THE EFFECT OF THE CANADIAN FEDERAL GOVERNMENT DEFICIT ON REAL INTEREST RATES: THEORY AND EVIDENCE.

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The Effect of the Canadian Federal Government Deficit on Real Interest Rates: Theory and Evidence

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ABSTRACT

As the economic recovery in Canada continues to improve , increasing concern has been focused on the size of the Government budget deficit. Many commentators insist that the present budget deficit will lead to higher than normal real interest rates, and will therefore stifle the promising recovery. This paper considers the channels through which budget deficits affect real interest rates, and concentrates on one in particular, the stock of government bonds outstanding. Empirical evidence from 1954 to 1981 is then used to test the above theory. A correct measure for the interest rate variable and for the budget deficit were essential for the analysis. The federal budget deficit had to be adjusted for the effects of inflation and possibly for cyclical variations in the level of economic activity. The study reveals that the judgment of many economic analysts--that present budget deficits raise real interest rates--are far from clear.

The regression equations, using short and long term real rates , indicated that between 1954 and 1981, the appropriately measured federal deficit and national debt variables had not been a source of pressure for the credit markets. Even the large cyclical component of the deficits was shown to have had little effect on short term real rates. However, these results should be interpreted with caution, because of two crucial assumptions

about the real interest rate. First, taxes are assumed not to affect real interest rates ; and secondly, nominal interest rates are assumed to incorporate one hundred percent of the expected inflation rate.

The study shows that the reason for the present high real interest rates has to be found in economic explanations other than that of the federal government's fiscal policy.The study also shows that the federal government can adopt a more stimulative fiscal policy, without putting significant pressure on the credit markets.

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TABLE OF CONTENTS

Approval ii

abstract iii

Acknowledgements v

List of Tables vii

List of Figures viii

I. Introduction. 1

II. WHICH INTEREST RATE? 3

III. HOW THEORY EXPLAINS THE EFFECT OF DEFICITS ON REAL INTEREST RATES. 6

The level of national debt. 11

A Canadian Perspective. 12

IV. A CORRECT MEASURE OF THE BUDGET DEFICIT. 14

INFLATION ADJUSTMENT 14

PENSIONS 19

CYCLICAL FACTOR 21

V. THE EMPIRICAL EVIDENCE. 29

VI. SUMMARY AND CONCLUSIONS. 40

APPENDIX A. NOTES TO TABLE 1 AND THE FIGURES. 44

APPENDIX B. TABLES 46

REFERENCES. 52

LIST OF TABLES

TABLE		PAGE
1	Regression results	33
2	Actual and adjusted federal deficits 1954-81	46
3	Federal securities held by the public as a percentage of actual GNP.	48
4	Short term ex ante real interest rates.	49
5	Long term ex ante real interest rates.	50
6	Inflationary expectations.	51

LIST OF FIGURES

FIGURE		PAGE
1	Bank of Canada Monetization of Actual Deficit	10
2	Actual and Adjusted Budget Balances	25
3	Real Deficits and Real Interest Rates	31

I. Introduction.

The recent growth of the federal budget deficit has lead to a number of concerns about fiscal policy. One concern in particular , that the federal budget deficit leads to high real interest rates, is considered in this paper. The federal government deficit in 1982 was $25.2 billion, which was equivalent to 7.2 percent of the gross national product, and the 1983 deficit is projected to be even larger. With the Canadian economy at the beginning of what could be a sustainable recovery, the role for fiscal policy, as expressed in the federal government budget figures, has become vigourously debated.

Participants in financial markets, and a number of economists, would contend that the budget deficit is too large and is the source of high real interest rates and, until recently, stubborn inflation. The resulting high interest rates are seen as responsible for low levels of expenditure on capital equipment and household durable goods , and are therefore the prime obstacle in the way of a sustained recovery. However, when analysing the impact on the economy, more care has to be taken to ensure that the variables considered are appropriate. Hence, this paper clarifies the appropriate interest rate to be used, and then considers possible adjustments to the measured budget deficit which would lead to a true reflection of the impact of

fiscal policy on the credit market. The longer run effects of budget deficits are captured by using a national debt variable, indicating that stock levels may be a contributing factor to high real interest rates. When these "appropriate" measures are tested empirically, it is far from clear that fiscal policy is a significant factor in accounting for the present pressure on credit markets.

II. WHICH INTEREST RATE?

Much of the discussion on the effect of budget deficits on interest rates is misleading, since the latter variable is not clearly specified. There are two clarifications concerning interest rates that should be made. First, attention should be on the real rate of interest and not the nominal rate, since the latter includes an inflation premium. The real rate of interest is equal to the nominal rate minus the expected inflation rate.

$$r = i - \pi^e$$

If inflation is correctly anticipated, it is the real rate of interest which expresses the cost of credit in terms of goods and is therefore a key determinant in the extent of capital accumulation. Since returns to investment are going to be in real terms, the cost of financing this investment has to be considered in real terms. In the long run the real rate is determined by the expected marginal productivity of capital and the marginal rate of time preference of consumers. However, in the short run this equilibrium may not be achieved if there are unexpected money surprises or excessive demand for funds on the credit markets (see Makin 1982.) In these cases there will be a

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[1] a more accurate specification is $i = r + \pi^e + r\pi^e$ however the last term is insignificant and we shall not worry about it here.

temporary deviation from the long run real rate of interest.

A second clarification is needed when considering the financial market interpretation of the effects of deficits on interest rates. Private agents will not forgo the present use of goods unless they expect to receive a positive return from doing so. In other words, the expected rate of interest, sometimes called the ex-ante rate, is always positive since resources have productive uses and private agents have positive time preference. This rate of interest must be carefully distinguished from the actual rate of return that is ultimately received, called the ex-post rate of interest. The ex-post rate can be negative, positive or zero depending on how correctly the inflation rate was anticipated. Since it is unknown at the time an investment decision is made, the ex-post interest rate is irrelevant for determining economic decisions. Therefore, the effect of budget deficits on economic decisions is most appropriately analysed by considering how they effect the ex-ante real rate of interest.

However, on Bay street and Wall street it is the ex-post real rate of interest that is mostly quoted (ie. the prevailing nominal interest rate minus the actual rate of inflation). If inflationary expectations are not correct, the ex-ante and ex-post real interest rates are going to differ. As it is the former which is going to affect economic decisions, but the latter which is quoted in financial markets, interpretation of real interest rates may be erroneous from an economic point of

view. Therefore, participants in financial markets who complain about too high a real interest rate, on an ex-post basis, may lead us to undue worry if inflationary expectations turn out to be higher than the actual inflation rate. In such a situation, actual real interest rates are higher than expected real interest rates. However, one way in which the ex-post real rate can determine economic decisions is if private agents form expectations of future interest rates by using present financial market interpretations of interest rates. Since these rates are ex-post, private agents would not be rational to use them to predict future rates.

III. HOW THEORY EXPLAINS THE EFFECT OF DEFICITS ON REAL INTEREST RATES.

The real rate of interest is determined simultaneously by the goods market and the money market . Since this paper is concerned about the effect of budget deficits on the real rate of interest, consideration of real money balances and also the stock of government bonds is necessary. With this background in mind there are three ways the federal government deficit can affect real interest rates.

