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# What drives Provincial – Canada Yield Spreads?

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## Abstract

Although recent research has led to a deeper understanding of the factors determining yields on long term Canada bonds, there has been little corresponding work on provincial bonds. This is despite the fact that unlike the US state bond market, provincial debt represents a significant part of the Canadian bond market. Provincial and state debt are examples of sub-national debt which are backed by taxing powers similar to that of the national government, but without control of the money supply, which leaves them open to the possibility of default or payment rescheduling. This in turn makes them similar to corporate debt. By using a carefully constructed new data set we establish two important results. First, provincial fiscal positions (debt and deficits) are an important factor in determining yield spreads between provincial and Canada bonds. Second we show that provincial bonds are a substitute for corporate debt, in that during recessionary “flights to quality” their yields react similar to those on corporate bonds.

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## 1. Introduction

Canada is a federation with strong federal and provincial governments and shared responsibilities. The federal government is the national government and we will refer to provincial governments as sub-national governments. Within Canada program spending by the provinces is about 30% greater than that of the federal government, while the province of Ontario alone spends almost half as much as the Federal government.<sup>1</sup> This spending is economically significant, as are the implications for financial markets where 35% of the Canadian bond market consists of provincial bonds. Yet while there has been significant research into the factors that determine the yields on long-term Canada bonds (Booth (1995), Boothe (1991), Gauthier et al. (2004), Hejazi, Marr and Parkinson (2000) and Johnson (1993)), there has been relatively little research into the factors determining provincial bond yields. This research will examine whether the impact of provincial debt and deficits affect their yield spreads over equivalent term Canada bonds, which we will refer to generically as the provincial spread.

Whether debt and deficits affect long term interest rates remains a controversial question for national debt, let alone sub-national debt. In a recent review Friedman (2005) states “A long history of efforts to establish an empirical relationship between observed deficits and observed interest rates – has generated widely varying estimates.” Most macro-economic models would predict a short run impact of deficit spending on long term interest rates due to changes in aggregate demand and short run stickiness in the economy. However, Barro (1974) argued that Ricardian equivalence would generate offsetting savings by investor-taxpayers who explicitly recognize that increases in government debt imply higher future tax payments. Consequently, they save more to generate the interest receipts necessary to make the future tax payments, thereby negating the impact of deficit financing on aggregate demand. Whether investor-tax payers are as omniscient as implied by Barro has not been conclusively proved either way, so that it is an empirical question as to whether debt and deficits affect interest rates.

However, for provincial bonds there is an additional effect of deficits and the supply of

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1. As of 2004 program spending by the Government of Canada was \$158 billion and that of Ontario \$70 billion, with total provincial program spending of \$202 billion.

sub-national debt, which is increased liquidity. Amihud and Mendelson (1991) showed that even in the US bond market differences in liquidity for otherwise similar US government bonds generated significant yield spreads. Consequently, the observation of positive provincial yield spreads could simply reflect the greater liquidity of Government of Canada bonds. In this case, increased supply of provincial bonds may increase their liquidity, making them better substitutes for Government of Canada bonds and causing their spreads to decrease.

This tension between the two opposite effects of an increasing supply of provincial bonds means that it is an empirical question as to how provincial spreads are affected by debt and deficits. In this paper we look at the empirical evidence by using a carefully constructed new data base of provincial bond yield spreads over equivalent term long Canada bonds. As far as we are aware no-one has ever looked at the yield spreads of sub-national debt either in Canada or the United States. Instead, research has relied on bond ratings with the drawback that they do not reflect contemporaneous market forces because they are sticky, in the sense that the “stable rating” philosophy adopted by rating agencies makes them reluctant to make frequent changes to ratings. Our research is not be subject to this criticism.

This research also has implications for the emergence of regional blocks on the global stage, such as the European Monetary Union. The implications of sub-national economic policy making within a national government context is becoming increasingly important, and yet has not been subject to significant research. This paper works to fill this void.

The outline of the paper is as follows. Section 2 considers the existing literature and competing hypotheses as to the effect of government debt and deficits on interest rates and liquidity. Section 3 reviews some of the main institutional features of the Canadian bond market and recent trends to provide some perspective. Section 4 discusses the data, hypotheses and empirical specifications. Section 5 discusses the empirical results and Section 6 provides our conclusions.

## **2. Factors Affecting the Yield Spread**

Following Bernoth et al. (2004) assume an investor has a mean variance utility function ( $U$ )

expressed over terminal income ( $Y$ ) and for convenience makes myopic<sup>2</sup> single period investment decisions, such that the utility function can be expressed as

$$\frac{MaxU}{\alpha} = E[U(Y(\alpha))]$$

where the choice variable is the proportion of wealth ( $\alpha$ ) invested in provincial bonds. The investor can either invest ( $\alpha$ ) in provincial bonds (P) or  $(1-\alpha)$  in the benchmark Canada bond (C). The Government of Canada bond is the benchmark bond since it is default free and completely liquid in normal trading volumes with a stated interest rate of  $r$ . In comparison the provincial bond has a promised rate of return  $R$ , but has a probability of default ( $\pi$ ) in which case the payoff is  $\beta\%$  of the par value. If the bond does not default then the payoff is  $(1+R)$  with probability  $(1-\pi)$ . In either case there are liquidity or trading costs on the provincial bond of  $\gamma$ .

The expected terminal wealth is

$$Y(\alpha) = W[\alpha(\pi\beta + (1-\pi)(1+R)) + (1-\alpha)(1+r) - \alpha\gamma]$$

This is simply the portfolio weighted average of the probability weighted payoff from the provincial bond and the Canada bond. Since the payoff from the Canada bond and the transaction cost on the provincial bond are risk-free, the variance of the uncertain payoff from the two possible states of nature is simply

$$Var(Y) = \alpha^2 W^2 \pi(1-\pi)(1+R-\beta)^2$$

The first order optimality condition is

$$E[U'(Y)(\pi\beta + (1-\pi)(1+R) - (1+r) - \gamma)] = 0$$

Solving for the optimal investment proportion ( $\alpha$ ) gives

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2. See Mossin (1969) for a discussion of the conditions under which multi-period investment decisions can be collapsed into a single period decision in a discrete time framework. In a continuous time framework the conditions are less onerous, but their development would detract from the objective of this research.

$$\alpha = \frac{\theta_i^{-1}(\pi\beta + (1-\pi)(1+R) - (1+r) - \gamma)}{\pi(1-\pi)(1+R-\beta)^2} \quad (1)$$

where

$$\theta_i = \frac{E[U''(Y)]W}{E[U'(Y)]}$$

is a measure of the investor's relative risk aversion and its inverse the investor's risk tolerance. The optimality condition is the standard mean variance condition, where the optimal investment proportions are the expected risk premium divided by the variance of the investment weighted by the investor's risk aversion.

If we multiply (1) by each investor's wealth to get the demand for the provincial bond, equilibrium in the bond market requires that supply equals demand, and rearranging we get the yield spread

$$R - r = \pi(1 + R - \beta) + \gamma + S\pi(1 - \pi)(1 + R - \beta)^2 \phi^{-1} \quad (2)$$

where

$$\phi = \left( \sum_{i=1}^n \theta_i^{-1} W_i \right)^{-1}$$

is the market's risk tolerance weighted wealth, which reflects the importance of each investor's risk tolerance in determining market prices and  $S$  is the supply of provincial debt. As a result, the spread between the provincial and Canada bond is determined by three basic factors.

Consider the third factor first, which is the risk premium. If investors are risk neutral then their risk tolerance becomes infinite and the inverse of the market's risk tolerance in (2) drives the third term to zero, that is, there is no risk premium. In this case the provincial bond yield is higher than the Canada bond yield due to the second term, which is the higher transaction/liquidity cost attached to the provincial bond, and the first term which is the loss in value from the possibility of a rescheduling of the provincial bond's cash flows. On an expected value basis, even without risk

aversion, the investor requires a higher yield from the provincial bond to reflect the cash flow loss from this potential rescheduling. What (2) shows is that conceptually the yield spread consists of three factors. However, there are questions as to whether they all exist.

