Is the Ricardian Equivalence Relevant in Determining Economic Trends? An Empirical Assessment of the Canadian Experience

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ABSTRACT

This study seeks to examine the impact of budgetary balance on output, interest rate and inflation over several decades dating back to the 1960s. It investigates the validity of the Ricardian Equivalence within the context of the Canadian experience. The Ricardian Equivalence predicts that given an unchanged path of government expenditure, a reduction in taxes – and hence an increase in borrowing – will lead to future tax increases, leaving the wealth of the private sector and therefore consumption behaviour unchanged. The implication is that a rising debt burden due to deficit financing would have no positive impact on the interest rate (or on inflation), despite the increase in disposable income.

The evidence for Canada shows that periods characterized by huge deficits such as the decade of the 1980s were accompanied by a mixed effect on interest rates, dampened output, leaving inflation unaffected. This seems to support a variation of the Ricardian paradigm, which can be interpreted as the condition of statistical independence between deficits on the one hand, and interest rates and inflation on the other. As well, the negative impact on output due to the rising deficit also suggests that aggregate expenditure falls as deficits rise. Conversely, the decrease in deficits (leading to surpluses) and hence the decrease in public debt as experienced in recent years had the effect of an increase in output and ultimately wealth. This apparent sensitivity of output – and by extension, consumption and investment – to changes in the public debt demonstrates in some measure the importance of reducing the debt burden to ensure economic stability and long-run growth.

Keywords: *Budgetary Balance, Debt, Debt-to-GDP Ratio, Budgetary Balance-to-GDP Ratio, Ricardian Equivalence*

JEL Classification: E6; H6

1.0. Introduction

1.1. Background:

Like most other modern industrialized countries, Canada too has a long history of public indebtedness. The accumulation of this debt is the result of deficits exceeding the surpluses in annual budgets since Confederation in 1867. The massive deficit financing during the war years between 1939 and 1945 that had seen the post-war federal debt-to-GDP ratio rise to over 100 percent in 1945/46 fell sharply to 30 percent in 1960/61 and to 14 percent in 1973/74 (Gillespie, 1998). Since then, the accumulation of the debt, however, has been dramatic over in the next twenty-two years or so up until 1995/96.

It is worth mentioning that the aggregate of the deficits in the deficit years has *far* surpassed the sum total of surpluses in years in which budgetary surpluses were recorded. Although surpluses at the federal level have been recorded in every year since 1997/98, except for 1969/70 and 1972/73, budgetary deficits were the norm in every other year since the beginning of the 1960s. By 1995/96, the debt-to-GDP ratio had again risen sharply to 69 percent (see Figure 1) with debt service charges accounting for nearly one-third of all federal expenditure.

At the end of fiscal year 2001/02 the net federal debt had dropped somewhat, but was still at a staggering $534.7 billion for a debt-to-GDP ratio of 46.8 percent. In view of the government's tight fiscal stance since the mid-1990s and the likelihood that surpluses will be generated in the foreseeable future as the economy continues to grow, most economists and private sector analysts believe that the debt-to-GDP ratio will continue to decline. This begs the question of how the economy might react to this rapidly changing debt situation.

1.2. Scope and Objectives:

The primary motivation behind this study is to examine the impact of annual budgetary deficits on selected economic variables. As well, this study seeks to test the validity of the Ricardian Equivalence within the context of the Canadian economy over a period spanning more than four decades. This is done by examining the impact of the budgetary balance on interest rates, inflation and output (Wheeler, 1999). In some studies, government debt has been used,[1] while in others the budgetary deficit has been used[2] as the explanatory factor.

In this study, the budgetary balance-to-GDP ratio is used since the size of the deficit sends a more powerful signal rather than the debt on an *annual* basis regarding the financial requirements of the government. If this deficit is significant enough, it would likely impact on key variables such as interest rates. As well, the fact that the budgetary balance is a reflection of the *current* budgetary situation unlike the debt, which is the sum of *past* accumulated deficits, makes it a more relevant variable in testing for the impact on the behaviour of current economic trends (Hoelscher, 1986). This paper therefore aims at examining the impact of the budgetary balance on eight economic variables – the short-term, medium-term and long-term interest rates, both nominal and real, output and inflation. The primary emphasis is on the federal budgetary balance since data constraints have limited the scope of expanding the analysis to include provincial and territorial governments, and all-governments for the decades of the 1960s, 1970s and 1980s. Refer to the notes at the end of Table 1 for further details.

In 1992/93, the annual federal deficit-to-GDP ratio had reached 5.7 percent. The debt-to-GDP ratio, however, kept rising until it rose to a level of over 69 percent in 1995/96. Thus, by the early 1990s it had become amply clear to most policy analysts that something had to be

[1] See for example, Wheeler (1999), Fackler and McMillin(1989), De Leeuw and Holloway (1985), Hoelscher (1983), Kormendi (1983), Tanner (1979) and Yawitz and Meyer (1976).

[2] See for example, Miller and Russek (1996), Swamy et al. (1990), Darrat (1990, 1989), Evans (1987a, 1987b, 1985), Wachtel and Young (1987), Hoelscher (1986), Dewald (1983), Feldstein (1982), Makin (1983), Dwyer (1982) and Horrigan and Protopapadakis (1982).

done about the rising debt and deficit situation. It was at this point in time that the government began implementing drastic fiscal and monetary measures to reverse this trend. Some of these measures such as the huge cut in the Canada Health and Social Transfer *(CHST)* to the provinces and the aggressive tightening of the money supply to combat inflation were of a highly controversial nature. The wisdom of these measures, however, is beyond the scope of this study. Rather, our focus is on the impact, if any, of the rising debt and deficit situation on the economy. More specifically, we are interested to see if there are variations in this impact by comparing periods during which the debt-to-GDP ratio was low such as the 1960s with periods during which the ratio was relatively high such as the 1980s and 1990s. Will a rising deficit have a greater impact on the interest rate, for example, when the debt-to-GDP ratio is low rather than when it is high? Does the economy respond uniformly to changes in the deficit regardless of whether the debt is relatively high or low? These are some of the questions that we shall seek to answer.

As well, this study will conduct a decade-wise comparison of the impact of the annual budgetary balance on interest rates, output and inflation. As part of this analysis, it will also focus on the difference, if any, between the impact of the deficit on *real* versus *nominal* interest rates.

Section 2 discusses the underlying theory and reviews the literature on the impact of the debt and deficit on the key economic variables noted above. Section 3 describes the data sources and the methodology used for this study while Section 4 provides an analysis of the empirical investigation and the key findings. Section 5 presents a few concluding remarks.

2.0. Theory and Literature

There are a number of well-established theories in the literature that explain the impact of the public debt and annual budgetary deficits on various aspects of the economy. We now discuss briefly three of the most important of these theories.

2.1. The Neoclassical View:

According to the neoclassical school of thought, an increase in government expenditure through deficit financing (i.e., one that is *not* accompanied by an increase in taxes) has the effect of increasing the demand for money, which in turn leads to an increase in interest rates. The rise in interest rates makes borrowing more expensive, which then has the effect of decreasing investment and the demand for consumer durables. These contribute to the crowding out of investment and a lowering of private spending. Thus, the neoclassical approach argues that an increase in the fiscal deficit will ultimately have a negative impact on capital accumulation and limit capital mobility. These events will lower aggregate demand and hence limit the growth in real national income.