One method to finance a federal budget deficit is to sell government bonds to the public. The effect of this method is dependent upon whether private agents consider government bonds as wealth. Barro(1974), suggests that government bonds are not a form of wealth since public debt issue implies a stream of future interest payments.[1] These future payments must be financed either by future taxes(including money creation, which is a form of taxation that works through its effect on the price level) or by additional deficits. The latter option would require the public to hold an ever expanding amount of public debt, without regard to the government's limited capacity to

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[1]For a rigorous treatment as to why a public debt issue implies a stream of future interest payments see chapter 31 in Parkin: Macroeconomics.

raise revenue for debt repayment.[2] Generally, it seems safe to ignore this 'free lunch' possibility. Therefore, if government bonds are perceived as generating a future tax liability, which has the same present value as the market value of the bonds, private agents will increase their savings by exactly the amount needed to finance the extra bond sales, in anticipation of these future taxes. Private agents will view bond financing and tax financing as equivalent(Ricardian equivalence theorem). The special conditions required for this situation are expressed eloquently by Barro(1981 p 231). If government bonds are not thought of as part of wealth, financing the budget deficit by issuing bonds to the public will bring forward exactly the required savings needed to buy these bonds. In this case, savings are perfectly elastic with respect to the real interest rate, so bond financing would not alter that rate.

If private agents view bonds as part of net wealth, an increased supply of bonds to finance a government deficit would increase consumption as well as saving . The increased demand for funds would be greater than the increased supply of funds in the credit markets , leading to a rise in the real rate of interest so as to encourage an additional flow of saving. In this case, the budget deficit is financed partly by increased private saving and partly by decreased private investment. The extent of the increase in the real rate of interest depends on

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[2]In the case where the real rate of interest exceeds the rate of growth of the economy this implies an increasing ratio of public debt to gross national product.

the sensitivity of savings and investment to that interest rate. The more interest elastic are savings and investment in the economy, the less the real rate of interest will have to rise to finance a budget deficit. The two most powerful objections raised against the Ricardian view are, that private agents may not take full account of the implicit future tax liabilities incurred, and that liquidity constraints may inhibit consumption spending.

The second way that budget deficits can affect the real rate of interest is rather more indirect. Under the 'Tobin effect', the "natural" portion of the real rate can be affected by changes in the level of anticipated inflation. A rise in anticipated inflation causes a shift out of real money balances into real capital, thereby depressing the marginal product of capital and the equilibrium real rate of interest (Tobin 1965.). Mundell (1963) describes a similar phenomenon. If high budget deficits lead to expectations of high monetization, of the deficit then there is a connection between higher budget deficits and higher anticipated inflation rates. If the theory is correct , higher budget deficits will lead to a lower real rate of interest. In practice Feldstein (1978) ,after inclusion of personal and corporate income taxes, considers this real balance effect on the real rate of interest to be insignificant:

> even if some rate of inflation would completely eliminate the demand for money, the equlibrium capital stock would rise by less than 10 percent. With a Cobb Douglas technology the marginal product of capital would fall by less than one tenth of its previous value. It is difficult therefore to imagine that the absolute value

of the portfolio effect exceeds 0.01. (p 815.)

For this reason an anticipated inflation variable was not included in the regression equation.

A third, and again rather indirect way, that the budget deficit can affect the real interest rate is through "money surprises". Dwyer(1981) has found that the real rate is independent of predictable changes in the money supply. However, if prices are sticky upward, money growth below its anticipated level results in an excess demand for money. Until prices adjust to fully absorb this excess demand for money, the only alternative is for the real interest rate to rise. If increased budget deficits are associated with money surprises (ie. the government unexpectedly monetizes or does not monetizes the deficit) then, in the short run, this will lead to a change in the real rate of interest, since actual real money balances are different from desired money balances. In Canada the relationship between deficits and the Bank of Canada's monetization is shown by figure 1. Between 1962 and 1975 the relationship is unpredictable, although since 1975 it seems that the Bank of Canada has followed a more predictable policy by keeping monetization at roughly the same percentage of the actual budget deficit. Provided prices in Canada are sticky, the exclusion of a money surprise variable from the regression equations, (Table 1), is a limitation of this paper.

PERCENTAGE OF ACTUAL DEFICIT MONETIZED

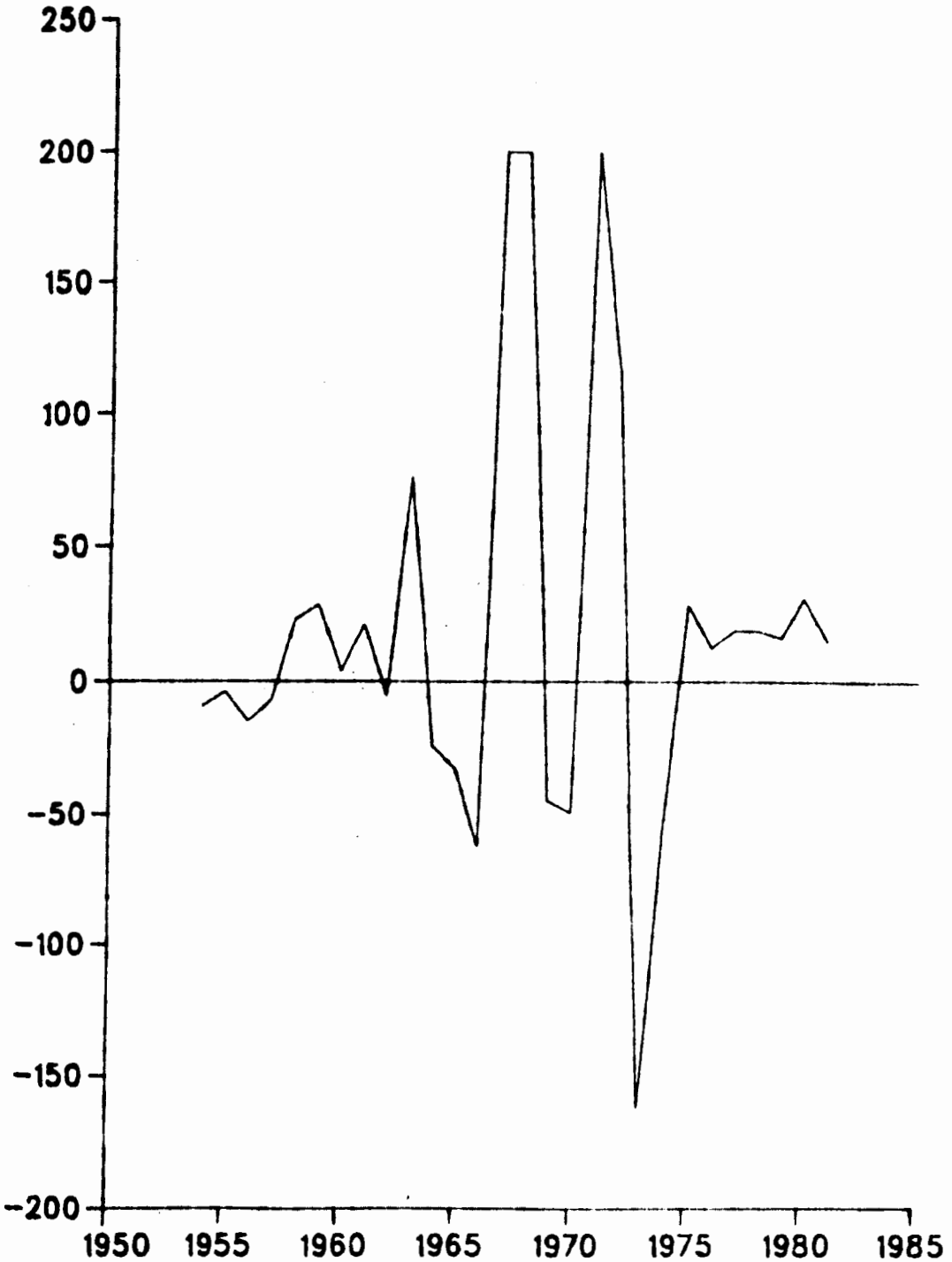

FIGURE 1

The level of national debt.