The existence of a risk premium depends on whether tax revenues can be raised to make interest payments, which in turn depends on whether Ricardian equivalence (Barro 1974) holds at a sub-national government level. If investor-tax payers consolidate per capita provincial balance sheets with their own and recognize the higher future tax payments as provincial debt increases, then investor-tax payer saving rates will adjust for the provincial saving rate (borrowing). Barro's argument for the irrelevance of national debt applies equally to provincial debt, since it relies on the tax raising ability of the government, rather than control of the money supply. It also means that in equilibrium, since we owe the provincial debt to ourselves, the supply of provincial debt is equal to zero and the risk premium, disappears.<sup>3</sup>

However, Ricardian equivalence also depends on whether investor-taxpayers are immobile.<sup>4</sup> Otherwise, investor-taxpayers can simply consume the extra resources provided by increased government spending and move before paying the higher tax bill. In this context Sillimaa and Olson (2003) examine administrative data for 2 million tax filers kept by Statistics Canada. They find that over the period 1985 to 1989, a 1 percentage point increase in the marginal tax rate resulted in the movement of about 300 new prime-aged adult migrants per year. However, in the face of tax differences across the provinces, that currently range from a low of 39% for Alberta to a high of 48.6% in Newfoundland, this still implies relatively low labour mobility. Similarly, for the US, evidence by Kotlikoff and Raffelhueschen (1991) indicates that "regional fiscal differences play an important role in the location choices of three to four percent of Americans." Whether this indication of relative labor immobility is sufficient to offset the Barro argument or not is an empirical question.

Most policy makers believe in a positive relationship between interest rates and government debt and deficit levels, which by implication translates into higher provincial spreads for increasing

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3. Default risk may also be diversifiable in a more detailed portfolio balance model.

4. Ricardian equivalence requires some additional conditions, including infinite lives and no borrowing constraints.

supplies of provincial debt. Paul Martin when Canadian Finance Minister, for example, stated (1996, p 207) “endless deficits really did have something to do with Canada’s high real interest rates, and that higher government spending really did translate into higher taxes, the tolerance for which had reached its limit.”<sup>5</sup> However, the empirical evidence is ambiguous. The early work of Plosser (1982 and 1987) and Evans (1985 and 1987a,b) using U.S. data and Siklos (1988) using Canadian data generally found no direct link between government deficits and interest rates. One possible reason for these results is the estimation period. Plosser’s work, for example, covers the period 1954-1978 when government deficits were not as serious as they subsequently became. More recent empirical work, for example, Nunes-Correia and Stemitsiotis (1993) find that deficits affect interest rates, where they estimate a 1% increase in the deficit increases real interest rates by 0.53%. Similarly, Booth (1995) estimates a 0.26% increase, and using a VECM approach Gauthier et al. (2004) estimate an even stronger result where a 0.2% increase in the deficit increases nominal long term interest rates by 0.40%. Ardagna et al. (2005) most recently used a panel of 12 OECD countries and estimated that a 1.0% increase in the debt to GDP ratio led to a contemporaneous increase in long term interest rates of 10 basis points increasing to 150 basis points after ten years.

Apart from default risk, provincial spreads are also affected by low liquidity induced transaction costs. Van Horne (1978) describes liquidity as the “ability to realize value in money.” It has two main dimensions: the cost of transacting, and the volume that can be transacted, both of which are important for financial markets. Amihud and Mendelson (1991) examined the impact of liquidity in the largest most liquid bond market in the world, that for U.S. Government bonds. They pointed out that the bid-ask spread for a US\$1 million transaction in Treasury Bills was 1/128<sup>th</sup> of a point plus a brokerage fee of \$12.5-\$25 per million. In contrast, a similar sized transaction in Treasury Notes had a 1/32 spread plus a brokerage fee of \$78.125 per million. The discounted value of these differential transactions cost streams is then impounded in market prices to cause liquidity spreads between different US government securities, where there is no default or rescheduling risk.

If liquidity differences can cause spreads between otherwise similar US government bonds, then it

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5. Interestingly the Martin quotation that taxes have “reached a limit” is echoed in Barro, where he notes “The amount of bond issue would be limited by the government’s collateral, in the sense of its taxing

is natural to expect the size differences in outstanding debt issues between the government of Canada and the provinces to cause differential liquidity spreads. In this case, increased supply of provincial bonds will reduce liquidity spreads causing the differences between Canada and provincial bonds to narrow. Further, we would expect two provinces with the same debt and deficit problems, relative to GDP, to have different spreads if the absolute size of their bond markets, and thus their liquidity, is different.

Surprisingly there has been very little work on provincial or sub-national bond markets. Mattina and Delorme (1997) looked at the impact of fiscal policy on the provincial spreads for Ontario, Quebec, British Columbia and Nova Scotia bonds. Using British Columbia as a benchmark, they estimated a non-linear supply curve. Bayoumi, Goldstein and Woglom (BGW 1995) used survey data on 20-year general obligation US state bonds and also found evidence for a non-linear supply curve.<sup>6</sup> The BGW study was motivated by the same concerns as our paper that the US state experience as sub-national units in a monetary union may have implications for countries that are now part of the European Union with a common currency. In a similar vein, Alesina et al. (1992) for a sample of 12 OECD countries found a strong correlation between the size of public debt markets and spreads between public and private rates of return. Moreover Bernoth et al. (2004) in a recent European Central Bank working paper find that the spreads on bonds of countries within the European Union over German and US bonds reflect positive default and liquidity effects.

However, as far as we are aware no-one has looked at this tension between the liquidity and rescheduling effects of the supply of provincial bonds. Whether debt and deficits cause portfolio balance effects in requiring higher yields to induce investors to hold them or lower yields since they look more like Canada bonds is an open empirical question.

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capacity to finance the interest and principal payments.”

6. U.S. state and local bonds, also called municipal bonds, are long term instruments issued by state and local governments to finance expenditures on schools, roads, and other large regional programs. The interest payments on these bonds are exempt from federal income tax and generally from state taxes in the issuing state. The largest buyers of these securities are commercial banks, who, with their high income tax rate, own over half of the total bonds outstanding. The next biggest group of holders is wealthy individuals also with high income tax brackets, followed by insurance companies.



### 3. Canadian Bond Market

Figure 1 Panel A indicates that in 2003 fully 30% of the \$1,202 billion Canadian bond market consisted of debt issued or unconditionally guaranteed by the provinces. The other major issuers are the Canadian government (Canadas) with 26%, the corporate sector with 33% and specialised securitisations with 8%. This latter amount consists of pass-throughs of mortgages and other bonds backed by loans, credit card receivables, etc. The residual consists of the municipal bond sector and some foreign issuers in Canada. Panel B shows the trend in the provincial share over the last 26 years. Traditionally provincial bonds have been about 40% of the overall bond market. However, the provincial share started to decline in 1993 as all levels of government focussed on deficit reduction and corporate bond issues increased. Since 1997 the provincial share has experienced a persistent downward trend.

The importance of the government segment of the bond market is simply the mirror image of government deficit problems. Figure 2 indicates the aggregate Canadian government deficit, both federal and provincial, as a percentage of GDP. The deficit was around zero until the late 1970s when it started to increase significantly and reached cyclical lows in the recessions of the early 1980s and 1990s at -8.2% of GDP in 1983 and -9.13% in 1992. After 1993 the deficit was reduced almost yearly until it achieved a peak surplus of over 3.0% of GDP in 2000, before softening with the slowdown in the early 2000s. However, in contrast with other G-8 countries the Canadian government in aggregate remains in surplus. One implication of the data in Figure 2 is that the early tests on Canadian data prior to the late 1970s covered a period when deficit problems were not as acute as they subsequently became.