One goal of this study is therefore to test this approach to see if indeed deficit financing in Canada has had the effect of increasing interest rates and lowering output.

2.2. The Keynesian Perspective:

The Keynesian perspective focuses on the notion that the fiscal deficit is intended to stabilize demand. Thus, if aggregate consumption and investment spending is sluggish or is declining, running a deficit through a reduction in taxes, for example, will help to restore consumption and investment spending to the desired level. Alternatively, if the deficit is matched by an increase in government expenditure with taxes unchanged, the overall effect will still likely be an increase in aggregate demand. Some combination of these two measures will also have a stimulating effect on the economy.

More generally, Keynesians argue that the appropriate role of government intervention when aggregate demand deviates from the desired level is to stabilize this demand through an adjustment of government expenditure or taxes or some combination of the two. This adjustment will lead – temporarily it is believed – to a deficit when total spending is below

the desired level and to a surplus when such spending is above the desired level. In the long run, deficits and surpluses are expected to cancel each other out.

2.3. Ricardian Equivalence:

David Ricardo (1772 – 1823) introduced an alternative theory two centuries ago that links public deficits with private saving. Robert Barro (1974) subsequently revived this proposition, known as Ricardian Equivalence. The main idea behind Ricardian Equivalence is that consumers characterize government borrowing as a future tax liability. Thus they view a reduction in taxes and hence an increase in borrowing as a temporary phenomenon since taxes would eventually have to go up to repay this borrowing. Over the borrowing cycle, therefore, this would leave the wealth of the private sector and hence consumption behaviour unaffected. Ricardian Equivalence says that given the level of public spending, a change in the mix of financing between taxation and borrowing has no effect on wealth. This implies that a change in public spending has the same effect on macroeconomic equilibrium independently of how it is financed at the margin.[3]

This approach assumes that citizens are rational enough to know that an increase in public debt due to the lowering of taxes must eventually be offset by higher future taxes when this debt must be repaid. As a result, citizens do not change their spending behaviour by increasing consumption since they do not view a break in taxes as an increase in wealth. Thus, the net effect of a decrease in taxes on private spending as well as private perceptions of economic wellbeing is neutral. The implication is that, in the first instance, the public saves the increase in disposable income due to the reduction in taxes as public debt increases. Later, when taxes must go up to repay this debt (with interest), and disposable income must inevitably go down as a result, the tax savings (with interest) from the past is then used to maintain an unchanged level of spending. In the end, changes in taxes have no impact on national saving since public dissaving and private saving will simply cancel each other out.

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[3] In the standard neoclassical model, the main effect of an increase in public spending is to decrease private agents' wealth, since they know that sooner or later they are going to have to pay for the increase in government

The Ricardian Equivalence assumes that citizens can predict the future implication of taxes on the basis of their assessment of the current debt and deficit situation. Consequently, a high and rising level of debt in the current period implies that future generations will have to bear the burden of carrying this debt. Barro (1974) has argued that parents and grandparents attempt to make this task easier by making bequests and gifts to their children and grandchildren. Whether or not the purpose of these intergenerational transfers is made with the aim of helping the next generation in paying off the future debt may not necessarily be the motivation, however. If the transfer is large enough, it is argued that the older generations must have strong altruistic ties to the younger generations. But this might not be the case in practice. Recent studies have shown, on the contrary, that the ties are weak (Kotlikoff, http://www.econlib.org). As a result, some economists are unwilling to accept Barro's argument because they doubt that households can foresee the higher future tax implications of large deficits and also because they doubt that households have such strong altruistic intergenerational transfer motives (Evans, 1985).

Despite these controversies, the Ricardian Equivalence has been found to be an important premise for every debt-burdened country in developing appropriate public policies. It provides a useful context for shaping the course of fiscal and monetary policies for implementation.

2.4. Evidence from the Literature:

Lee and Lee's (1991) response to the basic notion of Ricardian Equivalence is that if borrowing versus taxing is a matter of indifference to taxpayers, it should also be a matter of indifference in other respects such as influencing aggregate expenditure or interest rates. Thus, if there is no change in consumer spending due to a change in taxes, there will be no corresponding impact on aggregate expenditure should government spending remain unchanged. Whether or not this will hold true can only be determined through empirical investigation.

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spending. This has a positive effect on labour supply and output. See Baxter and King (1993) for a clear exposition of the basic model and its implications.

Hoelscher (1983) isolated expected inflation, monetary factors and the phase of the business cycle as the major determinants of nominal short-term rates, but found no significant correlation with federal borrowing. Canto and Rapp (1982) employed causality tests by taking one-year Treasury-bills, but they too found no significant association of the deficit with increasing interest rates. Horrigan and Protopapadakis (1982) also found no causal relationship between total government net borrowing and interest rates. Plosser (1982) regressed excess returns on six, nine and twelve-month Treasury-bills and twenty-year Treasury bonds on unexpected changes in the monetary base, government purchases and privately held debt. He found insignificant coefficients on the debt term and concluded that the increase in government debt does not increase interest rates.

Wheeler (1999) examined the impact of government debt on the long-term interest rate, output and the price level. His findings support an extreme form of Ricardian Equivalence in the US economy. Paul Evans (1987a, 1987b, 1985) analyzed the relationship between deficits and interest rates in several countries, but could find no significant impact on long-term interest rates, despite the large deficits produced by wartime spending. Mascaro and Meltzer (1983) studied three-month and ten-year interest rates, but found no significant effect of the deficit either on long-term or short-term interest rates. Such findings are also consistent with Ricardian Equivalence. Aschauer (1985), Seater and Mariano (1985), Kormendi (1983) and Tanner (1979) have all used different variations of the consumption function with the government debt or deficit as the regressor. They all found empirical support for Ricardian Equivalence.

Contrary to the above findings, Martin Feldstein (1982) and Yawitz and Meyer (1976) using more or less the same methodology involving the consumption function did not find any support for Ricardian Equivalence. Eisner and Pieper (1984), using regression analysis of real GNP or the unemployment rate on various measures of the debt and deficit did not find any evidence to support Ricardian Equivalence either. De Leeuw and Holloway (1985), regressing nominal GNP on variables such as changes in government debt and the level of government debt also could not find evidence to support Ricardian Equivalence. Macklem et al. (1995) followed the Bank of Canada's model of the Canadian economy and concluded that

the main economic cost of the high debt is the lower level of consumption. It is likely that this lower level of consumption was due in part to the high interest rates prevailing at that time.

To test the validity of Ricardian Equivalence, Johnson (1994) estimates an Euler equation that considers consumption as a function of lagged consumption and a wealth variable that is composed of both financial wealth and non-financial wealth. He derives three alternative, but equivalent measures of wealth and concludes that the purest form of the model that is consistent with Ricardian Equivalence does not explain the observed variation in consumption. In rejecting Ricardian Equivalence for the period 1950 to 1992 for Canada, Johnson goes on to say that *ceteris paribus* a federal government deficit increases consumption, which reduces private sector capital formation. In the case of the open economy, this would increase the current account deficit. Lucas (1994) has vigorously criticized Johnson's research by suggesting that the basic specification of the model is flawed and the improper measurement of variables has generated biased and inconsistent estimates of the parameters. Therefore, Johnson's interpretation of the results must be viewed in light of the potentially erroneous model specification and empirical analysis. If Lucas' argument is to be accepted that Johnson's results are indeed suspect, they can not then provide adequate justification for dismissing the Ricardian view.

