted by Poloz (1992).

These examples illustrate that the effects of high private sector borrowing (as in the case of Mexico) or saving (as in the case of Belgium and Italy) can offset the government deficit. In Canada's case, volatile monetary policy has often had large impacts on the current account deficit. In the period following 1987, tighter monetary policy caused a sharp appreciation in the Canadian dollar's exchange rate and an increase in the current account deficit.

This historical experience tells us that government deficits are not the only cause of changes in the current account deficit. However, that does not negate the hypothesis that they are one of the leading causes of changes in the current account deficit. At a point in time, there is a fixed pool of savings in Canada. If the government increases its deficit, this might be offset by an increased supply of money from the Bank of Canada, but this is only likely to happen when the economy is depressed and inflation is falling. Alternatively, there could be increased saving or less borrowing from the private sector.

In fact, while higher interest rates would crowd out some private investment, and may generate some additional saving, empirical studies have rejected the contention that higher higher government deficits are fully offset by such changes, as found by Johnson (1995). While the effect may take place with a time lag, and may be less than one to one, logic dictates that changes in government deficits lead to changes in the current account deficit under equilibrium conditions. The key to this is the exchange rate: it must be allowed to adjust downwards in response to a reduced fiscal deficit, in order to induce an increase in net exports. The central bank needs to accept this and accommodate it. This outcome is contrary to the prediction frequently made by financial journalists, that reduced deficits lead to an appreciating exchange rate as a result of improved confidence.

### The Effect of Monetary Policy on Interest Rates and the Current Account

In an open economy the central bank's monetary policy is only one of two sources of liquidity. International borrowing is an alternative source. In the extreme case, where international capital flows are perfectly elastic, the simplest form of the Mundell theory predicts that there will be no increase in interest rates due to a tighter monetary policy. The tightening occurs entirely through the appreciation of the exchange rate caused by higher capital inflows.

If a monetary policy change the exchange rate, it inevitably also moves the current account. In an open economy, monetary policy cannot be effectively tightened without inducing an increase in capital inflows and a corresponding increase in the current account deficit. The elasticity of capital inflows determines how much the current account deficit will have to increase in order to bring about the magnitude of the increase in interest rates that the central bank desires. This is one reason for the very strong inverse relationship between interest rates and the current account balance seen in Figure 1.

## An Empirical Model of the Canada-U.S. Short-Term Interest Differential

### 1. Factors Determining Canadian Short-Term Interest Rates

Canadian financial markets are closely linked to those of the United States, and the U.S. T-bill rate explains 76 percent of the variance of the Canadian T-bill rate even over the recent history from 1988 to 1996. It is the differential between Canadian and U.S. interest rates which is the focus of discussion in Canada, and this is what will be used as the dependent variable in the econometric analysis discussed below.

The unemployment rate can be used to represent the economic environment which determines the Bank of Canada's monetary policy decisions. The unemployment rate is a better variable in this regard than the inflation rate. The Bank of Canada targets the

inflation rate, but it does so in a forward looking way. It does not wait for the inflation rate to rise before it tightens monetary policy. Rather, it looks at the unemployment rate as a predictor of how inflation will behave in the future.

The current account balance represents marginal net borrowing by the Canadian economy. An increase in the current account deficit represents an upward shift in the demand curve for funds in Canada without any corresponding upward shift in the supply curve. Unless that foreign supply of funds to Canada is perfectly elastic, this increase in demand will cause an increase in Canadian interest rates. As noted above, when government borrowing rises in Canada, there are often offsetting reductions in private sector borrowing, effectively shifting up the net supply curve.

The Canada-U.S. interest differential was regressed on polynomial distributed lags of the current account to GDP ratio, the Canada-U.S. unemployment rate differentials, and the Canada- U.S. inflation rate differentials. All of these explanatory variables were found to have significant t-statistics. Regressing over the 1977 to 1996 sample period, the sum of coefficients on the current account balance (lagged from t-2 to t-6) was -0.60, with a t-statistic of -4.1. This implies that the Canada-U.S. three month T-bill differential would eventually rise by 60 basis points for every 1 percentage point increase in the current account balance as a percent of GDP.

One interesting result that emerges from these regressions is that the Canada-U.S. inflation differential affects the T-bill differential with a very long lag, and has little short-term impact. Values of the inflation differential from 3 years earlier are significant, with a sum of coefficients of 0.3. This is consistent with the fact that purchasing power parity does not hold in the short run. The Canadian inflation rate only matters to foreign investors if it gets reflected in the exchange rate, and this does not happen in the short run.