Figure 3 shows the composition of the provincial bond market for 2003. Overall the provincial bond market was worth \$354.7 billion. Quebec, Ontario and BC account for 80% of this total. The rest are scattered at 3-4% levels each except for Prince Edward Island and the Territories, which together account for less than 1.0%. However, even though 4% seems like a small number, for 2003 this amounted to \$16.5 billion for Manitoba, which dwarfs almost all corporate issuers and may indicate significant liquidity differences between provincial and corporate debt.<sup>7</sup>

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7. Government borrowing is from a variety of sources, but the use of non-market sources such as the Canada

Table 1 provides data on the liquidity of the bond market, where liquidity is defined as the turnover or the average monthly trading volume divided by the stock of outstanding debt. Canada bonds are overwhelmingly the most liquid, where on average there is a 20-30% turnover a year. In contrast there is just a 1.4% turnover in the corporate bond market and about a 2.5% in provincial bonds. The liquidity data reflects the heterogeneity of the corporate bond market, the homogeneity of the Canada segment, with the provincial segment in between.<sup>8</sup> The data also indicates that investors in non-Canada bonds partially give up the right to trade these bonds given their evident lack of liquidity. However, this lack of liquidity varies from province to province. Ontario and Quebec typically re-enter existing issues to build liquidity in their own benchmark bonds. This also facilitates stripping and subsequent reconstituting of their bonds, which again enhances their liquidity.<sup>9</sup> However, the smaller provinces usually sell their bonds on a “one off” basis as bought deals so their issues tend to be small and lack liquidity similar to corporate bonds.

Before formally testing specific hypotheses, consider the behaviour of corporate spreads. Corporate bonds are both less liquid and more default risky than provincial bonds. Consequently we would expect them to be sensitive to the business cycle consistent with Atkinson’s (1967) original results. This is what Figure 4 shows, where the spreads are those between BBB rated corporate bonds and equivalent maturity long Canada bonds. The spreads are clearly inversely related to corporate profitability, as measured by Statistics Canada as the average return on equity (ROE) for “Corporate Canada.”

If corporate spreads are sensitive to the business cycle what about provincial spreads? Figure 5 plots the spreads on the long term Provincial and Corporate bond indexes maintained by Scotia

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Pension Plan (CPP), and the Ontario Teachers Pension Fund has dropped dramatically since the late 1980s, as both have been freed from the requirement to buy government debt.

8. The public good aspect of the Canada bond market is taken seriously by the Government of Canada, which has taken significant steps to preserve the liquidity of the benchmark bonds. For example, when the Government of Canada decreased the frequency of Canada bond auctions from quarterly to semi-annually in April 1998, it also shifted its financing from Treasury Bills to long Canada bonds and repurchased illiquid off the run bonds.

9. Stripping bonds simply means selling off individual coupons. Once this is done it only used to be possible to reconstitute the bond by buying back all the original pieces. The movement to common terms and coupons for the benchmark bonds and the use of generic identifiers makes it easier to reconstitute the bonds and arbitrage.

Capital over similar maturity Canada bonds back to 1977.<sup>10</sup> The spreads are based on index data and so reflect a weighted average of provincial and corporate issuers. The provincial spread is usually lower than the corporate spread, due possibly to the greater liquidity discussed earlier, and lower default risk. More importantly, the recession and slow downs of the early 1980s, 1990s and 2000s is clearly evident in wider spreads for both corporate and provincial issuers, although the impact on corporate issuers is more attenuated.<sup>11</sup> The casual empiricism of Figures 4 and 5 indicates that provincial and corporate bonds seem to be substitutes in responding in a similar fashion to broad macro-economic effects. However, the graphs say little about the role of debt and deficits in determining these spreads except that the provincial spreads have been lower than the equivalent corporate spreads since about 1997, when government deficits from Figure 2 moved into surpluses.

#### **4. Data and Hypotheses**

To examine the impact of debt and deficits on provincial yield spreads we hand collected monthly yield data on long-term provincial government bonds for the period 1981 to the end of 2000 from the Financial Post.<sup>12</sup> The yields were calculated as follows: an average was estimated for all bonds outstanding for each province with a maturity of 5 to 10 years, weighted by the amount of bonds outstanding for that maturity. This was done for each province, from 1981:1 to 2000:12. There were no data available for Prince Edward Island (PEI) for the last nine months of 2000 or for British Columbia for the period 1981:1 to 1983:8. Yields on Canadian benchmark bonds were obtained from CANSIM. The yield data reflected transaction yields, except for some of the smaller issues, where they were indicative yield quotes by investment dealers making a market in the bonds. In this latter case they still reflect market conditions since providing stale quotes would

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10. Equivalent BBB and ROE data is not available this far back. The Scotia Capital Indexes are the standard benchmarks for Canadian yield data and are used in the Bank of Canada Review.

11. Different econometric modeling of the provincial against the corporate spread indicates that it varies by 56-65% of the corporate spread.

12. Time series data on provincial bonds is difficult to obtain. The only publicly available data is that for the overall provincial bond index which is maintained by Scotia Capital. Landon and Smith (2000) in their study of spill over effects in the Canadian bond market justify their use of bond ratings as their dependent variable on the grounds that comparable yield data is not available. Bayoumi et al. (1995) rely on semi-annual surveys of municipal bond traders to retrieve the yield data used in their analysis of the US bond market.

soon drive an investment dealer out of business.<sup>13</sup>

Table 2 provides descriptive statistics for our interest rate data. The average yield on medium term Canadas was 8.47%. The province with the highest average yield was Prince Edward Island at 9.54%, followed by Newfoundland at 9.49%. The province with the lowest average yield was Alberta at 8.89%. The next four lowest provincial yields are very close to one another with Ontario at 9.09%, British Columbia at 9.11%, and Manitoba and Saskatchewan each at 9.12%. Over this period the average yield curve was normal as long Canada bonds yielded 0.33% over medium term Canada bonds, and mediums 0.96% over short term Canadas.

Of interest are the yield spreads in Table 2, where consistent with the average yield data described above, the average spread runs from a low for Alberta of 0.13% to a high for Newfoundland of 0.71% or 71 basis points. In all cases the maximum spread occurred either in the recession of the early 1980s or that of the early 1990s. It is worth noting that on several occasions, the spread for Alberta was negative, that is, the yield on Alberta provincial bonds was lower than that for Canada. This should not be entirely surprising given that Alberta has run surpluses over much of this time period. In addition, the Alberta government maintains the Heritage Fund of several billion dollars which is derived from its provincial revenue and is actively paying down its provincial debt. The summary data indicates that there is significant dispersion in the provincial spreads, so there is something to explain.

For our independent variables we hypothesize that the probability of default or rescheduling is determined by the following provincial values relative to Canada: total debt, annual budget deficit, employment, and openness variables (discussed in detail below). Descriptive statistics for these values are in Table 3, where Panel A provides the data for each province and Canada and Panel B the difference variables we use to estimate the model.

The debt levels come from the Financial Management System, which expresses all the provincial budgets on a consistent basis and includes provincial assets as well as marketable and non-marketable debt. Consequently the level of indebtedness is a broader and more encompassing

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13. New issue yields are unreliable simply because of the lack of a continuous time series for most provinces.

measure than simply the amount of public market bonds outstanding. The average debt load varies from -4.39% of GDP for Alberta to 68.6% for Newfoundland. The negative debt for Alberta indicates that provincial assets exceeded liabilities, in this case due to the Heritage fund and the oil and gas royalties earned by the province.

There is also wide variation in the deficit levels across provinces. For the deficit variable a negative value denotes a surplus and a positive value a deficit. All provinces have run deficits at various times. The highest deficits have split evenly in both the 1980s and 1990s with five provinces recording their highest deficit in the 1980s and five in the 1990s. Overall, provincial deficits have not been as significant as those of the Government of Canada, but the data indicate significant dispersion both across time and across provinces.

We used employment and openness variables as provincial characteristics to capture other effects that might affect the rescheduling risk, as well as dummy variables for specific political events that likely influenced spreads. The employment data is meant to indicate trends in income tax revenues and the ability of a province to increase taxes. The conjecture is that employment levels indicate a private wealth effect independent of the impact on the provincial deficit: the higher the level of employment the higher the level of savings and investment. The trade data is an openness index defined as the sum of exports and imports divided by provincial GDP. This latter variable has been used extensively in sovereign debt research to gauge the ability of a country to generate hard currency. In our case it indicates the ability of a province to attract international business and we use it as a broad measure of awareness and competitiveness.