Some studies have found the deficit to be of *marginal* importance in explaining interest rates. Dewald (1983) analyzed the effect of real deficits on long-term and short-term interest rates, using quarterly postwar data, and found that the real deficit is only marginally important in explaining real interest rates. He concluded that budget deficits were responsible for only a very small part of the high real interest rates. Makin (1983) used three-month Treasury-bill rates and also found the deficit to be of marginal importance in explaining short-term interest rates. He found that the short-term interest rate was well explained by money surprises, expected inflation and inflation uncertainty. Motley (1983) concluded that monetary shocks and changes in inflation rates account for most of the variation in the real short-term rate, but was not significantly affected by federal borrowing. Marinheiro (2001) found that although the theoretical requirements of Ricardian Equivalance reveals that they are not likely to be

fulfilled in practice, the empirical applications show that the evidence is inconclusive, rendering the overall results ambiguous. This is an interesting finding.

To summarize, the literature on the empirical relevance of Ricardian Equivalence provides a mixed account. While some studies support its validity, others do not. Still others suggest that it is only partially valid. These are studies that have found the deficit to be of marginal importance in explaining interest rates. It is therefore hoped that the present study will help to provide a clearer insight in assessing the evidence for Canada.

3.0 Data Sources and Modelling Strategy

3.1. Data Sources and Constraints:

To maintain consistency with past studies and to remove the scale effect of inflation over time from creating anomalies in the distribution, it was felt that the deficit-GDP ratio would serve as an appropriate measure for the deficit variable instead of simply the unadjusted deficit figures.

The difficulty of generating reliable GDP data on a monthly basis meant that, like Dewald's (1983) study, this study has also relied on quarterly data. A long time series of quarterly data on federal government deficits is produced. This was achieved by splicing together a number of series produced by Statistics Canada along with series published by the IMF.

CANSIM II Series V6612 provides monthly data for the budgetary balance from January 1954 to March 1986. This series was terminated after March 1986 due to a change in the method of calculating the budgetary balance. A new series (CANSIM II Series V156384) was launched in 1997, which essentially revised the database dating back to 1989. Thus, for the decades of the 1960s, 1970s and 1990s and up until the present year, CANSIM data on the budgetary balance are used. CANSIM data is also used for the decade of the 1980s except for the missing years, 1986/87 and 1987/88, for which the data on the budgetary balance were collected from the Public Accounts of Canada (1987, 1988).

CANSIM II Series V156384 provides data on the budgetary balance on an annual basis. Since this has a rather limiting effect on the sample size, it was decided to use the period from 1990/91 to 2003/04 for a sample size of fourteen as one block of time – the 1990s and beyond.

CANSIM II Series V498918 provides quarterly data on nominal GDP for the entire study period. For the decade of the 1990s and beyond, however, data on deficits are available on an annual basis, but not quarterly. As a result, to maintain compatibility between the data on deficits and GDP for this period, the GDP data was annualized on a fiscal year basis in the analysis.

Three sets of interest rates were used for this study. The average yields of three-month Treasury bills were used to represent the short-term nominal interest rate. These data were collected from CANSIM II Series V122484, which provide the rates on a monthly basis. These monthly data were converted to quarterly data for the decades of the 1960s, 1970s and 1980s, and to annual data for the decade of the 1990s and beyond.

The average yields of three- to five-year Government of Canada marketable bonds were used to represent the medium-term nominal interest rate. These data were collected from CANSIM II Series V122485, which provide the rates on a monthly basis. These rates were then converted to quarterly and annual rates as required.

For the long-term interest rate variable, the average yields of ten-year and over Government of Canada marketable bonds were used. These data were collected from CANSIM II Series V122487, which also provide the rates on a monthly basis. These rates were then converted to quarterly and annual rates as mentioned above.

The real interest rates for all duration were calculated by adjusting for inflation.

For the purpose of calculating the implicit GDP deflator, data from CANSIM II Series V498918 and CANSIM II Series V1992292 were used to obtain the nominal and real GDP respectively. This GDP-deflator series in turn was used to calculate the inflation variable.

With regard to the output variable, the seasonally adjusted index of industrial production was used. This data series was obtained from the IFS Database Series Code 15666C..ZF. CANSIM II does not provide any data on output or industrial production. Finally, with regard to the data for net debt mentioned in the paper, the data source used was CANSIM II Series V151537.

3.2. Methods and Design:

There are several methods of testing the Ricardian Equivalence and with it the associated impact of the debt (or deficit) on key economic variables.

Tests of Ricardian Equivalence are classified mainly into two categories: consumption function tests and deficits' impact on interest rates. Consumption function tests in turn can be classified into two groups: reduced-form consumption function tests and Euler equation-specification tests. Studies by Kormendi (1983) and Modigliani and Sterling (1986) utilize the reduced-form (structural) consumption functions. Blanchard (1985) and Evans (1988, 1993) use the Euler equation approach. Marinheiro (2001) builds on these earlier reduced-form consumption functions and the Euler equation approach to demonstrate that if equivalence prevails there is no scope for effective stabilizing fiscal policies. The present study is based on the second of the two categories mentioned above. It tests the effect of deficit on interest rates and two other variables, output and inflation. A summary of other studies using a similar methodology is given below.

Wheeler (1999) and Fackler and McMillin (1989) used the vector autoregressive (VAR) to test Ricardian Equivalence. Kormendi (1983), Tanner (1979) and Yawitz and Meyer (1976) employed regression analysis on different variations of the consumption function. Wachtel and Young (1987) utilized event analysis. Swamy et. al. (1990), Evans (1987a, 1987b, 1985), Hoelscher (1986) and Makin (1983) applied ordinary least squares and/or instrumental variables such as two-stage least squares on single-equation reduced-form models. One of the more commonly used approaches, however, is the single-equation regression (one-stage ordinary least square) analysis. Single-equation regression analysis is often the first step in

testing the validity of Ricardian Equivalence. Other methods are essentially extensions of this approach. This method has been used in this study not simply because it enables one to make predictions about the empirical relevance of Ricardian Equivalence, but also because it allows one to test the impact of the deficit on interest rates and other related variables.

More specifically, this study employs single-equation regression analysis by successively regressing the short-term (three-month T-Bill) interest rate, the medium-term (three- to five-year marketable bond) interest rate, the long-term (ten-year marketable bond) interest rate, industrial output and inflation, as measured by the GDP deflator, on the budgetary balance-to-GDP ratio. Since two sets of interest rates, nominal and real, were used in running the regressions the number of dependent variables totalled eight. Furthermore, in the econometric analysis, since the budgetary balance is defined as the difference between government revenue and spending, a positive value is associated with a surplus while a negative value represents a deficit.