The level of real federal government debt, along with the change in the real value of federal debt, might affect the real interest rate. There are two reasons why a debt variable may explain the level of real interest rates. First, it might be expected that a 1 percent change in the budget deficit, which leads to a second order change in the government debt, would have different effects on the economy depending on the level of savings already financing the government debt. Raising the proportion of private savings donated to government bonds, will become increasingly more difficult. If private agents are already contributing 50 percent of their savings to government debt, further savings needed to finance additional debt will only be forthcoming at greater rates of return. If only 5 percent of savings are going to government debt, the same increase in government debt as above, will require the same additional savings, but these will be less costly to obtain if private agents find it increasingly difficult to save a higher proportion of their income. Therefore,we might expect that in the longer run it is the stock of government debt that could determine the real interest rate.

A Canadian Perspective.

Since Canada can be described as a small open economy, the real interest rate is expected to be a parameter , and not permanently affected by domestic variables, such as the federal governments fiscal position. The Canadian real interest rate should equal a weighted average of foreign interest rates(which would be dominated by the United States real interest rate), if there is perfect capital mobility between countries, and no transaction costs. If real rates were not equalised, there would be unexploited profit cpportunities, which is not consistent with the basic economic concept of rational behaviour. It is the Canadian credit market which follows the United States credit market since the latter is so much larger, in terms of funds raised. Due to this consideration, the regression equations include the United States real interest rate as an explanatory variable. On this variable, the expected coefficient value is one, indicating that movements in the United States real interest rate are exactly matched by movements in the Canadian real interest rate. In this case, a Canadian budget deficit would be manifested by an inflow of capital and, ceteris paribus, a balance of payments surplus. An inflow of capital would put pressure on the exchange rate to appreciate. On the other hand there would be, after a time, increased outflows so as to service the enlarged foreign debt. A closer look at the capital flows in the balance of payments, would indicate the

nature of the federal budget deficit effect on the exchange rate.

IV. A CORRECT MEASURE OF THE BUDGET DEFICIT.

It is crucial to get an appropriate measure of the budget deficit in order to show its true impact on credit markets. The focus of this paper is on federal deficits, rather than the aggregate budgetary positions of local, state and federal governments. The prime reason for concentrating in this area is that the majority of the press and participants in financial markets seem concerned about the policies of the federal governments. Perhaps this concentration in one area is a limitation of this study. However, given that the paper is concerned with the federal budget, the measured budget deficit has to be altered for three reasons.

INFLATION ADJUSTMENT

If federal government deficit figures are not adjusted for inflation, they will understate the true government surplus and overstate a true deficit. The paper is concerned about the real effects of fiscal policy on the economy, the deficit has to be adjusted for inflation. Two forms of adjustment are required, one of them rather obvious and the other a much more subtle form of adjustment.

The first is that the government's receipts and expenditures should be deflated by the increase in the price level, since dollars at the end of one year are not equivalent in purchasing power to dollars at the end of the following year. To avoid subtracting 'apples from oranges' it is necessary to convert the budget deficit at the end of one year into dollars whose purchasing power is defined in terms of a base year.

This conversion is not enough if our figures are to be consistent and appropriate, since inflation has an important impact on reported interest expense on the government debt . In an inflationary economy the nominal interest rate will include an expected inflation premium, equal to the expected inflation rate, which compensates lenders for the expected loss in the real value of their assets, (If taxable interest payments are not indexed, then the inflation premium will exceed the expected inflation rate). An example may help to clarify the concept; with 10 percent inflation the real value of a bond having a nominal face value of $100 falls to $90 after one year. If the interest rate payable on the bond is 12 percent, $10 of the $12 in nominal interest payments really represents nothing more than repayment of the principle lost because of inflation. The real deficit cost is $2 and not $12. For measured savings in the economy as a whole there is no distortion, assuming no external sector, since every lender is matched by a borrower. However, for any particular sector, measured savings will not reflect the true savings. For the government, the real cost of borrowing is

increased by inflation induced increases in interest payments but decreased by the inflation induced reductions in real principle outstanding. The net real cost of borrowing per dollar of debt is the ex-post real interest rate. Since the public sector is a net borrower, the measured deficit (public dis-saving) overestimates the true deficit since it does not incorporate those capital gains due to the inflation induced reduction in the real value of outstanding government debt.

This paper is concerned about the pressure on credit markets, as reflected by the real rate of interest. In an inflationary economy, the government has to sell government bonds to finance the inflation component of interest payments. The need to sell these bonds creates a cash flow problem and would occur even if the real value of outstanding government debt was constant. However, this extra financing need not put pressure on the credit market if private bond holders are concerned about real wealth ,and portfolio composition effects are assumed constant. Under such circumstances, the demand for new credit by the government is exactly matched by the supply of new credit by private agents, as they attempt to keep the real value of their assets constant. A precondition is that government bonds are treated by the private sector as wealth. In this case, inflation is assumed to be correctly anticipated, since the federal government is financing an expected inflation premium, while private agents are keeping their ex-post real savings constant by reinvesting an actual inflation premium.

Private agents are reinvesting after the inflation rate is known, and they will reinvest the actual inflation premium since this is the extent to which they calculate that the real value of assets has declined. Therefore, if expected inflation is less than the actual inflation rate, the increased supply of credit, as private agents keep the real value of savings constant, will be greater than the demand for credit, from the government financing the inflation premium. In this case, there will be an implicit redistribution of real assets from the lenders (private agents) to the borrowers (the government).

The crucial factor is whether real savings are kept constant. Evidence given by Davidson and Mackinnon (1982) would suggest that private agents have been concerned with real savings in Canada. For example, in the Economic review (April 1982 p.48) the Department of Finance estimates that since 1954, measured savings are less variable if they are adjusted for the inflation rate. Only that part of interest payments which is reinvested in federal securities will make the government deficit have a neutral effect on the real interest rate. However, the analysis may not be a true reflection of private agent's behaviour for two reasons. First, there may be lags in perceiving the impact of inflation on financial assets, and a further lag in adjusting to the new situation. Secondly, inflation may also have an impact on the composition of portfolios by reducing the demand for financial assets, such as federal securities. The implication of this latter point is that

the inflation adjustment of the deficit may be overestimated. In such a situation, the impact of the budget deficit on the credit markets is underestimated.

One further point in the calculation of inflation adjusted deficits needs to be expressed. The Bank of Canada's holdings of federal government liabilities need to be included, since the Bank of Canada receives an inflation premium to compensate for the reduction in the real value of federal securities held by the Bank. However, the Bank may not wish to reinvest this premium, since there may be an on-going anti-inflation policy, therefore monetizing of further debt is disallowed. Since the Bank of Canada's profits , and therefcre interest payments from the federal government, go to the federal government, the inflation premium is automatically financed even though the Bank of Canada does not wish to keep the same real value of federal securities. If the Bank wished to keep the same real value of federal securities, and thereby reinvest the inflation premium, the federal government would have two channels to finance the inflation premium debt issue; one, a conscious decision from the Bank of Canada , the other due to the special relationship between the Bank and the federal government. Therefore, the Bank of Canada's holdings of the national debt should be included, when the budget balance is adjusted for the inflation premium. If the Bank of Canada keeps the real value of federal securities constant, even this adjustment will lead to an overestimation of the effect of the deficit on credit markets.

PENSIONS

The method of including federal pension plans into the budget balance has to be altered, (Federal pension funds include the Canadian pension plan and the Quebec pension plan). Such a need arises since the financial accounts treat the pension funds on a cash receipts rather than an accrual basis. The use of a cash receipts definition of income and expenditures differs from the accrual base definition in ignoring the effect of committed receivables and liabilities. As a result, the conventionally measured deficit will diverge from the correctly calculated deficit. Canada is in the early stages of a new pension program, so cash receipts from the large number of working contributors substantially exceed the cash payments to those already retired or eligible for pensions. However, given the age composition of plan members and the relatively recent growth in these plans, the contributions required to fund current pension payments are much smaller than contributions required to fund existing pension rights of plan members. The government is incurring a liability to existing contributors in the same way as it incurs a liability when it sells a bond . In this way, holders of pension plans can think that they are holding an implicit bond.