In addition to these four characteristic variables for each province, we also used dummy variables for five significant political events. Since political uncertainty surrounding potential Quebec separation is known to have affected Canadian Treasury bill and bond yields (Hejazi, Marr and Parkinson (2000), Johnson and McIlraith (1998), Shum (1995)), we therefore test whether they also impacted provincial spreads.

In the discussion of prior research we noted that several researchers had found non-linear effects. We might expect this if there is a tipping point in terms of the impact of debt and deficits. To account for this we use an extreme variable which indicates a situation where everything is “going

bad” with higher deficit levels compounding the effects of higher debt levels. The extreme variable is designed to capture the intuition that the effect of a higher deficit is greater when the existing debt load is also high. It thus implicitly incorporates non-linearities in the supply of provincial debt. The extreme variable is one if both the province and Canada have debt and deficit levels above their average level, and zero otherwise.

The above discussion leads to the following estimating equation,

$$Spread_{it} = \beta_{i0} + \beta_1 debt_{it} + \beta_2 deficit_{it} + \beta_3 employ_{it} + \beta_4 open_{it} + \delta_1 extreme_{it} + \delta_2 political_{it} + \varepsilon_{it}$$

where  $i$  denotes province ( $i = 1, \dots, 10$ ) and  $t$  denotes time in quarters ( $t = 1981Q1, \dots, 2000Q4$ ). The variables are defined as follows:

- ***Spread*** is the provincial yield spread over the equivalent Canada bond.
- ***debt*** is the difference between the provincial debt to GDP ratio and that of the Government of Canada. Differences were used since some of the provincial debt ratios are negative indicating surpluses.
- ***deficit*** is the difference between the provincial deficit as a percentage of provincial GDP and the same for Canada, and again differences are used since some of the deficits are negative (surpluses).
- ***employ*** is the difference between the natural logarithm of provincial level employment and the natural log of Canada level employment.
- ***open*** is the difference between the natural logarithm of the sum of provincial exports and imports to GDP and that for Canada.
- ***extreme*** is a dummy variable that captures above average values to debt and deficits for both Canada and the provinces. This variable takes on a value of one when both the provincial and Canada debt and deficits relative to GDP are simultaneously above average, and zero otherwise.
- ***political*** is a dummy variable which captures the impact of known periods of political uncertainty. This variable takes on a value of one when during periods of political uncertainty discussed below, and zero otherwise.

If fiscal imbalances and levels of government debt do not impact yields, then  $\beta_1 = \beta_2 = 0$ . If debt and deficits cause increased liquidity then  $\beta_1, \beta_2 < 0$ . Alternatively if increased debt and deficits increase rescheduling concerns  $\beta_1, \beta_2 > 0$ . We hypothesize that increased employment generates a wealth effect and lower spreads either through increased demand for provincial securities or lower rescheduling risk  $\beta_3 < 0$ . We argue that the greater the international linkages of a province the more

competitive it is, so  $\beta_4 < 0$ .

There have been several political events surrounding the possible separation of Quebec from Canada. These events are:

*	1990 Quarter 2:	Failure of the Meech Lake Accord
*	1992 Quarter 3:	Charlottetown Accord defeated on October 1992
*	1995 Quarter 3:	2 <sup>nd</sup> Quebec referendum announced August 1995
*	1995 Quarter 4:	October 30 Quebec referendum

Dummy variables were used to reflect these four specific events as the associated uncertainty is known to have affected Canadian bond yields, and hence provincial spreads. Our political dummy variable takes on a value of one in these periods, and zero otherwise. Although the provincial yield data are available monthly, provincial GDP is only available quarterly. Hence we use quarterly data for 1981 to 2000.

## 5. Empirical Results

We test for the presence of non-stationarity in each of the variables used in the model. These tests are undertaken in a panel framework using the Fisher panel unit root test methodology, where the null hypothesis is non-stationarity. We find that all but two variables are non-stationary, those two being the spread and the deficit.<sup>14</sup> Given the existence of non-stationary variables we estimated the Pedroni (1995) panel co-integration test, where the null is no co-integration in heterogeneous panels with multiple regressors.<sup>15</sup> Pedroni derives two residual based test statistics that are analogous to the Phillips–Perron and augmented Dickey –Fuller t-statistics. The panel co-integration Phillips-Peron test statistic for the variables *spread*, *debt*, *deficit*, *employ*, *open*, is -11.32, and the augmented Dickey-Fuller statistic is -4.38. Both statistics allow us to reject the null of no co-integration at the 1% level of significance. In other words, this multivariate panel co-integration regression test finds that our variables are co-integrated.

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14. The Fisher test combines the p-values from n independent unit root tests, as developed by Maddala and Wu (1999). The panel unit root p values for the spread, debt/gdp differences, deficit/gdp differences, employment differences, openness differences are 0.001, 0.255, 0.938, 0.0428, 0.999 respectively.

15. Pedroni shows that these are one-sided tests with standard normal test statistics as both the time series and cross-sectional dimensions of the panel grow large.

Our initial OLS estimates of our model tested for panel level heteroskedasticity and autocorrelation (Woolridge 2002), where the test statistics for both tests rejected the null of no heteroskedasticity and no autocorrelation. Consequently we estimated our model using feasible GLS which allows for autocorrelation and heteroskedasticity across panels. These results are presented in Panel A. Three of the four independent variables are significant, indicating that both the size of the debt and the deficit relative to that of the Government of Canada tends to increase provincial yield spreads.

Note from Tables 2 and 3, the spreads, debt and deficit data are all in percentages, so the empirical results indicate that a 1% increase in provincial debt to GDP relative to Canada increases the spread by 0.54 basis points. To put this in perspective if the debt to GDP ranges between 20% and 50%, all else constant the provincial spread would range between 11-27 basis points. Similarly, if the deficit to GDP ranges between 5.0% and 10.0%, all else constant the spread would range between 14-26 basis points. The fact that the signs on both the debt and deficit variables are significantly positive indicates that the risk effect of provincial debt outweighs any liquidity effect.

The ratio of provincial-federal employment difference indicates that increasing provincial employment levels reduce the provincial spread, but the coefficient is not significant. Interestingly, the negative and significant sign on the openness variable confirms the hypothesis of lower risk associated with provinces that are relatively more diversified through high levels of international integration.

The models in columns 2 and 3 repeat the tests with the added “extreme” value variable and the political dummies. Interestingly, while the coefficients on the independent variables are largely unchanged, the impact of the extreme variable indicates an extra 10 basis points is added to the provincial spread, whereas the four political events seem to have added another 15 basis points. Clearly there are some non-linearities in the impact of debt and deficits on provincial spreads, and as you would expect, political events affect the attractiveness of holding provincial bonds and thus their spreads. Again the sign and significance of the debt and deficit variables indicate that spreads are primarily affected by risk rather than liquidity concerns.

There are two other factors that we considered. Canada has some provinces that consistently



receive equalization payments from the federal government. These transfer payments represent another source of revenue to the provincial governments and hence may affect spreads. At the same time there are size differences across the provinces with the four Atlantic provinces being significantly smaller than the other provinces, which may lead to systematic spread differences.

Data from the Department of Finance shows all provinces except Ontario, Alberta, and BC have received equalization payments. Panel B of Table 5 extends our model to include an equalization payment dummy, where the dummy variable takes on a value of 1 if the provinces received such payments in that year, and zero otherwise. The main impact of the equalisation dummy is to increase the size of the coefficient on the debt variable marginally from 0.55 to just below 0.70, with its biggest impact on the employment variable. The employment variable doubles in size and is significant at the 10% level of significance indicating, as we would expect, that equalisation payments are correlated with provincial employment levels. The equalization dummy itself has the correct sign, indicating that this extra source of revenue reduces the spread, although it is only significant at the 10% level.