The general specification of each regression is given by

$$Y = \beta_0 + \beta_1 \text{ BB-GDP} + \varepsilon \qquad \ldots\ldots\ldots \qquad \text{(i)}$$

The variable *Y* in the above formulation assumes successively the eight dependent variables while each β_0 and β_1 represents the eight pairs of intercept and slope values corresponding to the dependent variables.[4] The regression results for each of the four time periods along with the t-values, p-values, standard errors and other relevant statistics are presented in Tables 2 through 5.

The correlation matrices together with the corresponding p-values for each time period are presented in Appendix Tables A.1 through A.4. These correlation coefficients complement the regression analysis by providing further evidence on the nature of the relationships among the variables under consideration.

[4] These dependent variables are denoted by Nom_ST (nominal short-term interest rate), Real_ST (real short-term interest rate), Nom_MT (nominal medium-term interest rate), Real_MT (real medium-term interest rate), Nom_LT (nominal long-term interest rate), Real_LT (real long-term interest rate), output (industrial output) and inflation. The independent variable is denoted by BB-GDP (budgetary balance-to-GDP ratio).

4.0. Empirical Investigation, Analysis and Findings

4.1. Summary Statistics:

Table 1 provides chronological historical data on the net budgetary balance for the provincial and territorial governments, and the federal government, separately and together, GDP, and the three corresponding budgetary balance-to-GDP ratios dating back to 1960/61, which is the start of the present study period.

Quite a number of interesting pieces of information emerge from this table. Since the dollar figures are given in nominal terms and can not therefore be meaningfully compared over such a long period, the focus of attention is largely on the ratios.

Over the forty-four year period of this study, as already mentioned, a federal budgetary surplus was recorded only in 1969/70, 1972/73 and in all the years since 1997/98. In the remaining years, the federal government recorded a deficit. This resulted not only in a steady increase in the federal debt, but also an increase in the federal debt-to-GDP ratio since the increase in the debt was relatively greater than GDP in most years.

With few exceptions, the decade of the 1960s and the first half of the 1970s were mostly characterized by small deficits. The economy, however, was growing rapidly during this period due to which the federal debt-to-GDP ratio declined from 30 percent in 1960/61 to 14 percent in 1973/74. The rising deficit accompanied by a less than robust rise in GDP since then resulted in an increase in the debt-to-GDP ratio to 23 percent in 1979/80 and over 53 percent in 1989/90.

As noted above, the budget recorded a small surplus in 1969/70 and 1972/73, but was more or less balanced in other years from 1960/61 to 1973/74. After the mid-1970s, however, it started recording relatively large deficits. By 1984/85, the deficit-to-GDP ratio was almost 8 percent. Although the debt-to-GDP ratio had not peaked, it had risen to almost 37 percent.

The rising debt surpassing GDP in relative terms in the years following led to a rapidly rising debt-to-GDP ratio. In 1995/96 this ratio peaked at over 69 percent. Thus, the twenty odd years between the mid-seventies and the mid-nineties were characterized by a steady and uninterrupted increase in the debt-to-GDP ratio. This is most evident from Figures 1(i) and 1(ii). Although the deficit-to-GDP ratio has fluctuated quite significantly throughout the post-war period, its rise to almost 8 percent in 1984/85 is particularly pronounced, as seen in the figure. The steep rise in the debt-to-GDP ratio from 1973/74 to 1995/96 provides compelling evidence of the increase in the burden of debt in the past half-century. This wave of debt accumulation has not only been dramatic, it also was not accompanied by either war or depression unlike the four previous waves of debt accumulation since Confederation (Gillespie, 1998).

Starting from around 1993/94, the federal government's reaction to this rising debt was to implement some fairly drastic measures that included among other things cutting federal transfers in support of social programs to the provinces and tightening unemployment insurance benefits. Helped along by a growing economy, the second half of the 1990s ushered in smaller and smaller deficits and finally surpluses since 1997/98. This obviously created the conditions necessary for the debt-to-GDP ratio to decline rapidly. As a result, by 2001/02 the debt-to-GDP ratio had dropped to less than 47 percent. Given that growth in federal spending has been largely contained and the economy continues to perform well, the overall indications are that budgetary surpluses will continue to be generated in the years ahead. This should inevitably lead to a continual decline in the debt-to-GDP ratio.

The lack of organized data on the net provincial and territorial budgetary balance prior to 1988/89 meant that the budgetary balance-to-GDP ratios for these governments and for all-governments are available only for the last sixteen years or so. These are presented in Table 1. Although the federal budgetary deficit has shown a steady decline since 1993/94, such has not been the case with provincial and territorial balances, recording deficits in most years, but also a surplus of more than $10 billion in 2000/01. Since 1997/98, however, the provincial and territorial, federal, and all-governments budgetary balance-to-GDP ratios have all been quite small in absolute terms and usually between plus one and minus one percent.

4.2. Regression and Correlation Results:

The regression results for each of the four periods are presented in Tables 2 through 5 while the correlation results are given in Appendix Tables 1, 2, 3 and 4.

As Table 1 shows, the federal deficit in the decade of the 1960s was relatively low and therefore was not of any great concern from an economic perspective. This is borne out in the correlation results in Appendix Table A.1, which shows that the budgetary balance-to-GDP ratio has very low and insignificant correlation with all variables except the long-term real interest rate and inflation. As the deficit rose through the 1970s, the budgetary balance-to-GDP ratio displayed moderate, but significant correlation with interest rates of all duration, both nominal and real. Significant correlation was also recorded between the budgetary balance and output, but not with inflation (see Appendix Table A.2). This shows that the rising deficit in the 1970s was beginning to have some impact on the key economic variables. As the deficit continued to rise through the 1980s along with the rising debt-to-GDP ratio (see Figure 1), the pattern of correlation between the budgetary balance-to-GDP ratio and interest rates was almost absent except for the correlation with long-term interest rates and output (see Appendix Table A.3). In the decade of the 1990s and beyond, high and significant correlation coefficients were recorded between the budgetary balance-to-GDP ratio, both federal and all-governments, on the one hand and all interest rates and output on the other (see Appendix Table A.4). By this time, the debt-to-GDP ratio had become a major cause for concern, so it was not surprising to see the economy react with such sensitivity to the deficit (or the surplus as the case may be). The higher deficit (surplus) drove up (down) interest rates, which in turn had a negative (positive) impact on output.

Let us now focus our attention more specifically on interest rates, both nominal and real. For all decades, the *nominal* short-term interest rate is highly correlated with both the *nominal* medium-term and long-term interest rates. This consistency in the correlation coefficients as well as in the level of significance also holds when the nominal interest rates are replaced by *real* interest rates (see Appendix Tables A.1 through A.4). The correlation between inflation and the other variables does not reveal any clear pattern over the decades. The significant correlation between inflation and *nominal* interest rates for the decade of the 1980s, however,

does imply that the inflation component is perhaps embedded in nominal interest rates. The fact that inflation and *real* interest rates are not correlated for the 1980s possibly suggests that inflation might have served as the trigger behind the correlation between it and nominal interest rates. This characteristic, however, is absent for the other decades.