2. Ordinary Least Squares May Not be Reliable

The strong inverse relationship between the interest differential and the current account ratio can be seen in Figure 1. It is not obvious that one of them leads the other, and economic theory tells us that causality is likely to run in both directions. A larger current account deficit will require higher interest rates to attract the foreign capital needed to finance it. Conversely, a higher interest rate, caused by tighter monetary policy or other domestic factors, will attract capital, boosting the exchange rate, and reducing net exports and the current account balance. Vector autoregression is a useful technique for forecasting where each variable in a group helps to forecast the others.

In addition, these variables are nonstationary, and this violates a key assumption of the OLS model. The interest rate differential, unemployment rate and the current account ratio are nonstationary variables, as seen from the numbers in Table 1. These three variables have unit roots. An OLS specification with nonstationary data may appear to show a statistically significant relationship which is actually a spurious correlation. A

more reliable estimate of the impact can be obtained with a vector error correction, which can deal with the interdependence of cointegrated variables.

3. Vector Error Correction Estimates Significant cointegration was found among the interest rate, current account, and unemployment rate, and between just the interest rate and the current account. In some VEC's the unemployment rate was not used, resulting in slightly smaller impacts of the current account innovation on the interest differential.

The Canadian inflation rate and the Canadian T-bill rate are not cointegrated, according to the Jorgenson test. Even the Canada-U.S. inflation differential and the T-bill differential are not cointegrated over the shorter sample from 1983 to 1996, although they are cointegrated over the longer sample. The inflation differential was included as an endogenous variable in some VEC's, and this produced the largest long-run impact of the current account on the T-bill differential. In other VEC's, only a distant lagged value of the inflation differential was included. Taking a cue from the OLS result, the 3 year earlier lagged value of the inflation differential was used as an exogenous variable.

Two U.S. variables were included as exogenous variables: the current account balance and the unemployment rate. These serve as proxies for changes in the world supply curve of capital to Canada. The fluctuations in the Canadian current account balance can be viewed as the demand curve which shifts relative to this world supply curve.

VEC's were also estimated for longer and shorter sample periods, from 1963 to 1996 and 1983 to 1996, to check for sensitivity. The cointegrating equation remained significant over the alternative sample periods. The coefficient on the current account balance from the longer sample period from 1963 to 1996 was not too different from the 1977 to 1996 sample, with a value of 0.61 (and a t-statistic of 7.1). By contrast, the coefficient on the current account balance jumps substantially in the shorter sample period, to 1.17 (compared to 0.7 in the 1977 to 1996 period). It is likely that the short sample period is strongly influenced by the rapid, dramatic deterioration in the current account deficit in the late 1980s. This may indicate an increasing inelasticity of capital inflows as the deficit gets especially large. Given the likelihood of asymmetric responses, one should not extrapolate from this type of estimate to predict how low interest rates could drop if Canada achieves a large surplus in the future.

In the two VEC's summarized in Tables 3 and 4, the lags on the endogenous variables are from t-3 to t-6, as this was found to be the range which maximized the likelihood ratio in the Jorgenson cointegration tests. Lags from t-1 to t-6 were also tried, and this produced slightly smaller impacts of the current account on the T-bill differential.

4. Predicted Impacts of Changes in the Current Account Balance

The estimated VECs can be shocked with an exogenous change in the value of the current account balance. This sets off a chain reaction in which the current account

balance and interest rates mutually change each other's values, since both are endogenous to the model. The implied impact from the VECs is generally larger than from the OLS model for this reason. A lower current account deficit leads to lower interest rates. The VEC model, appropriately, reflects the virtuous circle aspect of this, which the OLS model cannot do. It tells us, correctly, that lower interest rates will lead to a lower current account deficit. This, in turn, will allow a further reduction in interest rates.

Figure 2 shows the impact through time of a 1 percentage point reduction of the current account deficit as a percentage of GDP. It contrasts two VEC models with the results of the OLS regression shown above.

VEC no. 1, which incorporates the unemployment rate, implies that the mature impact (which occurs about 22 quarters after the beginning of the shock) is a large 80 basis point reduction in the Canadian three month T-bill rate. The peak impact occurs after 12 quarters, and exceeds 90 basis points. This perhaps reflects the monetary policy response to the drop in the current account balance. It is noteworthy that the VEC which excludes the unemployment rate shows a smaller impact. It is possible that part of the initial reaction to a current account deficit reduction is a cyclical one, since declines in Canada's deficit often occur due to a growth slowdown in which Canada's imports drop more than its exports. This would prompt an easing of monetary policy, but in such a situation the drop in the current account balance would be an indicator of cyclical conditions rather than the actual cause of the decline in interest rates. Therefore, it is possible that the result from VEC no. 1 exaggerates the true impact, and it should be viewed as the upper limit of a potential range of impacts.

