25/5/93

Public Choice, Government Debt Management and the Minimization of Interest Costs

Submitted by: Geoffrey Poitras*

Mailing Address:

Faculty of Business Administration
Simon Fraser University
Burnaby, B.C.
CANADA V5A 1S6

ABSTRACT

This article provides an analytical and practical discussion of economic criteria applicable to reforming government debt management. A model is postulated for the primary cost effectiveness problem: debt cost minimization. Analytical solutions are derived which form a basis for interpreting potential government debt management reforms. Based on empirical evidence from Canadian federal debt management, it is argued that the current debt management administrative process imposes significant bureaucratic restrictions on the government's ability to implement the most cost effective solutions, i.e., there may be potential social gains to implementing a reform process. Reforms aimed at capturing these rents through either activist government debt management strategies or changing the organizational 'rules of the game' are assessed.

* The author would like to thank Zane Spindler, John Chant, Aidan Vining, John Heaney and participants in the SFU Finance Workshop for helpful discussions.

Public Choice, Government Debt Management and the Minimization of Interest Costs

The fiscal environment of the last two decades has led to a considerable expansion in the outstanding stock of federal government debt. This expansion has significantly increased the budgetary and financial market impact of government debt management operations. In both the US and Canada, interest expense arising from the debt is the single largest federal government expenditure item. Yet, despite its importance, government debt management does not receive the general scrutiny associated with other areas of both economic policy and government expenditures.[1] Policy analysis of the issues associated with government debt almost invariably focuses on the aggregate size and rate of growth of the stock of debt. Problems associated with how to raise the required funds in the most cost effective manner are typically ignored. From a public choice perspective, this is unfortunate because the precise, if somewhat technical, rules which apply to debt management can be used to provide substantive empirical evidence on bureaucratic effectiveness in achieving desirable economic objectives.

The general approach of this article is to provide an analytical discussion of potential economic reforms associated with bureaucratic debt management. This requires evaluating whether the social benefits arising from the reform process are outweighed by the costs of special interest rent-seeking activity.[2] In this vein, government debt management is somewhat different than other areas of public sector activity which have been examined by public choice theorists. Among other factors, in many previous studies of government policy situations, it has not been possible to precisely specify the socially desirable outcome and, hence, the degree of productive inefficiency inherent in government activity. In the debt management case, under appropriate assumptions socially optimal behaviour can be, more or less, precisely modelled using an objective function that is defined over the mean and variance of expected interest expenses. The resulting "socially optimal" solutions can be used to assess bureaucratic performance. An empirical examination of government debt management behaviour reveals inefficiencies associated with, among other factors, a bureaucratic reluctance to forecast essential policy variables.

Given that bureaucratic objectives do not coincide with the achievement of a socially optimal level of public sector activity, does it necessarily follow that reform of present debt management practices will produce a net social benefit? Analysis of this question requires specific identification of the gains or losses accruing to rent-seeking interest groups involved in the reform process. In this case at hand, the relevant groups are the liability issuers and purchasers, as well as the marketing intermediaries, i.e., the government debt management bureaucracy and the investment dealers. The status quo is characterized by the monopoly power granted to the debt management bureaucracy. In turn, scale economies both for capital and information create a marketing environment populated by oligopolistic investment dealers. Competition among dealers is conducted, by the bureaucratic debt manager, according to well-defined rules. Because a government liability issue can be taken as a pure social claim, excess "all-in" interest expenses can be taken as a pure social rent which is distributed between the liability purchasers and the intermediaries.[3]

In the following, Section I outlines the literature on the public choice approach to modelling economic reform of public sector activity. Section II develops a mean-variance cost effectiveness model for government borrowing. Among other results, it is demonstrated that, except under restrictive conditions, interest cost minimizing debt management requires that the stock of debt issued in different maturity categories should be varied to account for expected changes in the term structure of interest rates. Using Canadian examples, Section III examines a number of areas of current policy and compares observed practice with the theoretically optimal solutions. Based on this, it is argued that debt management represents an area where bureaucratic preferences are inconsistent with the achievement of a socially optimal provision of public sector services.[4] Section IV considers a number of possible reform proposals. Specific attention is given to the different organizational structures which could permit a socially desirable interest cost minimization outcome. Finally, Section V provides a summary of the important issues raised in the paper such as the limitations of the policy analysis process in the case of government debt

management.