Consider now the regression results. For the decade of the 1960s the results are characteristically familiar. The low deficit together with the declining debt-to-GDP ratio as the decade progressed meant that the budgetary balance was of little or no significance insofar as most of the key macroeconomic trends were concerned. As a result, as the regression results in Table 2 shows, the impact of the budgetary balance-to-GDP ratio on short, medium and long-term interest rates and output are mostly insignificant. The real long-term interest rate, however, does show significant, but relatively mild variation. The impact on inflation is also significant.

For the decade of the 1970s, the budgetary balance-to-GDP ratio has a significant impact on all interest rates, nominal and real. The sign of the slope coefficient is also consistent throughout implying that a deficit would lead to higher interest rates. The impact on output is also significant showing that deficits will likely have a stimulating effect on the economy. The impact on inflation, however, is insignificant suggesting that Makin's (1983) finding that market interest rates reflect an efficient inflationary premium is not immediately clear from this result. The regression results for the decade of the 1970s are presented in Table 3.

The decade of the 1980s was characterized by tremendous volatility. This was reflected not only in the high and fluctuating deficits, but also in the tightening of monetary policy that took interest rates to historically high levels in the early part of the decade which gradually fell, but rose again towards the end of the decade. It was also a period that saw the debt-to-GDP ratio more than double from 23 percent in 1979/80 to over 53 percent in 1989/90. The response of interest rates to the budgetary balance was for the most part insignificant. This is consistent with Dewald's (1983) findings that the real deficit does not have a strong association with either short-term or long-term interest rates. As Table 4 shows, other than

the significance of both the nominal and real long-term rates, the interest rate variables display hardly any reaction to the rising deficit. The impact on the long-term real interest rate was due in large measure to the government's aggressive inflation-fighting stance, which resulted in the rapid increase in long-term interest rates. This rise in interest rates brought inflation down quickly enough, but the persistence of high nominal rates contributed to the high real interest rates lingering long after inflation had been largely contained. This phenomenon seems to have been captured in the positive coefficient recorded in the regression for the output variable. The inflation variable, as in the case of the 1970s, is insignificant.

The regression results for the 1990s to the present period on both the *federal* and *the all-governments* budgetary balance-to-GDP ratios are presented in Tables 5a and 5b. The two tables are given since it is believed that the all-governments data provide a more comprehensive measure of the budgetary balance. Although there are no significant differences in the two sets of regression results, together they represent a clearer evidence of the close relationship between the budgetary balance and interest rates. The results demonstrate that both nominal and real interest rates moved in tandem. The prediction is that the fall in the deficit and the eventual surplus later in the 1990s gave rise to declining interest rates. This implies that deficits have a direct correlation while surpluses have an inverse correlation with interest rates. This is fully consistent with standard theoretical deductions, which suggest that as the government demand for borrowed money decreases there will be a negative crowding-out effect, which in turn will lead to a decrease in interest rates. Hoelscher's (1986) findings also support the crowding-out effects of deficit spending given the sensitivity of long-term rates to many consumer and business spending decisions. The evidence from the decades of the 1960s and 1980s, however, does not necessarily support this pattern. Rather the findings for these two decades are more in line with Evans' (1985) conclusion that large deficits are not associated with high interest rates. He also found that the postwar period offers no support for a positive association between deficits and interest rates. While output and the budgetary balance-to-GDP ratio show a strong positive relationship, there seems to be no connection at all between inflation (measured by the year-

over-year percentage change in the GDP deflator) and the budgetary balance-to-GDP ratio. It is possible that the tightening of monetary policy in the 1990s reduced inflation to a relatively insignificant variable in influencing economic trends.

Overall, our findings suggest that the budgetary balance has a mixed impact on both nominal and real interest rates, which in some respects imply an apparent statistical independence between deficits and interest rates. This, together with the positive and highly significant coefficients for the budgetary balance-to-GDP variable corresponding to output for the 1980s and beyond support a variation of the Ricardian view, which suggests that wealth rises as deficits fall. The decrease in public debt in this case implies an increase in output (Wheeler, 1999). These results are at variance with Johnson's (1994) rejection of the Ricardian proposition, but they do not provide unconditional support for it either.

5.0. Summary and Conclusions

The decade-wise analysis of the relationship between the annual budgetary balance and interest rates, output and inflation reveal a number of interesting points.

First, the true impact of the budgetary balance depends not only on the magnitude of the deficit (or surplus) relative to GDP, but also on the accumulated debt itself. Since the annual deficit feeds into the debt each year, both the magnitude and the trend followed by the debt relative to GDP are significant factors in determining what impact, if any, the budgetary balance might have on interest rates, output and inflation. For example, in the 1960s, not only was the deficit relatively low, but the debt-to-GDP ratio was also relatively low and falling. These two factors combined to send a signal to the rest of the economy that the deficit was not a major issue of concern. This is evidenced in the lack of correlation between the deficit and the other variables noted above. In the following decades, the deficit was high and/or was accompanied by a high (or rising) debt-to-GDP ratio. This led to varying degrees of correlation between the deficit and the other variables, but the lack of any clear relationship between the variables as witnessed for the 1960s was not found in later decades.

Second, a major consequence of a deteriorating budgetary balance and public debt is the crowding-out of investment (Fortin, 1998). Most of the crowding-out effects are due to increases in government borrowing, which cause interest rates to rise thereby lowering private consumption and investment (Buiter, 1977). The evidence shows that for the decade of the 1980s and beyond the relationship between the budgetary balance and output is positive. This implies that a rising deficit has a dampening effect on output, possibly due in large measure to the rising interest rates that accompany a rising deficit by crowding-out investment. In any event, a rising deficit seems to slow down economic growth.

Third, the negative relationship between deficit and output suggests, at least implicitly, that as the budgetary balance improves aggregate expenditure rises. This relationship seems to hold for all the periods considered in this study except for the decade of the 1970s.

To summarize, the evidence for Canada during the latter part of the last century shows that periods characterized by huge deficits, for example the decade of the 1980s, were accompanied by a mixed effect on interest rates, but nevertheless dampened output. The negative impact of deficits on output is consistent with the neoclassical perspective, despite the mixed effect on interest rates. To the extent that the Ricardian paradigm can be interpreted as the condition of statistical independence between deficits and interest rates (Swamy et. al., 1990), the mixed effect on interest rates does tend to support a variation of this paradigm. As well, the negative impact on output due to the rising deficit also suggests that aggregate expenditure falls as deficits rise. Conversely, the decrease in deficits (leading to surpluses) and hence the decrease in public debt implies an increase in output and prices and ultimately wealth. This apparent sensitivity of output – and by extension, consumption and investment – to changes in the public debt demonstrates in some measure the importance of reducing the debt burden to ensure economic stability and long-run growth.