The impact on credit markets is dependent upon whether the increased future liabilities of the government are going to be matched by increased saving on the part of private agents. The

increased saving will be forthcoming if private agents anticipate higher taxes or contributions in the future to finance these additional liabilities incurred by the government. If this occurs, selling federal securities to finance the deficit , caused by pension liabilities, will have little effect on the real rate of interest. The real question being asked is: Is government debt, in the form of pension obligations net wealth?

In 1981, on a national accounts and cash receipts basis,the Canadian and Quebec pension plans were in a surplus position, reducing the federal government deficit by $3.2 billion. However, a recent paper on pension reform estimates that Canadian pension plan and Quebec pension plan contribution rates must increase, over a period of several decades, from the current 3.6 percent of eligible income to a rate of between 8 and 10 percent. .[1] Since unfunded pension liabilities are as important a contributor to future revenue requirements as government issued bonds, it is inconsistent and inappropriate to regard the current cash surplus on government pension plans as affecting the credit market, if private individuals do not view pension plans as net wealth. If private individuals do regard the pension plans as net wealth, the story is rather more complex. It is beyond the scope of this paper to estimate the year to year changes in the magnitude of the unfunded pension

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[1] see Health and Welfare Canada and Department of Finance: "Better Pensions for Canadians." (Ottawa, Department of Supply and Services 1982.)

liabilities. Consequently, the analysis is restricted to measuring the size of the government deficit exclusive of pension plans.

CYCLICAL FACTOR

To gauge the impact of fiscal policy on the economy, most economists adjust the budget balance for the level of economic activity. Whether this study adjusts for a cyclical factor depends on the nature of our concern for real interest rates. It is necessary to distinguish between cyclical and structural components of the federal government budget. Cyclical, or "passive", changes in the budget are those that occur automatically in response to changes in the stage of the business cycle. Thus, once the tax rates have been determined, the amount of tax revenues will depend on the level of personal income, corporate profits and spending. The structural, or 'active', component of the budget only reflects discretionary changes in expenditure and taxes which result from current federal government actions. The structural element shows the effect of fiscal policy on the economy, while the cyclical element reflects the effect of the economy on the deficit. The cyclical behaviour of the deficit should be taken as evidence of the presence of automatic stabilizers.

In the longer run, when the economy is at its natural level of output, only the structural part of the budget will remain. [2] Assuming private agents expect the economy to reach its natural level within ten years, the return on a ten year federal security will be influenced, by the cyclical component of the budget, less than the return on a one year federal security. As the economy recovers the cyclical component of the deficit is removed and ceteris paribus, the demand for funds by the federal government is reduced. Therefore, private agents who buy a one year federal security in year "one", and expect the economy to recover in the succeeding years, will expect to obtain a diminished return on the same one year security in year "two","three",.....,"ten". Since a ten year security is an average of ten one year securities , it is expected that, the ten year security bought in year "one" has a rate of return affected less than the one year security bought in year "one". Therefore, if the budget deficit is adjusted for the level of economic activity, it is expected to have two effects on the results. First, short term rates (and indeed long term rates, although the effect is less significant) should show a closer association with an unadjusted measure, as opposed to a cyclically adjusted measure of the deficit, assuming the deficit does affect real interest rates. . Secondly, with a cyclically unadjusted measure of the deficit, long term rates should be

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[2]The natural level of output is the long run equilibrium level of output, when private agents have correct price expectations.

affected less than short term real rates. To consider evidence of this hypothesis both cyclically unadjusted and adjusted measures of the budget deficit are used in the empirical section of this paper.

The usual way to make the adjustment for the cyclical factor, is to reconstruct the current deficit on the assumption that the economy is operating at full employment, or a more normal employment level ie: assume the existing tax and expenditure structures in the economy. A crucial assumption is the level of normal or average employment to be used in the calculation, since it is estimated the deficit rises, approximately, $2.5 billion for every 1 percentage point increase in the unemployment rate, (Bruce and Purvis, 1983). However, no general consensus exisits on the normal level of employment, since it may depend on other factors apart from the level of business activity, eg.labour cost competitiveness level. Some would deny our ability to identify a normal rate of unemployment because it depends on the relationship between the actual and unobservable expected rate of inflation. Despite this, in our calculations, the cyclical adjusted budget figures are taken from the Economic review 1982, published by the Department of Finance. In their estimations, the 1981 cyclically adjusted balances depend on an assumed cyclically adjusted unemployment rate of 6.3 percent and an average rate of growth of labour productivity of 0.5 percent.

Table 2 and figure 2 , show the extent of the change in the deficit after the above adjustments. In 1981, the measured budget deficit jumped to $7.5 billion, which represented 2.3 percent of actual GNP. After the cyclical adjustment, the deficit is more than halved to just over $3 billion, an amount equivalent to less than 1 percent of cyclically adjusted GNP. If the budget balance is cyclically and inflation adjusted , the 1981 deficit turns into the biggest surplus, as a percentage of GNP, recorded during the period. This reflects the high inflation rate in 1981. Of the 18 measured budget deficits during the sample period, only 9 remained after the inflation adjustment, and only 6 of them remained after the cyclical and inflation adjustments. From 1975-81 accumulated measured budget deficits equalled over $50 billion, but after adjusting for the recession and the inflation rate, the cumulative deficit is only $1.7 billion. Considering the inflation adjustment alone, the cumulative deficit is $13.8 billion. These changes would alter the interpretation of the impact of measured budget deficits on the credit market. It could be argued that the Canadian federal government has been squeezed by high nominal interest rates and a very low level of economic activity, which has created excessive measured budget deficits.