We test the sensitivity of our analysis to the inclusion of a dummy variable for the Atlantic provinces with the estimates in panel C of Table 5. There are two noticeable effects. First the Atlantic dummy variable is statistically significant and indicates that 24 basis points of their spread is attributable to their unique features, separate from the effects of the other independent variables. Second while the significance of the financial variables is unchanged, the size of the coefficient on the debt is lower and that on the deficit higher. Together these results indicate that the relative illiquidity of the bond market for these provinces does increase their spreads and the true impact of debt levels is marginally lower.<sup>16</sup>

Table 5 further investigates the relationship between liquidity and debt outstanding. We did this by estimating a fixed effects panel model, where the constant term is allowed to be different across the provinces, but the impacts of the independent variables is forced to be the same. Column 2 reports the fixed effect coefficients for the model with BC as the numeraire. The overall constant is -1.92 and all the fixed effect constants are significant and range from -3.79 for PEI to 1.32 for

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16. We also re-estimated the model excluding the Atlantic Provinces. The results were qualitatively

Ontario indicating that there are factors other than the independent variables affecting the spreads. The table also includes the amount of provincial bonds and debentures outstanding in 1981, 1990 and 2002, both in absolute dollars and, like the constant, relative to BC. A simple correlation between the ratio of outstanding bonds and the fixed effects coefficient indicates correlations in the range of 0.86 to 0.90; as the stock of bonds increase, so too does the fixed effects coefficient indicating higher spreads.<sup>17</sup> This in turn indicates the absence of liquidity externalities in the provincial bond market and implies that spreads increase with the supply of provincial marketable bonds.

Our final check on our results is to address any potential endogeneity between the spreads and the financial variables. To do this we use a procedure used by Ardagna et al. (2004) where we estimate our model using one period lags of the independent variables.<sup>18</sup> The GLS results are reported in Table 6. The results are substantially the same, where the fiscal and political estimates are qualitatively the same but with marginally smaller coefficients. The only difference is that the employment variable increases in significance, while that on the openness variable declines.

Overall what is striking in the regression results is the robustness and relative stability in the magnitude and significance of both the deficit and debt variables. Their stability is robust to including:

- Fixed provincial effects;<sup>19</sup>
- Variables that capture wealth and revenue impacts such as employment and the openness of the provincial economies;
- Pure political uncertainty variables that capture unique events such as the collapse of the Charlottetown and Meech Lake accords and the Quebec referendums;
- GLS estimation;
- Separation of Atlantic from non-Atlantic provinces;
- Increased liquidity effects.

Furthermore, by including an extreme variable we confirm that the impact of financial health is more pronounced as financial health deteriorates. This confirms the non-linearity effects of debt and deficits alluded to in previous research. The overwhelming evidence is that the size of both

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unchanged.

17. Provincial bond data is only available on an annual basis so can not be used as an independent variable.

18. Similar results are produced with variables lagged two periods.

19. Not reported but available on request.

provincial debt and deficits does impact provincial spreads: more debt and higher deficits cause higher spreads consistent with the risk effects in a portfolio balance model. In contrast there is little evidence to support a positive liquidity effect and what there is may just be proxying for other factors.

Our final check is to examine the relationship between corporate and provincial yield spreads. As Figure 4 shows, corporate spreads vary with the state of the business cycle and corporate profitability. Hence, as Atkinson (1967) showed corporate spreads are indicative of general economic conditions. However, these same cyclical effects may affect the provinces if they are seen as possessing rescheduling risk. Table 7 shows the results of a series of regression models of provincial yields spreads against the corporate spread and the political uncertainty dummy used before. These estimates use monthly data as opposed to the quarterly data for the earlier results, since the frequency of the regressors in the main empirical model were constrained by data availability. By regressing the provincial on the corporate spread, we directly estimate the similarity in the movement of corporate and provincial bonds.

The first model in Panel A is a simple pooled regression across provinces, and so it assumes that investors regard all provinces as being equally sensitive to economic conditions. The slope coefficient is 0.423 indicating that provincial bonds are less than half as sensitive as corporate bonds to economic conditions. The slope on the political uncertainty dummy variable indicates that uncertainty over the Quebec referendum and various constitutional crises increased provincial spreads by an average of 91 basis points. In the second model, we allow for provincial fixed effects. An F test on the intercepts indicates that there are distinct provincial effects.<sup>20</sup> In Panel B, the assumption that the sensitivity is the same across all provinces is relaxed. The first model is a standard least squares regression for each province, while the second is a seemingly unrelated regression (SUR) model where correlation between the contemporaneous error terms is allowed. This essentially just recognizes that while the coefficients can differ across the provinces, each province's bonds are still a part of the overall bond market and likely to be buffeted by common economic forces. The results from the OLS and SUR models are very similar to the other models.

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20. For these pooled models, as well as the individual models that follow, the results without the political uncertainty dummy are almost exactly the same.

Overall

- The significance of the political uncertainty variable drops, and is significant for half the provinces with OLS, but only two with SUR. However, most of the coefficient estimates are positive and of similar size to previous estimates.
- The sensitivity of the provincial to corporate spreads differs significantly across provinces, indicating that investors treat these bonds differently. The least sensitive bonds are those of Ontario and Quebec. From Figure 3 these are the provinces with the most outstanding public market bonds as well as the biggest and most diverse provincial economies. However from Table 3 it is not obvious that these provinces have better financial health in terms of their deficits and debt as a share of provincial GDP.

Generally, the results indicate that investors view the smaller provinces as more sensitive to economic conditions in spite of the fact that their financial health has not generally been demonstrably worse than that of the larger provinces.

## **6. Conclusions**

The analysis in this paper adds to the literature on whether or not government debt and deficits “matter” for the yields on their public market debt. This research clearly shows that for the period 1981 to 2000 for Canadian provinces, there is strong link between provincial yield spreads and provincial debt and deficit levels. Further we show that extreme levels of debt and deficits have an effect over and beyond the linear effect estimated in the regression analysis. Political uncertainty surrounding the status of Quebec also increased provincial spreads, while the openness of the provincial economy and employment levels tend to reduce spreads. However, in the case of these last two variables the evidence is weak and inconsistent. Finally we show that provincial debt responds in a less exaggerated way to general economic conditions than corporate debt, implying that provincial bonds may be weak substitutes for corporate bonds. The only possible exception to this is the biggest issuer in the provincial bond market (and Canada’s richest province) Ontario, where Ontario spreads are the least sensitive to corporate spreads in spite of its very large deficits in the 1990s. This lack of sensitivity indicates that alone among Canadian provinces Ontario (and possibly Quebec) bonds share similar qualities to government of Canada bonds, and yet even here investors react as if they possess some rescheduling or default risk. Our results clearly indicate that provincial yield spreads are directly related to the fiscal situation of the provinces and as a result there are limits to the taxing powers of government.

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**Table 1**

**Turnover in the Bond Market**

	Canadas	Corporates	Provincials*
1995	0.244	0.012	0.020
1996	0.303	0.010	0.022
1997	0.317	0.012	0.018
1998	0.270	0.014	0.024
1999	0.202	0.013	0.027
2000	0.195	0.014	0.022
2001	0.236	0.014	0.024
2002	0.236	0.017	0.024
2003	0.263	0.016	0.023

*Source:* Chouinard et al. (2002) updated for 2002 and 2003.

Provincials include Municipal bonds.

Turnover is defined as the annual average based on weekly trading volume divided by the outstanding stock of bonds.