Table 1

Budgetary Balance Ratios Relative to GDP

(1960/61 – 2003/04)

Year	Net Provincial and Territorial Budgetary Balance ($ Billion)	Net Federal Budgetary Balance ($ Billion)	All Governent Budgetary Balance ($ Billion)	GDP ($ Billion)	Budgetary Balance - GDP Ratio (%) [Provincial and Territorial]	Budgetary Balance - GDP Ratio (%) [Federal]	Budgetary Balance - GDP Ratio (%) [All Governments]
1960/61		-0.3402		36.710		-0.927	
1961/62		-0.791		41.936		-1.886	
1962/63		-0.6915		45.326		-1.526	
1963/64		-0.6192		49.185		-1.259	
1964/65		-0.038		53.539		-0.071	
1965/66		-0.039		59.542		-0.065	
1966/67		-0.4215		66.006		-0.639	
1967/68		-0.7948		71.000		-1.119	
1968/69		-0.576		78.041		-0.738	
1969/70		0.3992		85.695		0.466	
1970/71		-0.3792		91.188		-0.416	
1971/72		-0.6142		101.194		-0.607	
1972/73		0.4809		113.671		0.423	
1973/74		-0.6719		134.643		-0.499	
1974/75		-1.3851		158.419		-0.874	
1975/76		-4.021		180.015		-2.234	
1976/77		-6.301		205.868		-3.061	
1977/78		-10.036		225.907		-4.443	
1978/79		-11.707		252.076		-4.644	
1979/80		-12.054		288.859		-4.173	
1980/81		-12.082		324.662		-3.721	
1981/82		-13.372		367.752		-3.636	
1982/83		-24.34		384.92		-6.323	
1983/84		-32.353		421.367		-7.678	
1984/85		-36.638		458.375		-7.993	
1985/86		-31.701		493.392		-6.425	
1986/87		-30.7		521.173		-5.891	
1987/88		-27.8		573.517		-4.847	
1988/89	-4.401	-26.666	-31.067	623.783	-0.706	-4.275	-4.980
1989/90	-3.157	-28.023	-31.180	665.335	-0.474	-4.212	-4.686
1990/91	-7.573	-32.368	-39.941	680.375	-1.113	-4.757	-5.870
1991/92	-22.943	-38.617	-61.560	689.078	-3.330	-5.604	-8.934
1992/93	-24.839	-40.602	-65.441	706.403	-3.516	-5.748	-9.264
1993/94	-20.149	-40.432	-60.581	735.566	-2.739	-5.497	-8.236
1994/95	-14.658	-36.736	-51.394	781.646	-1.875	-4.700	-6.575
1995/96	-9.686	-33.211	-42.897	816.116	-1.187	-4.069	-5.256
1996/97	-5.893	-13.499	-19.392	847.693	-0.695	-1.592	-2.288
1997/98	-2.344	4.507	2.163	891.944	-0.263	0.505	0.243
1998/99	-11.914	2.786	-9.128	925.027	-1.288	0.301	-0.987
1999/2000	0.939	6.999	7.938	1006.091	0.093	0.696	0.789
2000/01	10.839	9.213	20.052	1094.502	0.990	0.842	1.832
2001/02	-6.644	7.351	0.707	1108.459	-0.599	0.663	0.064
2002/03	-7.576	2.78	-4.796	1181.275	-0.641	0.235	-0.406
2003/04	-7.940	6.779	-1.161	1228.634	-0.646	0.552	-0.094

Sources: CANSIM II Series V206481, V6612, V156245, V498918 and the Public Accounts of Canada.

Notes: The source for net provincial and territorial budgetary balance is CANSIM II Series V206481. This series provides data from 1988/89. The unavailability of this key data for previous years meant that regressions using the all-governments budgetary balance could not be run. The Department of Finance changed the calculation method for the net federal budgetary balance in 1997 and adjusted the data series to reflect the new method back to 1988/89. Hence the data series for the federal budgetary balance relies on three different sources. For the period 1960/61 to 1985/86, the data was collected from CANSIM II Series V6612. This series provides data on the federal budgetary balance until March 1986 when it was terminated. CANSIM II Series V156245 provides data on the federal budgetary balance using the new method of calculation from 1988/89 until the present time. Data from 1988/89 has been collected from this series. As none of the series' provide data for the years 1986/87 and 1987/88, the budgetary balance for these two years have been collected from the Public Accounts of Canada (1987 and 1988). The use of multiple sources in collecting the data for the federal budgetary balance carries with it the potential problem of mismatch. The source for gross domestic product is CANSIM II Series V498918. This series provides data from the first quarter of 1961. Hence the annual GDP entries using this source dates back only to 1961/62. The GDP for 1960/61 was estimated using the trend in GDP for the decade of the 1960s. The all-governments budgetary balance was calculated by adding the net provincial and territorial budgetary balances and net federal budgetary balance.

Table 2

Regressions for Selected Variables on the Federal Budgetary Balance-to-GDP Ratio

(1960/61 – 1969/70)

Dependent Variables	Constant (β_0)	Slope (β_1)	D-W	R-square
Nom_ST	**4.57** (18.49) (0.000) (0.2472)	**0.064** (0.60) (0.551) (0.1065)	0.168	.0090
Real_ST	**3.54** (14.33) (0.000) (0.2471)	**-0.168** (-1.58) (0.122) (0.1064)	0.851	.0620
Nom_MT	**5.43** (27.37) (0.000) (0.1985)	**0.072** (0.84) (0.407) (0.086)	0.151	.0180
Real_MT	**4.40** (20.98) (0.000) (0.2095)	**-0.162** (-1.80) (0.08) (0.090)	1.101	.0790
Nom_LT	**5.78** (36.73) (0.000) (0.1574)	**0.044** (0.65) (0.522) (0.068)	0.78	.0110
Real_LT	**4.74** (25.53) (0.000) (0.1857)	**-0.191** (-2.39) (0.022) (0.08)	1.363	.1310
Output	**31.8** (30.74) (0.000) (1.035)	**0.369** (0.83) (0.413) (0.4458)	0.055	.0180
INFL	**1.00** (7.18) (0.000) (0.1392)	**0.226** (3.78) (0.001) (0.06)	2.245	.2730

Note: The first sets of figures within parentheses are the t-values. The second sets are the p-values and the third sets are the standard errors.

Table 3

Regressions for Selected Variables on the Federal Budgetary Balance-to-GDP Ratio

(1970/71 – 1979/80)

Dependent Variables	Constant (β_0)	Slope (β_1)	D-W	R-square
Nom_ST	**6.07** (12.24) (0.000) (0.496)	**-0.531** (-3.45) (0.001) (0.1539)	0.52	.2390
Real_ST	**3.84** (6.14) (0.000) (0.6252)	**-0.60** (-3.09) (0.004) (0.194)	1.786	.2010
Nom_MT	**7.26** (22.94) (0.000) (0.3166)	**-0.295** (3.00) (0.005) (0.098)	0.601	.1920
Real_MT	**5.00** (9.75) (0.000) (0.5131)	**-0.369** (-2.32) (0.026) (0.1592)	2.218	.1240
Nom_LT	**8.12** (34.85) (0.000) (0.2328)	**-0.239** (-3.31) (0.002) (0.072)	0.616	.2240
Real_LT	**5.84** (11.66) (0.000) (0.501)	**-0.315** (-2.03) (0.05) (0.1554)	2.351	.0980
Output	**48.8** (51.97) (0.000) (0.9395)	**-1.24** (-4.27) (0.000) (0.2915)	0.53	.3240
INFL	**2.21** (4.43) (0.000) (0.4989)	**0.084** (0.54) (0.59) (0.1548)	2.355	.0080

Note: The first sets of figures within parentheses are the t-values. The second sets are the p-values and the third sets are the standard errors.