The same model was tried using the differential between long- term bond yields instead of the three month T-bill rate. The likelihood ratio of the cointegrating equation declined considerably, although it remained significant. The size of the impact was about one-sixth as large as on the T-bill differential. This is consistent with findings by Spiro (1994), Laidler and Robson (1995) and Christiansen and Pigott (1997) on the relationship between movements in short-term and long-term interest rates.

The cointegrating equations also indicated that there is a substantial reverse impact, from changes in interest rates on the current account ratio itself. A one percentage point increase in the Canadian T-bill rate increases the current account deficit to GDP ratio by about 1.25 percentage points. Tight monetary policy in the 1987-93 period was a substantial contributor to the increase in Canada's current account deficit.

It should be cautioned that the particular impacts estimated here reflect the international capital market's demand curve for Canadian debt as it existed over the historical time period covered by the sample. We cannot state exactly what factors were important in determining the degree of elasticity of demand over this time period. It may have been primarily the response of risk averse investors who prefer to be more diversified, and therefore insist on a premium if they are asked to buy an unusually large amount of a particular country's debt. There may be more complex factors, specific to

Canada, such as a perceived risk of a deteriorating exchange rate in response to a high current account deficit.

The market's "taste" for Canadian debt may change, either positively or negatively, in response to political or other factors. For example, the proposed European Monetary Union may lead to a marked change in the attitude of European investors toward non-EMU debt. What we can say is that, over the past few decades, there has been a consistent statistically significant relationship, indicating that Canadian interest rates need to rise substantially when Canadians taken together increase their borrowing in foreign markets.

## Conclusions

The analysis above suggests that large current account deficits in the early 1990s contributed to significantly higher interest rates in Canada. These current account deficits were the result of a combination of large fiscal deficits and a very tight monetary policy. Both of these adverse policy factors have been reversed in the past two years, resulting in the current account deficit being essentially eliminated in 1996. Many forecasters are predicting a growing current account surplus for Canada in future years. If this proves to be correct, it is likely that Canadian real interest rates will remain considerably lower than they were in the 1980s and early 1990s.

## Data Used

DIF3 is the difference between the Canadian and U.S. three month T-bill rates, Cansim B14007 and B54409.

CURR is the Canadian current account balance as a percent of GDP, Cansim D72002 and D20011.

CURRUS is the U.S. current account balance as a percent of GDP, Citibase BPCR and Cansim D51230.

DRP is the difference between the Canadian and U.S. year-over-year percent change in CPI inflation, Cansim P700000 and D139105.

DUR is the difference between the Canadian and U.S. unemployment rates, Cansim D767611 and B53106

## References

Christiansen, Hans and Charles Pigott (1997), "Long-Term Interest Rates in Globalized Markets." OECD Economics Department Working Paper no. 175.

Darrat, Ali and M.O. Suliman (1991), "Have budget deficits and money growth caused changes in interest rates and exchange rates in Canada?" North American Review of Economics and Finance 2, 69-82.

Evans, Paul (1985), "Do large deficits produce high interest rates?" American Economic Review 75, no. 1 (March), 68-87.

Fillion, Jean Francois (1996), "L'endettement du Canada et ses effets sur les taux d'interet reels de long terme." Ottawa, Bank of Canada Working Paper 96-14.

Ford, Robert and Douglas Laxton (1995), "World Public Debt and Real Interest Rates." Washington, International Monetary Fund Working Paper 95/30.

Johnson, David R. (1994), "Ricardian equivalence: Assessing the evidence for Canada." In W. Robson. and W. Scarth, Deficit Reduction: What Gain, What Pain? (Toronto: C.D. Howe Research Institute).

Laidler, David, and William Robson (1995), "Don't Break the Bank! The Role of Monetary Policy in Deficit Reduction." C.D. Howe Institute Commentary, no. 66.

Orr, Adrian, Malcolm Edey and Michael Kennedy (1995), "Real long- term interest rates: the evidence from pooled time series." OECD Economic Studies no. 25.

Poloz, Stephen S. (1992), "Fiscal policy and external balance in the G7 countries." Ottawa, Bank of Canada Technical Paper no. 60.