**Table 2**  
**Descriptive Statistics: Provincial and Canada Yields and Provincial-Canada Spreads**  
**Sample: 1981:Q1 to 2000:Q4**

	Yields		Provincial-Canada Spreads	
	Mean	Std Dev	Mean	Std Dev
Newfoundland	9.49	2.11	0.71	0.33
PEI <sup>3</sup>	9.54	2.04	0.63	0.328
Nova Scotia	9.24	2.01	0.45	0.39
New Brunswick	9.15	2.09	0.39	0.32
Quebec	9.31	2.03	0.57	0.38
Ontario	9.09	2.04	0.32	0.31
Manitoba	9.12	2.07	0.30	0.31
Saskatchewan	9.12	1.96	0.31	0.48
Alberta	8.89	2.02	0.13	0.40
British Columbia <sup>4</sup>	9.11	2.11	0.31	0.32
Canada (5-10 year)	8.47	2.11	---	---

Notes: 1. Data for PEI span 1981Q1 to 2000 Q1.  
2. Data for British Columbia span 1983Q4 to 2000 Q4

**Table 3.**

Fiscal Positions of Provincial and Federal Governments									
Panel A.									
	Debt relative to GDP (%)		Deficit relative to GDP (%)		Employment, Thousands		Openness (Exports + Imports) / GDP		
	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev	
Newfoundland	68.63	14.20	2.7	2.4	192	9	57	14	
PEI	28.23	10.80	-0.2	1.8	54	4	35	12	
Nova Scotia	34.50	13.00	-1.8	1.9	365	28	52	10	
New Brunswick	40.36	4.80	0.2	1.6	241	21	74	13	
Quebec	39.51	11.70	3.2	1.6	3,028	215	67	15	
Ontario	21.77	7.90	1.6	1.7	4,933	475	88	18	
Manitoba	27.94	9.20	2.0	2.2	504	25	50	11	
Saskatchewan	26.35	17.10	1.5	2.9	454	16	63	12	
Alberta	-4.39	12.30	-0.5	3.3	1,290	141	58	11	
BC	4.37	5.00	0.9	1.5	1,554	247	61	7	
Canada	61.50	15.10	4.6	3.5	12,619	1,150	72	14	
Panel B: Each Province, Relative to Canada									
	Difference between Provincial & Federal Debt/GDP		Difference between Provincial & Federal Deficit /GDP		Difference between Log Provincial & log Federal Employment		Difference between Provincial & Federal Openness		
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	
Newfoundland	7.00	5.7	-1.98	2.8	-1.81	0.02	-0.10	0.05	
PEI	-33.35	7.5	-4.70	4.3	-2.36	0.009	-0.47	0.12	
Nova Scotia	-27.08	7.1	-6.39	4.7	-1.53	0.01	-0.28	0.07	
New Brunswick	-21.22	13.8	-4.30	4.0	-1.71	0.007	-0.13	0.07	
Quebec	-22.07	7.1	-1.44	2.6	-0.62	0.01	-0.18	0.09	
Ontario	-39.81	11.1	-2.99	3.1	-0.47	0.006	-0.63	0.08	
Manitoba	-33.64	7.5	-2.61	2.0	-1.40	0.02	-0.30	0.09	
Saskatchewan	-35.23	3.5	-3.12	2.4	-1.44	0.03	-0.20	0.08	
Alberta	-65.98	6.1	-5.05	3.6	-0.98	0.01	-0.23	0.07	
BC	-57.21	12.5	-3.70	3.9	-0.91	0.03	-0.21	0.05	

**Table 4.**  
**GLS Estimation in the Presence of Heteroskedasticity and Autocorrelation;**  
**Determinants of the Provincial Spread**

	Panel A			Panel B			Panel C		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
<i>debt</i>	0.543 (0.001)	0.566 (0.001)	0.566 (0.001)	0.654 (0.001)	0.687 (0.001)	0.690 (0.001)	0.411 (0.001)	0.418 (0.001)	0.422 (0.001)
<i>deficit</i>	2.69 (0.001)	2.50 (0.001)	2.59 (0.001)	2.80 (0.001)	2.64 (0.001)	2.73 (0.001)	3.04 (0.001)	2.87 (0.001)	2.94 (0.001)
<i>employ</i>	-0.037 (0.429)	-0.046 (0.305)	-0.044 (0.324)	-0.090 (0.130)	-0.105 (0.061)	-0.103 (0.061)	0.115 (0.158)	0.117 (0.124)	0.117 (0.120)
<i>open</i>	-0.484 (0.015)	-0.416 (0.030)	-0.429 (0.023)	-0.524 (0.009)	-0.467 (0.016)	-0.482 (0.011)	-0.641 (0.003)	-0.570 (0.005)	-0.580 (0.004)
<i>extreme</i> <sup>1</sup>	-	0.104 (0.028)	0.093 (0.046)	-	0.109 (0.020)	0.098 (0.033)	-	0.113 (0.014)	0.102 (0.026)
<i>political</i> <sup>2</sup>	-	-	0.152 (0.001)	-	-	0.153 (0.001)	-	-	0.152 (0.001)
<i>Equal. Payments Dummy</i>	-	-	-	-0.120 (0.171)	-0.137 (0.101)	-0.139 (0.089)	-	-	-
<i>Atlantic Dummy</i>							0.238 (0.015)	0.264 (0.004)	0.260 (0.004)
Sample Size	786	786	786	786	786	786	786	786	786

Notes:

p-values in parentheses

There is no R-squared statistic reported because such a statistic is not meaningful in GLS. See footnote 15.

1. This dummy variable takes on a value of 1 if provincial and federal debt/GDP and deficit/GDP are both above average, and zero otherwise.

2. This dummy variable takes on a value of 1 for the periods 1990Q2, 1992Q3, 1995Q3, 1995Q4, and zero otherwise.

Table 5

**Fixed Effects Intercepts and Outstanding Debt**

	FE Constant (relative to BC)	1981 Bonds \$Cmm	1990 Bonds \$Cmm	2002 Bonds \$Cmm	1981 Ratio to BC	1990 Ratio to BC	2002 Ratio to BC
Newfoundland	-2.25	2252	4581	6402	1.06	0.66	0.20
PEI	-3.79	257	618	1110	0.12	0.09	0.03
Nova Scotia	-1.64	2156	6526	13216	1.01	0.95	0.41
New Brunswick	-2.17	1597	4677	11493	0.75	0.68	0.35
Quebec	0.84	9194	25408	64474	4.32	3.68	1.98
Ontario	1.32	20723	45180	92631	9.73	6.54	2.85
Manitoba	-1.50	2652	9224	15288	1.25	1.34	0.47
Saskatchewan	-1.54	2480	8606	10448	1.16	1.25	0.32
Alberta	-0.38	5030	12988	8182	2.36	1.88	0.25
BC	n/a	2129	6903	32520			

Correlation between the fixed effects constant and the ratio of provincial debt to that of BC varies from 0.86 to 0.90. All fixed effects constant have p values of < 0.001.

**Table 6**  
**GLS Estimation in the Presence of Heteroskedasticity and Autocorrelation:**  
**Independent Variables Lagged One Period.**

	(1)	(2)	(3)
<i>debt</i>	0.329 (0.006)	0.363 (0.002)	0.385 (0.001)
<i>deficit</i>	1.50 (0.011)	1.36 (0.020)	1.45 (0.012)
<i>employ</i>	-0.133 (0.006)	-0.140 (0.003)	-0.130 (0.005)
<i>open</i>	0.114 (0.567)	0.162 (0.401)	0.121 (0.528)
<i>extreme</i> <sup>1</sup>	-	0.120 (0.011)	0.109 (0.020)
<i>political</i> <sup>2</sup>	-	-	0.150 (0.001)
Test Statistic for Heteroskedasticity (Null: No Hetero)	27.61 (0.001)		
Test Statistic for Autocorrelation (Null: No Auto)	4.71 (0.058)		
Sample Size	777	777	777

*Notes:*

p-values in parentheses

1. Dummy value of 1 if provincial and federal debt/GDP and deficit/GDP are both above average.

2. Dummy taking on a value of 1 at 1990Q2, 1992Q3, 1995Q3, 1995Q4.

**Table 7**  
**Sensitivity of Provincial to Corporate Spreads**

Panel A. Regressions Pooled Across Provinces			
	Constant	Corporate Spread	Political
OLS	0.025	0.423*	0.91*
Fixed Effects	0.021	0.427*	.091*

Panel B. Regressions for Individual Provinces						
	OLS			SUR		
	Constant	Corporate Spread	Political	Constant	Corporate Spread	political
Newfoundland	0.292*	0.452*	0.186*	0.281*	0.493*	0.163**
PEI	0.228*	0.448*	0.038	0.284*	0.390*	0.030
Nova Scotia	-0.086	0.594*	0.045	-0.040	0.571*	0.018
New Brunswick	-0.011	0.441*	0.035	0.014	0.402*	0.042
Quebec	0.252*	0.331*	0.114**	0.328*	0.211*	0.138
Ontario	0.081**	0.246*	0.090*	0.139*	0.172*	0.094
Manitoba	-0.022	0.350*	0.061	-0.016	0.411*	-0.001
Saskatchewan	-0.293**	0.664*	0.199*	-0.240*	0.667*	0.145
Alberta	-0.261*	0.419*	0.186**	-0.239	0.382*	0.195**
British Columbia	0.042	0.327*	-0.047	0.038	0.334*	-0.047