Table 4

Regressions for Selected Variables on the Federal Budgetary Balance-to-GDP Ratio

(1980/81 – 1989/90)

Dependent Variables	Constant (β_0)	Slope (β_1)	D-W	R-square
Nom_ST	**11.2** (14.46) (0.000) (0.7718)	**-0.024** (-0.15) (0.88) (0.156)	0.251	.0010
Real_ST	**9.67** (13.67) (0.000) (0.7073)	**-0.034** (-0.24) (0.811) (0.1429)	0.742	.0020
Nom_MT	**10.7** (19.00) (0.000) (0.5608)	**-0.167** (-1.47) (0.149) (0.1133)	0.267	.0540
Real_MT	**9.17** (18.11) (0.000) (0.5066)	**-0.176** (-1.72) (0.093) (0.1023)	0.921	.0720
Nom_LT	**10.6** (22.26) (0.000) (0.4772)	**-0.266** (-2.76) (0.009) (0.096)	0.253	.1670
Real_LT	**9.14** (20.70) (0.000) (0.4415)	**-0.274** (-3.08) (0.04) (0.089)	1.145	.1990
Output	**70.1** (49.41) (0.000) (1.1419)	**1.45** (5.06) (0.000) (0.2866)	0.265	.4020
INFL	**1.36** (4.27) (0.000) (0.3196)	**0.011** (0.17) (0.863) (0.065)	1.54	.0010

Note: The first sets of figures within parentheses are the t-values. The second sets are the p-values and the third sets are the standard errors.

Table 5 (a)

Regressions for Selected Variables on the Federal Budgetary Balance-to-GDP Ratio

(1990/91 – 2003/04)

Dependent Variables	Constant (β_0)	Slope (β_1)	D-W	R-square
Nom_ST	**4.18** (6.25) (0.000) (0.6686)	**-0.571** (-2.89) (0.000) (0.1973)	0.903	.4110
Real_ST	**2.48** (3.94) (0.002) (0.63)	**-0.527** (-2.84) (0.015) (0.1859)	1.364	.4020
Nom_MT	**5.29** (12.52) (0.000) (0.4227)	**-0.532** (-4.27) (0.001) (0.1247)	1.06	.6030
Real_MT	**3.59** (7.15) (0.000) (0.502)	**-0.489** (-3.30) (0.006) (0.1481)	1.96	.4760
Nom_LT	**6.07** (22.43) (0.000) (0.2704)	**-0.561** (-7.04) (0.000) (0.0798)	1.231	.8050
Real_LT	**4.35** (9.83) (0.000) (0.4422)	**-0.518** (-3.97) (0.002) (0.1305)	2.368	.5670
Output	**93.1** (57.97) (0.000) (1.606)	**4.02** (8.48) (0.000) (0.4738)	0.66	.8570
INFL	**1.66** (4.03) (0.002) (0.4133)	**-0.029** (-0.24) (0.816) (0.1219)	2.247	.0050

Note: The first sets of figures within parentheses are the t-values. The second sets are the p-values and the third sets are the standard errors.

Table 5 (b)

Regressions for Selected Variables on All-Governments Budgetary Balance -to-GDP Ratio

(1990/91 – 2003/04)

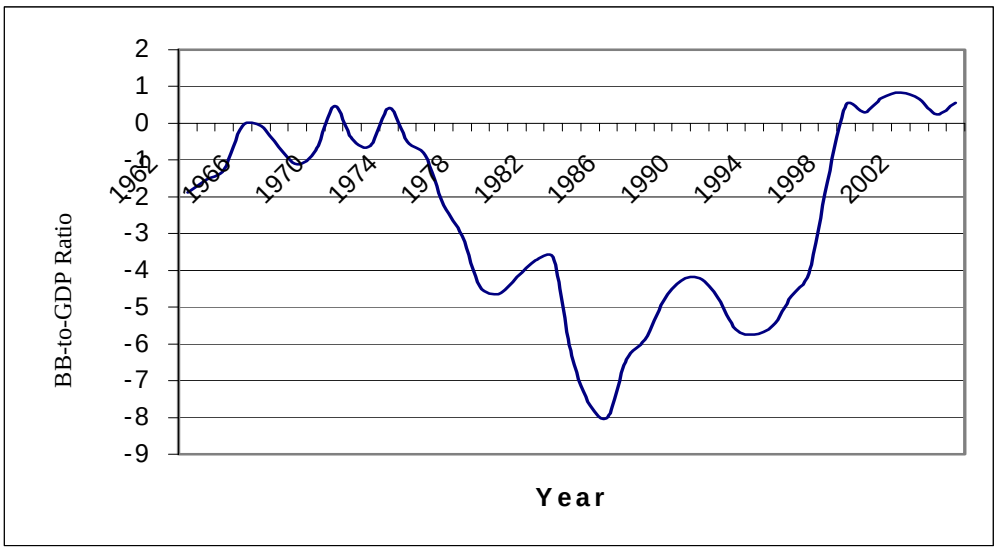
Dependent Variables	Constant (β_0)	Slope (β_1)	D-W	R-square
Nom_ST	**4.18** (5.52) (0.000) (0.757)	**-0.3574** (-2.36) (0.036) (0.1516)	0.947	.3170
Real_ST	**2.39** (3.51) (0.004) (0.681)	**-0.36** (-2.64) (0.022) (0.1363)	1.28	.3670
Nom_MT	**5.26** (10.46) (0.000) (0.5033)	**-0.342** (-3.4) (0.005) (0.1008)	1.067	.4900
Real_MT	**3.46** (6.50) (0.000) (0.533)	**-0.345** (-3.23) (0.007) (0.1067)	1.802	.4650
Nom_LT	**5.99** (17.20) (0.000) (0.3484)	**-0.375** (-5.38) (0.000) (0.07)	1.213	.7070
Real_LT	**4.18** (9.26) (0.000) (0.4514)	**-0.377** (-4.17) (0.001) (0.0904)	2.23	.5920
Output	**94.1** (53.14) (0.000) (1.771)	**2.84** (8.01) (0.000) (0.3546)	0.60	.8420
INFL	**1.76** (4.04) (0.002) (0.4351)	**0.011** (0.13) (0.901) (0.087)	2.24	.0010

Note: The first sets of figures within parentheses are the t-values. The second sets are the p-values and the third sets are the standard errors.