Siklos, Pierre L. (1988), "The deficit-interest rate link: evidence for Canada." Applied Economics 20, 1563-1577.

Spiro, Peter S. (1990), "The effect of government debt on short- term real interest rates." International Monetary Fund Staff Papers 37 no. 4 (December).

Spiro, Peter S. (1994), "The differential between Canadian and U.S. long-term bond yields." Canadian Business Economics 2, Winter, 16- 24.

Strauss, Jack and Dek Terrell (1995), "Cointegration tests of the Fisher Hypothesis with variable trends in the world real interest rate." Southern Economic Journal 61 no. 4 (April), 1047-1056.

Table 1. Unit Root Test ADF Statistics

| | Level | First Difference |
|---|---|---|
| current account ratio | -1.79 | -5.64 |

interest rate differential -2.24 -5.73

exchange rate -2.96 -2.76

Cdn. T-bill rate -1.32 -4.45

Cdn. CPI inflation rate -1.15 -4.95

unemployment rate -2.54 -3.74

Sample from 1977.1 to 1996.4. The hypothesis of a unit root cannot be rejected for the level of any variable at 5% confidence. It can be rejected for the first difference at 1% confidence for all the variables except the exchange rate, where it cannot be rejected even at 5%.

Table 2. Tests for Cointegration among Interest Rate Differential, Current Account Ratio, and Unemployment Rate

Sample Period Jorgenson Test with trend, lags from t-3 to t-6 ADF test with trend, 1 lag

None At most one

1977.1 to 1996.4 47.6*** 11.2 -3.59*

1963.1 to 1996.4 53.0*** 9.1 -4.15**

1963.1 to 1984.4 47.2*** 8.5 -4.04**

Hypothesis of no cointegration rejected at: 1% level (***), 5% level (**) or 10% level (*)

Table 3. Summary Statistics of VECM No. 1

Sample: 1977:1 1996:4 t-statistics in parentheses Cointegrating Eq: CointEq1 DIF3(-1) 1.000000 CURR(-1) 0.700729 (6.04011) UR(-1) 0.165385 (1.29753) C -2.091252 Error Correction: D(DIF3) D(CURR) D(UR) CointEq1 -0.513346 -0.034814 0.097749 (-4.95825) (-0.40163) (2.78317) D(CURR(-3)) 0.014219 -0.034403 -0.063461 (0.09299) (-0.26874) (-

1.22349) D(CURR(-4)) -0.163730 -0.196143 -0.117731 (-1.09466) (-1.56630) (-2.32034) D(CURR(-5)) -0.330852 -0.097605 -0.159170 (-2.16212) (-0.76185) (-3.06632) D(CURR(-6)) -0.388194 0.108387 -0.109573 (-2.51995) (0.84037) (-2.09680) R-squared 0.436178 0.233507 0.558669 Adj. R-squared 0.292986 0.038842 0.446585 Log likelihood -98.23911 -84.02724 -11.75199 Akaike AIC 0.043108 -0.312189 -2.119070 Schwarz SC 0.549288 0.193992 -1.612890 Mean dependent -0.077083 0.014511 0.029822 S.D. dependent 1.107220 0.795058 0.424533 Determinant Residual Covariance 0.021688 Log Likelihood -67.30490 Akaike Information Criteria -2.481009 Schwarz Criteria -0.873141

Table 4. Summary of VECM No. 2 (Excludes Unemployment Rate)

Sample: 1977:1 1996:4 t-statistics in parentheses Cointegrating Eq: CointEq1 DIF3(-1) 1.000000 CURR(-1) 0.542429 (4.43273) C -0.883309 Error Correction: D(DIF3) D(CURR) CointEq1 -0.509682 -0.028947 (-5.08463) (-0.34231) D(CURR(-3)) -0.048640 -0.022131 (-0.32725) (-0.17650) D(CURR(-4)) -0.146074 -0.230663 (-1.02040) (-1.90997) D(CURR(-5)) -0.346265 -0.155412 (-2.36543) (-1.25846) D(CURR(-6)) -0.348477 0.056174 (-2.34006) (0.44714)

R-squared 0.393292 0.162583 Adj. R-squared 0.295148 0.027118 Log likelihood -101.1715 -87.56711 Akaike AIC -0.008582 -0.348692 Schwarz SC 0.348722 0.008612 Mean dependent -0.077083 0.014511 S.D. dependent 1.107220 0.795058 Determinant Residual Covariance 0.349670 Log Likelihood -104.9995 Akaike Information Criteria -0.400767 Schwarz Criteria 0.373392 •