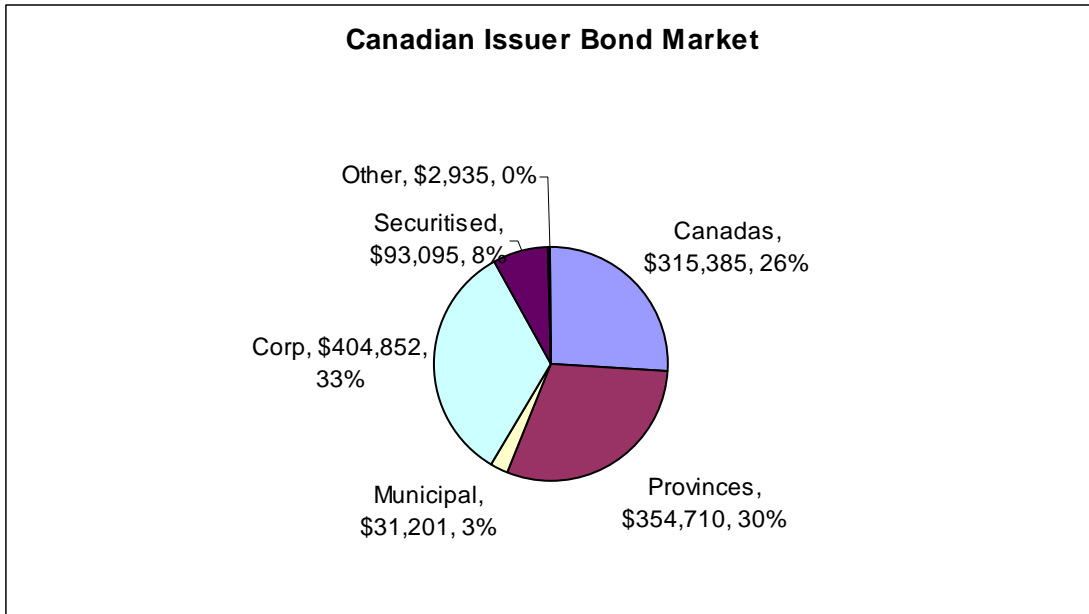
\* indicate significant at 1% and \*\*\* at 5% level respectively.

OLS: ordinary least squares; SUR: Seemingly Unrelated Regression.

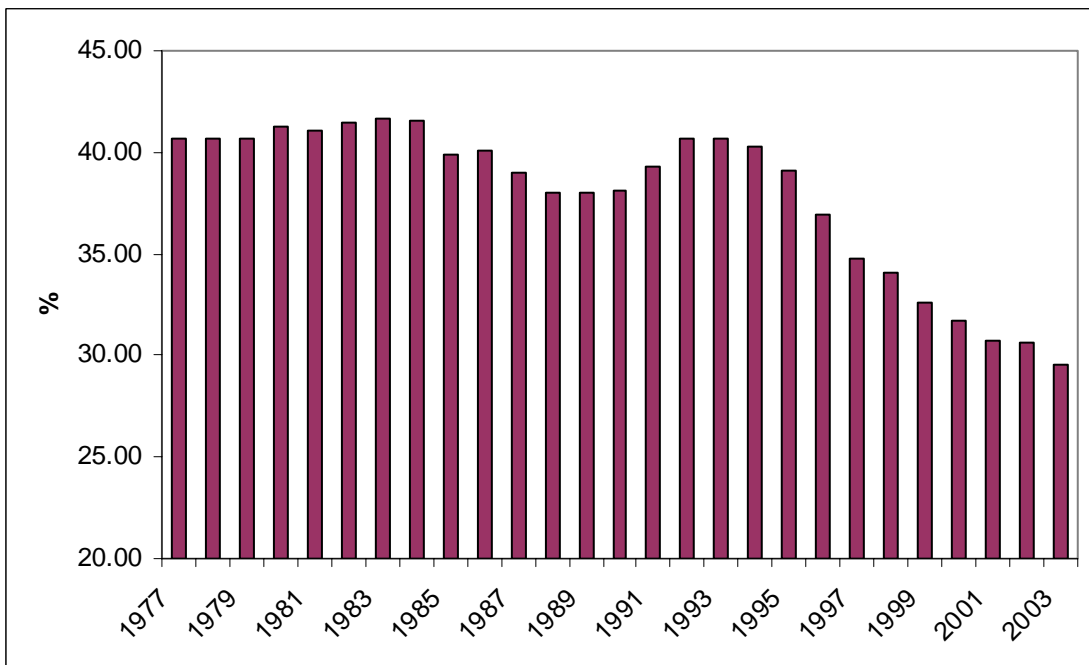
The F statistic testing whether the provincial fixed effects are the same (ie. OLS) is rejected ( $F(9,2347) = 99.71$ ).

Figure 1

Panel A. All 2003 Outstanding Debt Issues in C\$ mm  
(Total size of the bond market: \$1,202 billion)



Panel B. Trends in Provincial Share of the Bond Market (based on all issues)

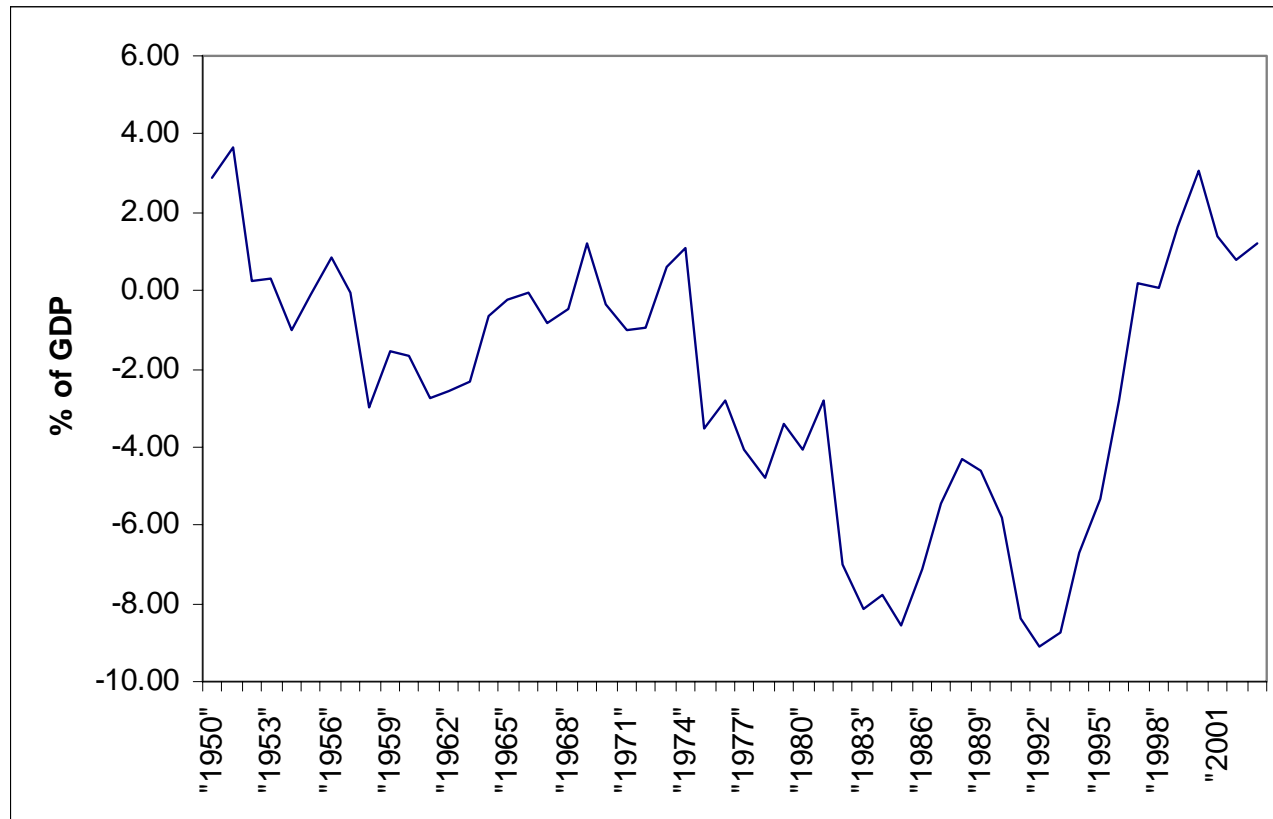


Bank of Canada Banking and Financial Statistics Tables G6 and K8)  
(Bank of Canada Banking and Financial Statistics Tables G6 and K8 for various years)