ACTUAL AND ADJUSTED BUDGET BALANCES AS A PERCENTAGE OF GNP

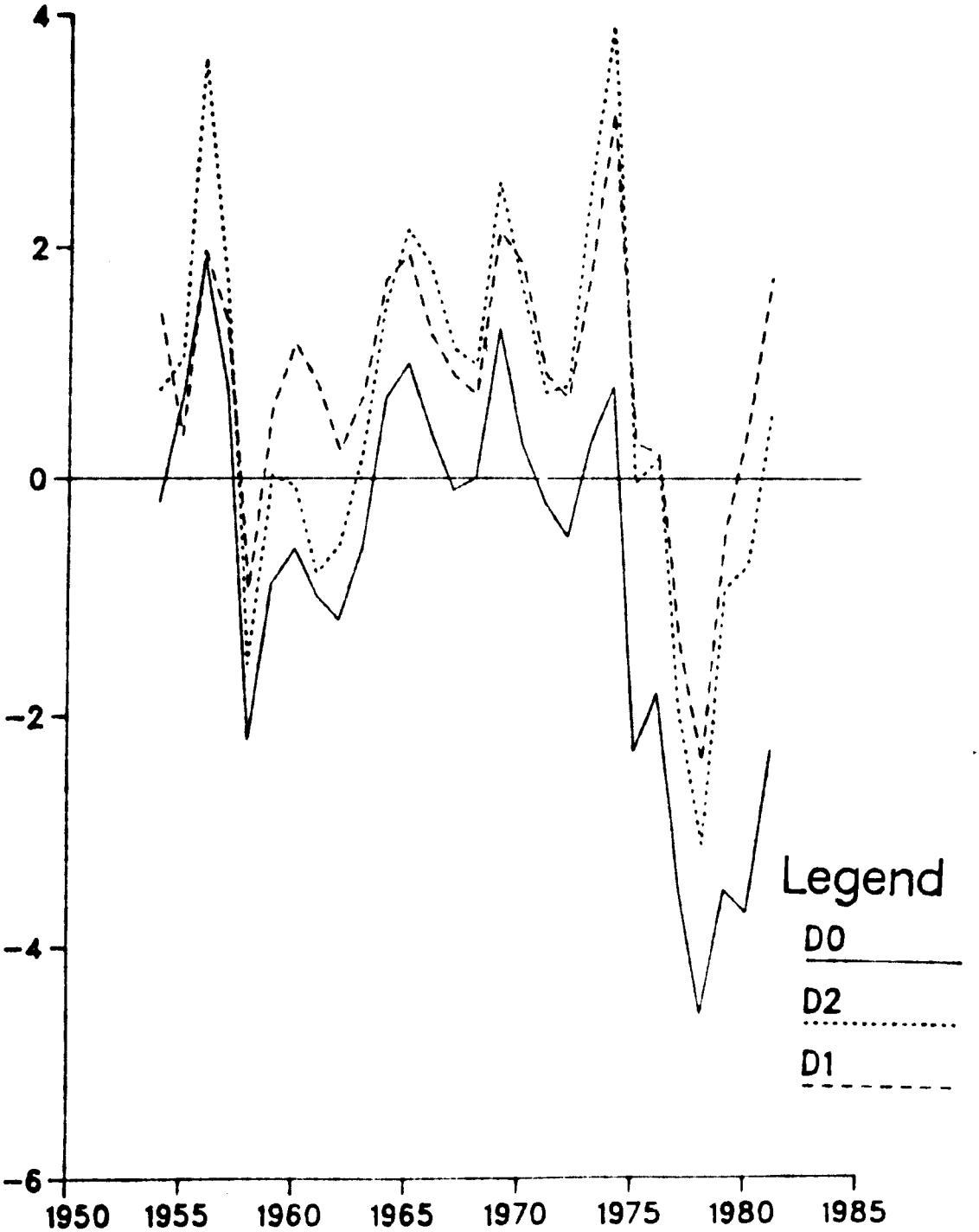

FIGURE 2

** See Appendix A

Given that adjustments have been made for the above considerations, the result can be formulated more rigourously. There is a necessary equality between federal government outlays and receipts.

(1) $G_t - V_t + iB_t - (B_t - B_{t-1}) - (M_t - M_{t-1}) = 0$

G_t = nominal government spending on goods and services.

V_t = nominal tax receipts net of transfer payments.

i = nominal rate of interest.

$B_t - B_{t-1}$ = issue of new government bonds.

$M_t - M_{t-1}$ = change in government bonds held by the Bank of Canada in period t.

Equation (1) is defined on a cash receipts basis, but with suitable redefinition of the various items the equation could be altered to reflect an accruals basis. This move would reflect changes in liabilities , even if those liabilities are not represented by an explicit contractual transaction, and hence the governments involvement in pension plans could be taken into account. However, as explained above, pension plans have been ignored in this measure of the budget deficit.

To adjust equation (1) for inflation it can be divided by the price level, and by remembering that the real interest rate is the nominal interest rate minus the expected inflation rate.

Denoting the real values of variables by the lower case letters:[3]

$$(2)\quad g_t - v_t + rb_t - (b_t - b_{t-1}) - (m_t - m_{t-1}) - \pi m_t = 0 \ .$$

a clearer way of writing this for our purpose would be:

$$(3)\quad \text{REAL DEFICIT} = (b_t - b_{t-1}) + (m_t - m_{t-1}) = g_t - v_t + rb_t - \pi m_t \ .$$

This equation states that the amount by which real federal government expenditures exceed real revenues, is financed by changes in the real value of government bonds and monetary liabilities. $(b_t - b_{t-1})$ represents the deficit financed by selling bonds to the public, and $(m_t - m_{t-1})$ represents the monetized part of the deficit, where the federal government sells bonds to the Bank of Canada. rb are the real interest payments on federal debt. Therefore, if inflation is fully anticipated, and thus completely embodied in the nominal interest rate that the Treasury department pays on federal government debt, then a higher inflation rate need not affect the real deficit. πm_t represents revenue to the government from taxing real money balances.

Depending on how private agents view federal bonds, the relevant measure of the budget deficit, for our purposes, is a weighted average of the change in real money balances and the

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[3]This step is explained in detail by Parkin(1983).

change in the holdings of federal securities.

(4) REAL DEFICIT $= \beta(b_t - b_{t-1}) + \gamma(m_t - m_{t-1})$

Where $0 \leq \beta \leq 1$, $0 \leq \gamma \leq 1$

If private agents do not regard government bonds as net wealth, then $\beta = 0$. In this case, the real deficit can only be financed by selling federal government bonds to the Bank of Canada, and the Ricardian equivalence theorem holds.

To adjust the deficit for the level of economic activity, an adjustment for the deviation of income from full employment is needed:

(5) $d_t = d_t^* + \alpha_t(y_t^* - y_t)$.

d_t = actual budget deficit.

d_t^* = full employment budget deficit

$y_t^* - y_t$ = full employment gap.

α_t = effects of real GNP on the deficit.

V. THE EMPIRICAL EVIDENCE.

The connection between fiscal policy and the real rate of interest is empirically tested by using budget balance and national debt variables. As mentioned earlier in the paper, a real problem was to appropriately define the variables to be used in the regressions. The data sources are documented in more detail in appendix B. A few comments on the data set seem appropriate, although the deficit figures have been discussed previously.

The inflationary expectation figures used to obtain the real interest rates are, for Canada, taken from Riddell and Smith (CJE 1982), while those used for the United States are a combination of the Livingstone index and those calculated by Dewald (FRB of Atlanta 1983).The resulting ex-ante real interest rates should never be negative. However, as table 5 shows, during the mid 1970s there were a couple of negative ex-ante real rates. These anomalies are not consistent with economic theory and are best explained by the difficulty of formulating inflationary expectation variables during the rather turbulent mid-1970s. These rather undesirable results are left in the data so as to be consistent with the remaining real rates of interest. As a result of the expectations data that were used, two main reasons can be given for the need to be cautious when interpreting the results. First, the long term nominal rates (10

year bonds and over) were combined with one year ahead expectations data. This procedure is rather unsatisfactory because a 10 year bond will reflect the inflationary expectations for the next 10 years , even if the individual only wishes to keep the bond for less than 10 years. Due to this problem it is expected that the regression equation, involving long term real rates, would have less explanatory power as compared with the other equations. Secondly, the Canadian real interest rate should be calculated by using a weighted average of Canadian and foreign inflationary expectations, where the weights reflect the proportion of Canadian and foreign funds in the Canadian credit market . This is correct since the appropriate rate is the one that is perceived by all the market participants. However, the procedure needed to calculate the appropriate rate is beyond the scope of this paper.

Casual examination of figure 3 and the data in Appendix B, shows no strong association between real interest rates and real deficits as measured. During the period 1954-81, real interest rates rose during 14 of the years. Of these,only 6 years were associated with a rise in the cyclically and inflation adjusted deficit, and only 4 years were associated with a rise in the inflation adjusted deficit. Especially since 1978, rising short term real rates have been accompanied by a decrease in the real deficit. Real interest rates during the middle to late 1960s were high relative to previous periods, but the real deficit was approximately the same percentage of nominal high employment GNP