I. Public Choice Background

Since the early contributions in public choice theory by Downs (1957), Buchanan and Tullock (1962) and Niskanen (1971), it has become increasingly apparent that the process of economic reform is a complex and subtle task that requires specific consideration of the competing interests involved. The public choice approach is characterized by the use of economic theory to measure the efficiency of government bureaucracy in achieving optimal levels of public sector activity. Within this general framework, a number of somewhat different paradigms have been suggested. For example, Niskanen (1971) focuses on the behaviour of a monopolistic government bureaucracy seeking to maximize total budget. The impact of political control on bureaucratic decision making is restricted by an assumption about the bureaucratic control of funding related information. Another approach ignores the impact of bureaucratic preferences and focuses on the legislative equilibrium, i.e., on the politically efficient level of output (Weingast and Moran 1983). Typically, it is demonstrated that public sector supply is substantially larger than the socially optimum level, e.g., Carroll (1993).

Unfortunately, for a number of reasons, it is not generally possible to translate conclusions about inefficiency in public sector supply into specific prescriptions for economic reform. In particular, it not possible to adequately separate the political problem of identifying a social optimum from the economic problem of efficient allocation. Using a utilitarian ethical framework, economic theory has traditionally circumvented the political problem by exploiting the unanimity property associated with Pareto optimality. However, in the presence of distortions, the "second best" problem obviates the use of Pareto optimality, i.e., there is no guarantee that partial reform will result in an efficiency gain rather than an efficiency loss. Use of political theory to provide a social preference ordering is undermined by Arrow's impossibility theorem. In addition, the logic of collective action suggests that a political process dominated by special interests will not

necessarily produce a socially desirable outcome, e.g., due to the free rider problem. The upshot has been justification for a process of bureaucratic "muddling through" inherent in the disjointed incrementalism of Lindblom (1965) and, more recently, in the policy analysis approach to public decision making, e.g., Quigley and Scotchmer (1989), Kesselman (1992).

In the face of these analytical difficulties, public choice theorists have proposed modelling the competitive interaction of "rent-seeking" special interest groups in order to explain observed government policy behaviour. Subjects for analysis are typically selected because of topical interest in the areas requiring reform. Hence, tax codes (DiLorenzo 1985, Spindler and Walker 1988, Tullock 1988, 1989) privatization (Walker 1988, Spindler 1990), monetary policy (Havrilesky 1990), and regulation (McChesney 1987, Tollison and Wagner 1991) have been areas of economic reform providing evidence in favour of the rent-seeking paradigm. Besides the focus on redistributive features of the reform process, another key feature of rent-seeking is the identification of "Tullock costs" arising from rent-seeking activity.[5] For example, a monopolist would incur Tullock costs in the effort expended to acquire and retain the monopoly position. Extending this notion, it is possible that the Tullock costs arising from a proposed reform could offset the efficiency gains inherent the reform program, i.e., the expenditure of resources by special interests seeking to extract rents from a policy change could either dissipate or exceed the benefits associated with the policy change.

While a useful pedagogical device, the rent-seeking paradigm suffers from the difficulties of measuring the gains and losses associated with a given economic reform. In many cases, the "efficiency" gains are combined with redistribution of property rights, further complicating the analysis; tax reform is an immediate example. In this vein, the ex ante difference between actual and potential Tullock costs is not readily derivable. However, while not without some measurement difficulties, analysis of government debt management reform is significantly less complicated than other policy areas which have been examined. Because government debt can be taken as a pure social claim, excess all-in interest expenses represent a deadweight social loss.

Given this, economic theory can be used to provide a precise evaluation of the potential social gain associated with reform. In turn, estimates of the Tullock costs can be fashioned from an examination of the affected special interests: the principals, i.e., debt issuers and purchasers, and the intermediaries, i.e., government debt managers and the investment dealers.