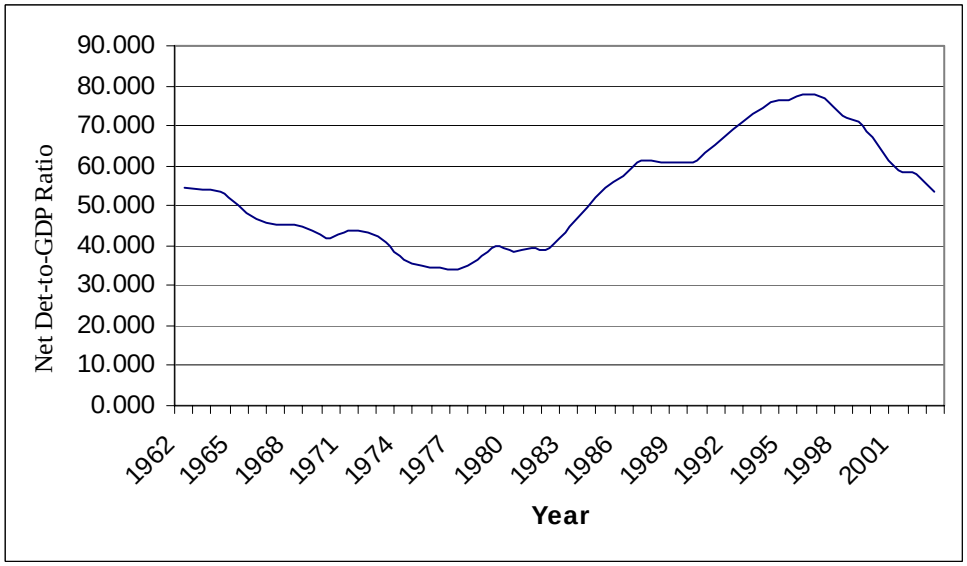
Figure 1

Various Ratios (%)

(1960/61 – 2003/04)



(i) Federal Budgetary Balance-to-GDP Ratio



(ii) Federal Net Debt-to-GDP Ratio

Appendix Table A.1

Matrix of Correlation Coefficients
1960/61 – 1969/70

	Fd BB-GDP	Nom_ST	Real_ST	Nom_MT	Real_MT	Nom_LT	Real_LT	Output
Nom_ST	0.097 (0.551)							
Real_ST	-0.248 (0.122)	0.777 (0.000)						
Nom_MT	0.135 (0.407)	0.970 (0.000)	0.737 (0.000)					
Real_MT	-0.280 (0.080)	0.660 (0.000)	0.965 (0.000)	0.675 (0.000)				
Nom_LT	0.104 (0.522)	0.944 (0.000)	0.742 (0.000)	0.982 (0.000)	0.695 (0.000)			
Real_LT	-0.361 (0.022)	0.499 (0.001)	0.908 (0.000)	0.515 (0.001)	0.971 (0.000)	0.568 (0.000)		
Output	0.133 (0.413)	0.885 (0.000)	0.643 (0.000)	0.890 (0.000)	0.560 (0.000)	0.857 (0.000)	0.400 (0.011)	
Inflation	0.522 (0.001)	0.287 (0.073)	-0.381 (0.015)	0.303 (0.057)	-0.498 (0.001)	0.256 (0.111)	-0.650 (0.000)	0.324 (0.042)

Note: The first entry in each cell represents the correlation coefficient and the second entry within parentheses represents the corresponding p-value.

Appendix Table A.2

Matrix of Correlation Coefficients
1970/71 – 1979/80

	Fd BB-GDP	Nom_ST	Real_ST	Nom_MT	Real_MT	Nom_LT	Real_LT	Output
Nom_ST	-0.489 (0.001)							
Real_ST	-0.448 (0.004)	0.692 (0.000)						
Nom_MT	-0.438 (0.005)	0.956 (0.000)	0.597 (0.000)					
Real_MT	-0.352 (0.026)	0.466 (0.002)	0.949 (0.000)	0.417 (0.007)				
Nom_LT	-0.474 (0.002)	0.957 (0.000)	0.615 (0.000)	0.970 (0.000)	0.420 (0.007)			
Real_LT	-0.313 (0.050)	0.328 (0.039)	0.902 (0.000)	0.253 (0.115)	0.978 (0.000)	0.292 (0.068)		
Output	-0.569 (0.000)	0.824 (0.000)	0.519 (0.001)	0.821 (0.000)	0.340 (0.032)	0.772 (0.000)	0.194 (0.231)	
Inflation	0.088 (0.590)	0.152 (0.349)	-0.608 (0.000)	0.233 (0.148)	-0.787 (0.000)	0.211 (0.192)	-0.873 (0.000)	0.191 (0.238)

Note: The first entry in each cell represents the correlation coefficient and the second entry within parentheses represents the corresponding p-value.

Appendix Table A.3

Matrix of Correlation Coefficients
1980/81 – 1989/90

	Fd BB-GDP	Nom_ST	Real_ST	Nom_MT	Real_MT	Nom_LT	Real_LT	Output
Nom_ST	-0.025 (0.880)							
Real_ST	-0.039 (0.811)	0.893 (0.000)						
Nom_MT	0.232 (0.149)	0.904 (0.000)	0.765 (0.000)					
Real_MT	-0.269 (0.093)	0.734 (0.000)	0.884 (0.000)	0.805 (0.000)				
Nom_LT	-0.408 (0.009)	0.806 (0.000)	0.672 (0.000)	0.971 (0.000)	0.789 (0.000)			
Real_LT	-0.447 (0.004)	0.584 (0.000)	0.763 (0.000)	0.721 (0.000)	0.964 (0.000)	0.768 (0.000)		
Output	0.634 (0.000)	-0.376 (0.017)	-0.258 (0.108)	-0.575 (0.000)	-0.425 (0.006)	-0.703 (0.000)	-0.525 (0.001)	
Inflation	0.028 (0.863)	0.361 (0.022)	-0.097 (0.551)	0.412 (0.008)	-0.208 (0.197)	0.389 (0.013)	-0.291 (0.069)	-0.297 (0.063)

Note: The first entry in each cell represents the correlation coefficient and the second entry within parentheses represents the corresponding p-value.

Appendix Table A.4

Matrix of Correlation Coefficients
1990/91 – 2003/04

	Fed BB-GDP	AG BB-GDP	Nom_ST	Real_ST	Nom_MT	Real_MT	Nom_LT	Real_LT	Output
AG Def-GDP	0.985 (0.000)								
Nom_ST	-0.641 (0.013)	-0.563 (0.036)							
Real_ST	-0.634 (0.015)	-0.606 (0.022)	0.875 (0.000)						
Nom_MT	-0.776 (0.001)	-0.700 (0.005)	0.949 (0.000)	0.873 (0.000)					
Real_MT	-0.690 (0.006)	-0.682 (0.007)	0.694 (0.006)	0.927 (0.000)	0.805 (0.001)				
Nom_LT	-0.897 (0.000)	-0.841 (0.000)	0.856 (0.000)	0.807 (0.000)	0.955 (0.000)	0.798 (0.001)			
Real_LT	-0.753 (0.002)	-0.769 (0.001)	0.552 (0.041)	0.823 (0.000)	0.704 (0.005)	0.959 (0.000)	0.782 (0.001)		
Output	0.926 (0.000)	0.918 (0.000)	-0.682 (0.007)	-0.758 (0.002)	-0.805 (0.001)	-0.814 (0.000)	-0.894 (0.000)	-0.851 (0.000)	
Inflation	-0.069 (0.816)	0.037 (0.901)	0.329 (0.251)	-0.170 (0.560)	0.228 (0.434)	-0.395 (0.163)	0.167 (0.567)	-0.484 (0.080)	0.091 (0.758)

Note: The first entry in each cell represents the correlation coefficient and the second entry within parentheses represents the corresponding p-value.

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