REAL DEFICITS AND REAL INTEREST RATES

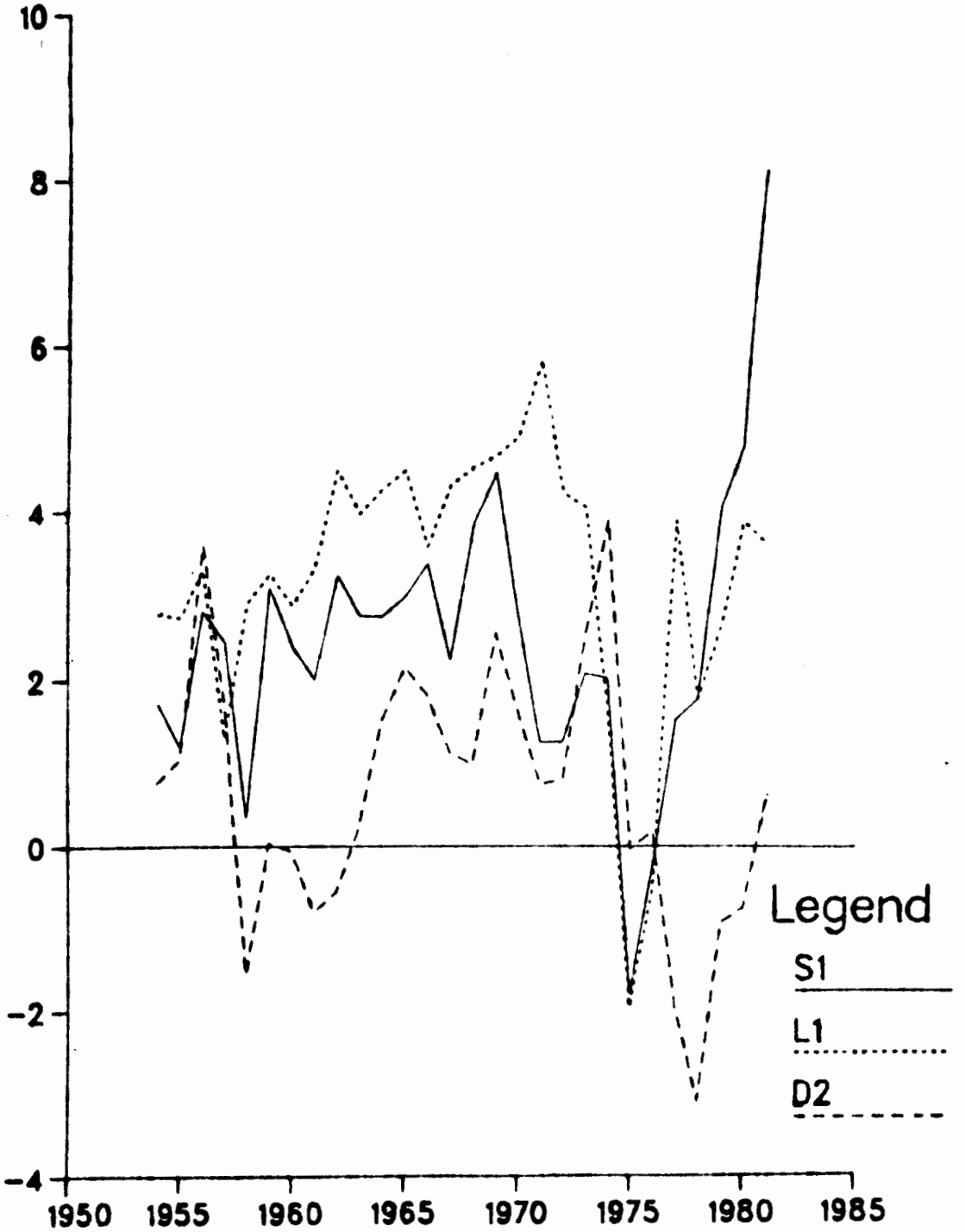

FIGURE 3

See Appendix A

as in previous periods. The highest estimated real deficit occured in 1978, and yet this was associated with a below average short and long term real interest rate. In fact, the comparatively high real deficit over 1975-80 was not accompanied by comparatively high real interest rates.

The regression results, using annual data, have a tendency to confirm the casual examination. Results from six equations are reported in table 1. There were three measures of fiscal policy used as explanatory variables; a cyclically and inflation adjusted real deficit, an inflation adjusted real deficit, and a measure of the national debt. All the explanatory variables were regressed as a proportion of GNP. Each one of these variables was regressed separately using short and long term Canadian real interest rates, and in each of the equations a United States real interest rate was included as an explanatory variable.

One of the outstanding conclusions to be drawn from table 1, is that the relevant United States real rate in each of the equations has a coefficient value of close to one. Each of these values are significant, according to a t statistic test, at the 1 percent level (t =2.485). This result would confirm the prior conclusion that Canada behaves as a small open economy, and that its real interest rate is determined largely by the United States real interest rate. As would be expected, the long term rate has a less significant t statistic associated with it, reflecting the difficulty in theory and practice of defining the long term ex-ante real rate of interest. The constant term in

TABLE 1: Regression results.

Dep. Var.	const	D1	D2	D3	U (short.)	R (SE)	F (DW)
1.S1	0.461	-0.167			0.996	0.746	40.62
	(1.61)	(-0.99)			(8.46)	(0.898)	(1.79)
2.S1	0.430		-0.174		0.999	0.759	43.60
	(1.53)		(-1.56)		(9.20)	(0.873)	(1.96)
3.S1	0.728			-0.011	0.949	0.739	39.32
	(1.27)			(-0.59)	(8.87)	(0.909)	(1.55)
					(long.)		
4.L1	1.04	0.049			0.858	0.243	5.34
	(1.42)	(0.19)			(2.99)	(1.43)	(1.41)
5.L1	1.038		0.069		0.857	0.247	5.43
	(1.42)		(0.39)		(3.14)	(1.43)	(1.42)
6.L1	1.536			-0.032	1.045	0.270	6.00
	(1.74)			(-0.98)	(3.33)	(1.40)	(1.59)

each of the regressions can be interpreted as the extent to which the Canadian real rate of interest differs from that prevailing in the United States, assuming that the deficit coefficient is zero. Perfect capital mobility would lead to the expectation that real rates of interest are equalised across countries, assuming no transaction costs. Still, a persistently positive constant term suggests that the Canadian rate has exceeded the United States rate by an amount that is inconsistent with economic theory. In all the regressions reported this constant term is positive , yet only in equation 6 is it significant beyond a 5 percent level. Two possible reasons might explain the anomaly of the persistently positive constant term. First, the policies toward foreign investment in Canada, regulated by the Foreign Investment Review Agency, could well inhibit capital mobility by erecting artificial barriers. Secondly, differences in the tax treatment of interest payments between Canada and the United States could show up in different pre-tax real interest rates. A more accurate measure would be a comparision of post-tax real rates of interest. This is especially important when the tax system is not indexed, so that the inflation premium incorporated in nominal interest rates is underestimated ,and the real interest rate is overestimated. Levi (1977) shows that, even in a world of perfect capital mobility, funds might not flow in the direction suggested by the pre-tax differential in the rate of return.

Equations (1), (2), (4) and (5) in table 1, include as one of the explanatory variables a real deficit measure. Equation (1) and (2) use short term real rates, calculated by deducting annualized monthly average inflationary expectations from the Canadian 3 month treasury bill rate. The negative coefficient value on the balance measure, for both the short term rate equations, is what would be expected. In other words, an increase in the budget surplus (or a decrease in the deficit) leads to a decrease in the real interest rate. It would be expected that the cyclically unadjusted deficit would exert a greater influence on short term real rates. Comparison of equation (1) and (2) will show whether this expectation is justified. Equation (1), using the cyclically and inflation adjusted deficit, indicates that an increase in this measure of the deficit of 1 percent would lead to a short term real rate increase of 0.167 percent, although this result is not significant even at the 90 percent level. Equation (2), using just the inflation adjusted deficit shows only a slightly larger effect of deficits on real interest rates, yet this result is statistically significant at the 90 percent level. These results lead to two conclusions. First, for the 1954-81 period, since the average real rate in Canada was 2.5 percent, the real deficit has not played a prominant role in excerting pressure on the credit markets. For example, the inflation adjusted real deficit increased by approximately 3 percent between 1976 and 1978, which would account for only a 0.5 percent increase in

real interest rates. Secondly, a cyclically unadjusted deficit exerts no more pressure on the credit market than a cyclically adjusted deficit. This indicates that the part of the deficit attributed to the present state of the economy could be viewed differently , by borrowers and lenders, than from the structural part of the deficit.