**Figure 2**

**Government Surpluses**

Statistics Canada Cansim series D14816, D2000, D 15075, D 20171

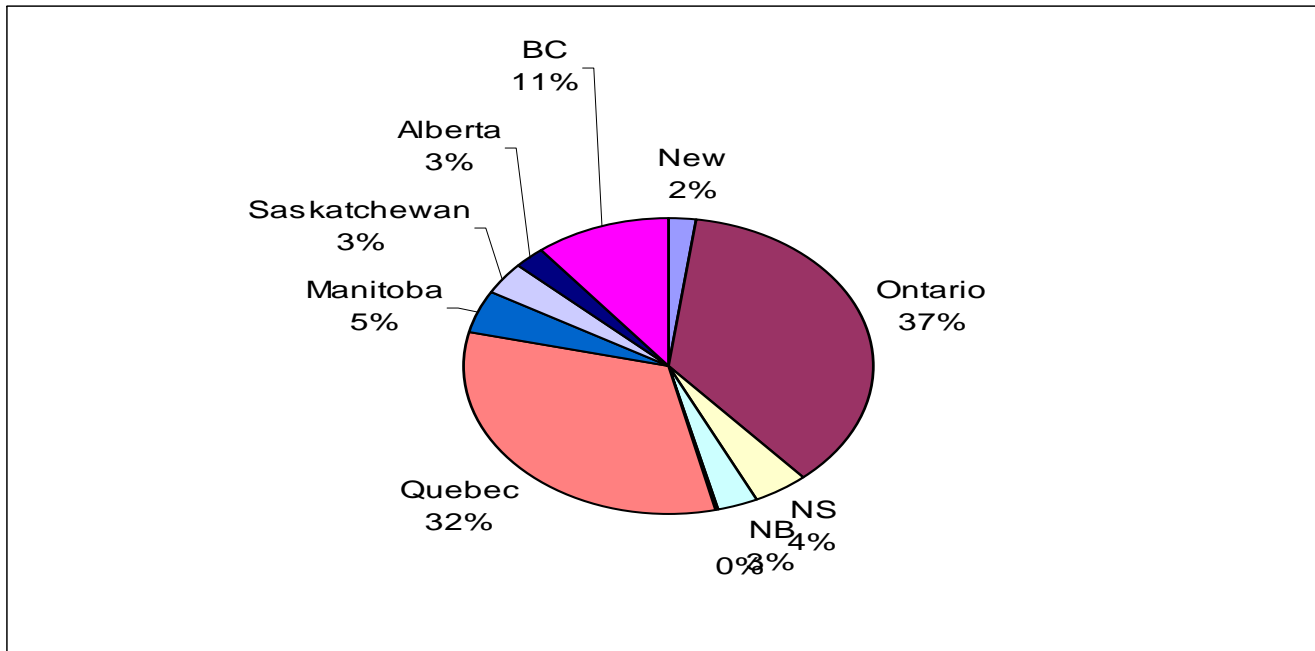




**Figure 3**

**2003 Provincial Bond Market**

Total size \$354.7 billion.



Bank of Canada Banking and Financial Statistics Table K8

For presentation purposes we have used the following abbreviations: BC is British Columbia

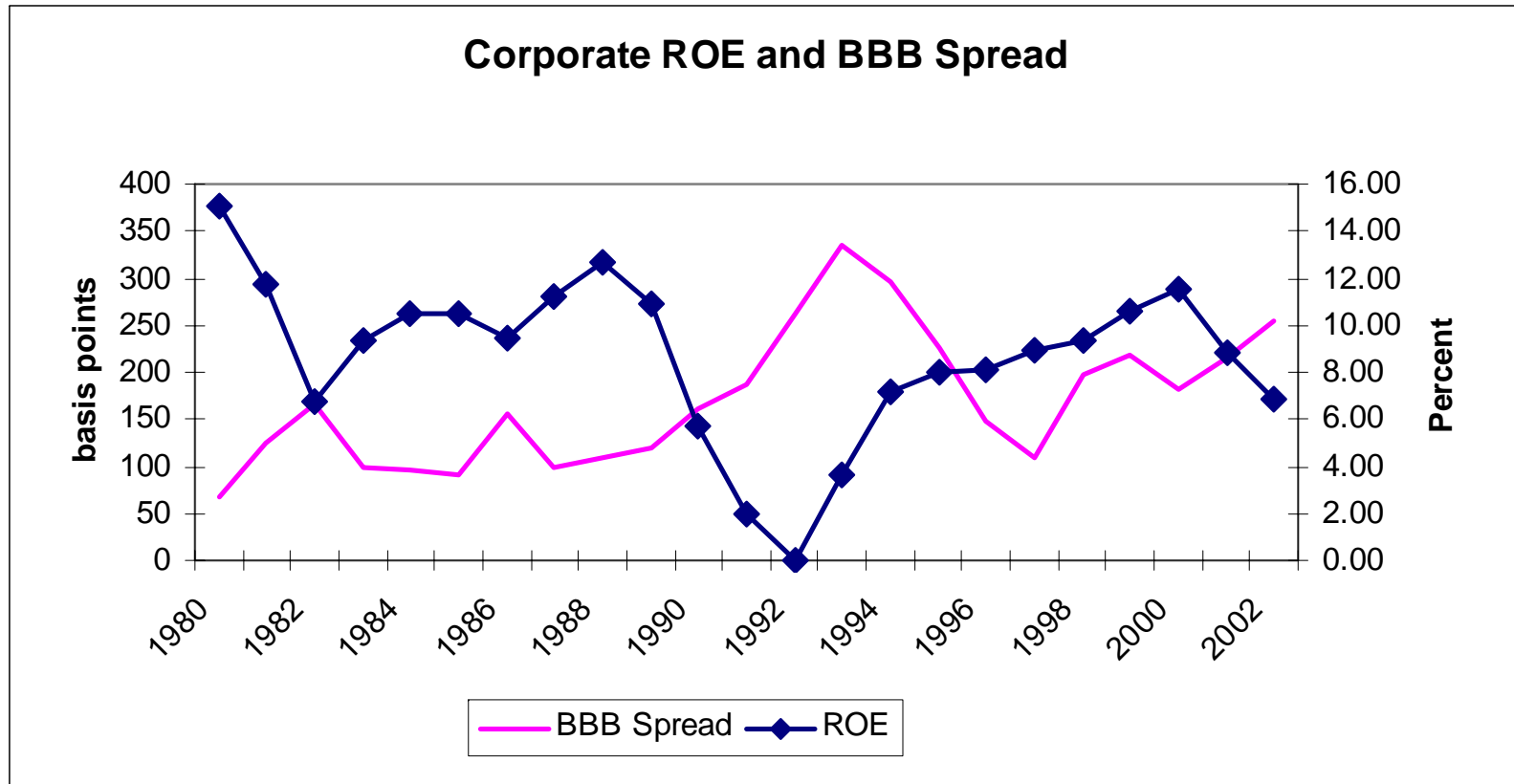
New is Newfoundland, NB is New Brunswick, NS is Nova Scotia, Unmarked (less than 1.0%) is Prince Edward Island, the Yukon and the Territories.

Figure 4

**Corporate Spreads and Profitability**

Cansim D86221 and Scotia Capital Markets, Handbook of Canadian Debt Market Indicators, Feb 2004.

The right axis is the ROE and the left the BBB spread over equivalent maturity Canada bonds.



**Figure 5**

**History of Provincial and Corporate Spreads over Equivalent Maturity Canada bonds**

Cansim data labels V121759, V121761 V121791  
(A similar graph appears in Mishkin and Serletis (2005))