Equations (4) and (5) use the same explanatory variables as described above, but are concerned with long term rates. Long term rates are expressed as the return on federal government securities of 10 year maturity and over. The coefficient sign on the real deficit measures is contrary to expectations, a rise in the deficit leading to a fall in real interest rates. Nevertheless,the coefficient values are small and statistically not different from zero at the 75 percent level. Changes in the deficit, using either measure, has an insignificant effect on long term real interest rates. Moreover, only a fraction of the variation in real interest rates can be explained, indicated by a low R^2value, which suggests that important variables are left out of the analysis. Finally, using the cyclically unadjusted deficit measure, a change in the deficit variable leads to a long term real rate 0.24 percent below the short term real rate. This implies that private agents do not expect the cyclical component of the deficit to persist . However, the coefficient values are small and not very significant, therefore the results do have to be interpreted carefully.

The equations testing the impact of the national debt on the real interest rate are equations (3) and (6) . The debt variable used is total government securities outstanding held by the public, divided by actual nominal GNP. Since debt is a stock, expressed in nominal terms, this proportion automatically includes the necessary inflation adjustments. As mentioned before, both equations showed the strong relationship between the United States and the Canadian real interest rates. For the short term rate, a change in the national debt of 1 percent, (in other words a real deficit level of 1 percent of GNP), would raise real interest rates by 0.01 percent. Since 1975 the national debt measure has risen approximately 7 percent, indicating that this change has lead to a 0.07 percent change in real interest rates. Even if the 1981 debt measure increased 13 percent to its average level over the sample period, the short term real rate would only increase 0.13 percent. Again however, the coefficient value has a t statistic insignificant from zero at the 90 percent level. For long term rates, although the coefficient value is slightly higher on the debt measure, a 10 percent increase in the national debt would lead to a 0.3 percent rise in long term interest rates. The explanatory power of this equation is not very high, again indicating that other factors complicate the long term picture.

Therfore, for both long and short term rates a change in real debt (or more appropriately the <u>level</u> of the real deficit), historically has little effect on real rates of interest. This

is appropriate for a level of real deficit equivalent to a surplus of 0.83 percent of GNP on average for the sample period. Rousseau (1983) estimates the cyclically and inflation adjusted real deficit measure to be a surplus of 0.41 percent of GNP for 1982. This would lead us to again conclude, that the level of the real deficit measure has little effect on real rates of interest.

A real problem with this empirical analysis and its interpretations is the assumptions underlying the real rate of interest. First, and as mentioned previously, it is assumed that private agents are concerned with the pre-tax real rate. This would seem irrational and we could expect a more accurate analysis if post-tax real rates were used. However, even the latter rates are not unambigiously defined. Secondly, it is assumed that the nominal interest rate reacts to inflationary expectations on a one to one basis, therefore if expectations increase by 10 percent in one year, so will the nominal interest rate (assuming the real rate constant). However, Feldstein (1978) and others showed that with an unindexed tax system, the nominal interest rate would have to increase greater than the inflationary expectations if real rates were to remain the same. To test the relationship between inflationary expectations and the nominal interest rate, for the period 1954-81, an equation was regressed. [1] The nominal interest rate, proxied by the 3

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[1] See Melvin (1982) for more discussion on this point as well as further references.

month Treasury bill rate, was regressed on three explanatory variables plus a constant; a comparable United States interest rate , the real deficit measure used in the other regression equations , and Canadian inflationary expectations taken from Riddell and Smith (1982). All these variables were first differenced to remove first order autocorrelation. The data was annual and no lagging was used. The coefficient value on the inflationary expectation variable was 0.39, significant at the 95 percent level. Therefore the nominal interest rate increased less than the expected inflation rate. The entire equation was significant, shown by the F statistic, at the 99 percent significance level. This result would imply that the real rate used in this paper underestimates the true ex-ante real rate of interest, since the inflation premium in the nominal interest rate is overestimated. Economic theory cannot satisfactorily explain why nominal interest rates do not fully reflect inflationary expectations. It is important to realise that the assumptions underlying the real rate of interest could be a source of error in the results calculated. Despite this , the evidence found in the paper strongly suggests that historically, the federal government's fiscal policy has had little effect on real interest rates.

VI. SUMMARY AND CONCLUSIONS.

Pre-tax ex-ante real interest rates have, since 1979, been above their average value for the period under consideration, reaching between 6 and 8 percent in the early 1980s. Many commentators have associated this rise in real interest rates with the rise in the federal government's measured budget deficit, saying the latter is the cause of the former. This paper has considered whether there is any economic validity to this line of causation.

The results show that, after formalising an appropriate measure of the budget deficit, the popular notion that high federal budget deficits cause high real interest rates is far from clear. Adjusting the deficit for inflation was required since evidence has shown that private agents are concerned with real savings. Adjusting for the level of activity in the economy is, for our purposes, theoretically ambigious. Empirical evidence showed that both the cyclically unadjusted (D2) and cyclically adjusted (D1) measures of the deficit had similar coefficient values in the regression equations, indicating that private agents view federal securities differently depending on whether the deficit is cyclical or structural. However, not only were the coefficient values small, they were statistically not different from zero at the 95 percent significance level. The largest effect of the budget deficit on real interest rates was

found for equation (2), where a 1 percent increase in the real deficit measure leads to a 0.18 percent increase in real interest rates. Since during the period 1954-81, the average real rate of interest was 2.5 percent, budget deficits have had a relatively small effect on real interest rates. For example, between 1980 and 1981 the real deficit measure decreased by approximately 2 percent, leaving a surplus for 1981, while real interest rates increased by approximately 2 percent. The regression results indicate that if the real deficit measure had not changed, real interest rates would have been 2.35 percent higher, and not just 2 percent higher. It would seem, therefore, that there are other factors which have exerted considerable pressure on the real interest rate, and that the federal budget deficit in the last few years has not been a critical factor. The long term rate results would also indicate that other factors play an important role, since the explanatory power of the equations, using the return on 10 year securities as the dependent variable, is rather low. The hypothesis that the federal debt to GNP measure is a more appropriate indicator of pressure on credit markets is rejected, whether considering short or long term rates. All regressions confirm a strong a priori hypothesis, that Canadian real rates match movements in the United States real rates of interest. Still, a word of caution should be expressed when considering the above results due to the assumptions underlying the real interest rate.

The results reported in this paper, added tc those calculated by Bosscns and Dungan (1983), stating the adjusted budget for 1983 shows a $6 billion surplus, seem to indicate that other factors are responsible for the present high real interest rates.These factors indicate that there is a significant amount of room for fiscal policy to manouevre. For example, in 1981 the budget deficit could have been doubled and real interest rates would have risen by 0.2 percent, (short term real rates were 8 percent in 1981.) Obviously, the costs and benefits of this action to the economy would need careful analysis, but those who argue against further fiscal stimulation, and are worried about its effect on the real rate of interest, would surely have to reconsider their position given these results. For 1983, Bossons and Dungan (1983) estimate that the inflation adjusted budget will be a deficit of approximately 3.5 percent of GNP. Given our results we would predict that this balance would raise real interest rates by 0.61 percent, not a very significant amount when real rates are approximately 5 percent.

One factor, which might reasonably be a more fruitful explanation of high real rates, depends upon future expectations of inflation. High real rates may be attributed to uncertainty about the level and variability of future inflation , since private agents will be unwilling to supply funds with fixed nominal returns under these conditions. Uncertainty about future monetary growth is a critical factor. This and other factors,

may offer a more promising explanation of high real interest rates than budget deficits, which have been found, in this study, to account for a small percentage of the high real interest rates. real interest rates.

APPENDIX A. NOTES TO TABLE 1 AND THE FIGURES.

D0 = Nominal federal budget balance.

D1 = Nominal federal budget balance adjusted for potential output growth and actual inflation.

$$\frac{(def - p(debt))}{YF}$$

def = National income accounts budget balance exclusive of pension plans and cyclically adjusted. Includes that part of the deficit held by the Bank of Canada.

p = Actual inflation as measured by the GNE deflator.

Debt = Federal pulic debt inclusive of holdings by the Bank of Canada. Measured as total federal securities outstanding.

YF = High employment GNP.

D2 = Nominal federal budget balance adjusted for actual inflation (cyclically unadjusted).

$$\frac{D0 - P(debt).}{YF}$$

D3 = Total federal securities outstanding, held by the public, divided by actual nominal GNP.

$$\frac{Debt}{YF}$$

S1 = Canadian short term (3 month) treasury bill rate

minus the averages of the 12 monthly forecasts for expected inflation.

L1 = Long term rate (10 years and over) on government securities minus the expected inflation rate over the first 12 months from the reference year.

U = United States real rate which is comparable to the Canadian real rate used as the dependent variable in each equation. The short term rate is the 3 month treasury bill rate minus expected inflation. The long term rate is the rate on federal securities which have 10 years and over to mature. The expected inflationis calculated over the first 12 months from the reference year.

APPENDIX B. TABLES .

TABLE 2: Actual and adjusted federal deficits 1954-81

	Actual Balances Deficit(-)		Cyclically adjusted balances	
	millicns of dollars	% of actual GNP	Millions of dollars	% of Cyc. GNP
1954	-46	-0.2	40	0.2
1955	202	0.7	35	0.1
1956	598	1.9	101	0.3
1957	250	0.8	54	0.2
1958	-767	-2.2	-543	-1.6
1959	-339	-0.9	-114	-0.3
1960	-229	-0.6	217	0.6
1961	-410	-1.0	240	0.6
1962	-507	-1.2	-162	-0.4
1963	-286	-0.6	-27	-0.1
1964	345	0.7	347	0.7
1965	544	1.0	367	0.7
1966	231	0.4	-219	-0.4
1967	-84	-0.1	-257	-0.4
1968	-11	-0.0	-158	-0.2
1969	1021	1.3	741	0.9
1970	266	0.3	541	0.6
1971	-145	-0.2	3	0.0
1972	-566	-0.5	-655	-0.6
1973	387	0.3	-598	-0.5
1974	1109	0.8	-3	0.0
1975	-3805	-2.3	-3213	-1.9
1976	-3391	-1.8	-3334	-1.8
1977	-7303	-3.5	-6084	-2.9
1978	-10654	-4.6	-9060	-3.9
1979	-9213	-3.5	-7942	-3.0
1980	-10697	-3.7	-7101	-2.3
1981	-7504	-2.3	-3191	-0.9

APPENDIX B.
TABLE 2 (contd)

	Inflation adjusted balances		cyclical and inflation adjusted balances	
	millions of dollars	% of actual GNP	millions of dollars	% of cyc. GNP
1954	201	0.8	287	1.4
1955	295	1.0	128	0.4
1956	1161	3.6	664	2.0
1957	565	1.7	369	1.3
1958	-547	-1.6	-323	-1.0
1959	12	0.0	237	0.6
1960	-21	-0.1	425	1.2
1961	-320	-0.8	330	0.8
1962	-246	-0.6	99	0.2
1963	97	0.2	356	0.7
1964	849	1.5	852	1.7
1965	1195	2.2	1018	1.9
1966	1133	1.8	683	1.3
1967	752	1.1	579	0.9
1968	724	1.0	577	0.7
1969	2045	2.6	1765	2.1
1970	1404	1.6	1679	1.9
1971	705	0.8	853	0.9
1972	852	0.8	763	0.7
1973	3116	2.5	2131	1.8
1974	5768	3.9	4656	3.2
1975	-60	-0.0	532	0.3
1976	348	0.2	405	0.2
1977	-4100	-2.0	-2882	-1.4
1978	-7139	-3.1	-5545	-2.4
1979	-2468	-0.9	-1197	-0.5
1980	-2168	-0.8	1428	0.5
1981	1809	0.6	6122	1.7

Sources: Department of Finance, Economic Review 1982.
Authors own Estimates.

APPENDIX B.

TABLE 3: Federal securities held by the public as a percentage of actual GNP.=D3

1954	50.7
1955	46.6
1956	41.4
1957	37.7
1958	37.8
1959	38.2
1960	38.2
1961	38.3
1962	37.1
1963	36.2
1964	34.1
1965	31.0
1966	27.7
1967	26.8
1968	25.9
1969	24.2
1970	23.5
1971	23.3
1972	22.0
1973	19.3
1974	16.2
1975	16.4
1976	16.4
1977	17.1
1978	18.9
1979	19.9
1980	22.2
1981	23.1

Source: Bank of Canada Monthly Review: Various Issues.

APPENDIX B.

TABLE 4: Short term ex-ante real interest rates.

	Canadian.	United States.
1954	1.73	2.02
1955	1.22	1.81
1956	2.83	2.19
1957	2.46	2.25
1958	0.35	1.58
1959	3.11	2.70
1960	2.40	1.87
1961	2.01	1.76
1962	3.25	1.61
1963	2.76	2.14
1964	2.75	2.67
1965	2.98	2.83
1966	3.39	3.21
1967	2.24	2.27
1968	3.87	2.67
1969	4.49	4.05
1970	2.79	2.87
1971	1.26	0.65
1972	1.26	1.01
1973	2.07	3.78
1974	2.02	2.77
1975	-1.81	-1.58
1976	-0.23	-0.75
1977	1.53	-1.21
1978	1.78	1.98
1979	4.09	3.63
1980	4.79	3.26
1981	8.12	6.76

Sources: Bank of Canada Monthly Review, Various Issues.
Expectations Data in Table 6.

APPENDIX B.

TABLE 5: Long term ex-ante real interest rates.

	Canadian.	United States.
1954	2.78	3.63
1955	2.74	2.80
1956	3.32	2.54
1957	1.31	2.39
1958	2.91	3.20
1959	3.27	3.27
1960	2.88	2.98
1961	3.35	3.26
1962	4.51	2.74
1963	3.99	2.90
1964	4.28	3.17
1965	4.50	2.98
1966	3.59	2.97
1967	4.34	2.66
1968	4.55	2.43
1969	4.68	3.21
1970	4.91	2.97
1971	5.85	1.94
1972	4.23	2.41
1973	4.06	2.83
1974	1.70	1.62
1975	-1.97	-0.50
1976	-0.52	0.93
1977	3.90	0.39
1978	1.77	2.29
1979	2.61	1.88
1980	3.88	2.12
1981	3.62	4.83

Sources: Bank of Canada Monthly Review, Various Issues.
Citibase, Citibank Economic Database, Citibank.
Expectations Data in Table 6.

APPENDIX E.

TABLE 6: Inflationary expectations 1954-81.

	Canadian	United states
1954	-0.3	-1.1
1955	0.4	0.1
1956	0.1	0.1
1957	1.3	1.1
1958	1.9	0.2
1959	1.7	0.1
1960	0.8	1.0
1961	0.8	0.6
1962	0.8	1.2
1963	0.8	1.1
1964	1.0	1.0
1965	1.0	1.2
1966	1.6	1.7
1967	2.4	2.2
1968	2.4	2.8
1969	2.7	2.9
1970	3.2	3.6
1971	2.3	3.8
1972	2.3	3.2
1973	3.4	3.5
1974	5.8	5.4
1975	9.2	7.5
1976	9.1	5.9
1977	5.8	6.7
1978	6.9	5.6
1979	7.6	6.8
1980	8.0	8.7
1981	9.6	8.0

note: Column 1 refers to the averages of the 12 monthly forecasts for the reference year. Column 2 refers to the expected inflation over the first 12 months out from December of the preceding year to the reference year.

Sources: Riddell and Smith (CJE 1982)
Livingstones Survey of Economists, Carlson,

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