As conceived here, the principals are passive participants. Inefficiencies, in the form of excess debt issue costs, arise from two sources: **inappropriate debt management strategies and higher than required transactions costs**. The primary source of these costs is the monopoly on debt issue granted to government debt managers. Among other reasons, this can create costs where the bureaucratic incentive structure is incompatible with making decisions aimed at achieving the requisite interest cost minimum. This problem is potentially compounded by the "bureaucratic capturing" inherent in the fundamental reliance on investment dealers to both distribute the debt to purchasers and to provide market surveillance information essential to a range of government activities. Attempts to implement economic reform of government debt management will impact the intermediaries both directly and indirectly, generating significant incentive to incur Tullock costs. For example, reforms aimed at reducing the transactions costs paid to dealers would indirectly affect government debt managers by undermining the dealer goodwill required for access to a rapid and reliable information flow.

II. Efficiency Cost Strategies

A number of simplifying assumptions restricting debt management strategy are made. Specifically, it is assumed that debt stock behaviour does not affect domestic interest rates. If this were not case, the model would have to be complicated by allowing future supplies of securities to affect the shape of future yield curves. In turn, the resulting optimality conditions for specific debt instruments would further depend on the time-varying elasticities of both the aggregate supply of funds available from lenders and the aggregate demand for funds from borrowers with debt instruments competing with the government's (e.g., Roley 1982). In addition, if the assumption

about independence of debt stocks and term structure behaviour is not made, policy analysis would require accurate empirical evidence on the size of the relevant parameters. On balance, available information on the degree to which the maturity composition of federal debt affects the level and term structure of interest rates would seem to indicate that such effects are small (e.g., Poitras 1989).

Given this, the model is developed with the use of a representative debt manager seeking to identify the optimal level of government debt expenses. The debt manager's decision problem proceeds by formally specifying an objective function associated with minimizing expected interest expense over a finite financing horizon. In particular, at a given point in time the debt manager is required to choose the quantity of the available securities which are to be used to finance a given aggregate borrowing requirement. Making this decision requires information about the current and future level and term structure of interest rates, which are assumed to be exogenously determined.[6] If short term securities are used, the debt must be refunded in a later period at rates which are not known at the time the debt management decision is being made. If longer term securities are used, a stream of certain interest expenses is locked in over the term to maturity. The debt manager must decide whether the known cost of long term debt may possibly be higher than the cost of "rolling over" short term borrowings.

Significantly, formal specification of the cost effectiveness problem based on expected interest expenses alone provides an inadequate representation of rational decision-making.[7] Correct specification requires uncertainty regarding the total interest expense to be introduced. This addition is essential for a number of reasons. For example, there may be aversion to the risk of unknown interest expenses which are incurred when debt is financed by rolling over short term issues. Conventional rationality axioms require that certain interest expenses will be preferred to uncertain expenses with equal expected value. This leads immediately to consideration of the differences between bureaucratic and "social" levels of risk aversion. By taking the degree of risk aversion to be a parameter in the optimization problem, it is possible to assess the impact of this

parameter across a range of scenarios. In turn, observed debt management can be evaluated in order to provide an indirect assessment of the degree of risk aversion inherent in bureaucratic behaviour.

The explicit introduction of uncertainty into the cost effectiveness problem also admits considerations about the distribution which is being used to forecast future interest rates. When the forecasting distribution is "diffuse", the dispersion is large and accurate forecasts are difficult to attain. Identification of the relevant distribution to use in determining the (socially) optimal debt management decision is an important analytical question. As with risk aversion, the distributions inherent in government debt management can also differ from the optimal, socially-attainable distribution. Specifically, in order to implement optimal solutions, the administrative structure must be equipped to produce competitive forecasts of the relevant exogenous variables. Actual debt management practice, i.e., variability in the amounts issued in available debt maturity categories, can be observed to indicate whether forecasts are being utilized. In the absence of sufficient volatility, diffuse forecasting distributions or high degrees of bureaucratic risk aversion are the logical implication.

For the funding of domestic debt alone, essential features of the model are most readily illustrated in a two period context. In this case, there are two decision variables, the supply of bills (Q_1) and of bonds (Q_2). If the debt manager chooses bonds at known interest rate $r_{2,0}$ the two period cost will be $Q_2 (1 + r_{2,0})^2$; if bills are used the expected cost will be $Q_1 (1 + r_{1,0})(1 + E[i_{1,1}])$, where $r_{1,0}$ is the (known) one-period interest rate which will prevail from t= 0 to t= 1 and $i_{1,1}$ is the uncertain one period interest rate which will to prevail from t= 1 to t= 2.[8] At the decision date, the total amount to be financed (D) is known, which means that the supplies of both securities are determined simultaneously. By assumption, considerations related to D at t= 1 are ignored. Observing that $Q_2 = D - Q_1$ and that, in the two period problem, $var[\cdot] = Q_1^2 (1+ r_{1,0})^2 var[i_{1,1} | X_0]$, then the debt cost minimization problem can be reduced to:

$$\min_{Q_1} \; L = \mathrm{E}[Q_1(1+r_{1,0})(1+i_{1,1}) + (D-Q_1)(1+r_{2,0})^2 \mid X_0]$$

$$+ b\, Q_1^2(1+r_{1,0})^2\, var[i_{1,1} \mid X_0] \qquad (1)$$

where b is the sensitivity to risk of the representative debt manager. E[·] and var[·] are the expected value and the variance of the **conditional** forecasting distribution, where X_0 is the conditioning information set. In this form, the constraint $Q_2 = D - Q_1$ has been substituted to leave only one choice variable.

Using * to denote an optimum value, the solution to (1) is given by (all proofs provided in the Appendix):

$$Q_1^* = \frac{\rho_{1,2} - E[i_{1,1}]}{2b\,(1+r_{1,0})\,var[i_{1,1}]} \qquad (2)$$

$$Q_2^* = D - Q_1^*$$

where $\rho_{1,2}$ is the implied forward rate (e.g., van Horne 1985) for a 1-period security beginning at t= 1 and maturing at t= 2:

$$1 + \rho_{1,2} = \frac{(1 + r_{2,0})^2}{(1 + r_{1,0})}$$

This rate is derived directly from the current (t= 0) term structure of interest rates. Significantly, (2) demonstrates that there is a direct connection between interest cost minimization and the current yield curve shape. In particular, optimal debt management strategy should be aimed at tailoring the maturity composition of the debt to exploit deviations between the implied forward interest rates imbedded in the term structure and expectations of future interest rates.

In order to use (2) as a basis for debt management strategy, it is necessary to specify the **subjective** parameters, b and var[·]. In effect, (2) accommodates a wide range of possible rational responses to a given deviation between implied forward rates and expected rates. For example, when either the variance of the subjective forecasting distribution or the debt manager's level of risk aversion is large, then (2) requires large deviations between implied forward rates and

expected rates in order to generate corresponding changes in the maturity composition of the debt. In this case, while it may be technically possible to achieve a lower level of interest costs, it would not be rational, i.e., expected utility maximizing, for the debt manager to pursue such an outcome. This leads to consideration of **global** versus **local** interest cost minima. A global minimum refers to a strategy where both b and var[·] approach zero, the debt manager is approximately risk neutral and able to almost certainly forecast future interest rates. In this case, small deviations of implied forward rates from expected interest rates would generate significant variation in debt maturity composition. Local solutions correspond to situations where more substantial deviations are required to generate strategic debt maturity variation.

Given this, (2) can be used to interpret the impact of differences between the b and var[·] that are 'socially appropriate' and the b and var[·] that are applicable for the bureaucratic debt manager. Specifically, when either b or var[·] for the debt manager is sufficiently "large", this leaves the locally optimal maturity mix largely undetermined. In this context, a number of different possible debt management strategies, e.g., one aimed at minimizing debt stock variability, are consistent with local interest cost minimization. However, in order to globally minimize interest costs, debt managers must be willing and able to forecast interest rates. This raises the fundamental question: is the global interest cost minimum also socially optimal? And, if not, what b and var[·] are appropriate? Presumably, the relevant information must be provided by the political process. Without this information, it is not possible to assess whether a given debt management strategy is consistent with (2). Empirically, it is not sufficient to demonstrate that a strategy is sub-optimal by showing that interest costs could have been reduced under an alternative debt management scenario.

At a more practical level, the solution to the two period problem (2) does not fully reveal the inherently dynamic structure of the debt management problem. Unfortunately, the complexity of deriving closed form solutions increases significantly as the number of future financing periods is increased. For example, uncertain future financing requirements would have to be taken into

account when determining the amount of short-term debt to be rolled over. Hence, the amount to be financed on a given rollover date would be the maturity value of the issues to be rolled over plus the market value of "new money" which will be required. Even if it was assumed that future financing requirements were known with certainty, accounting for the interactions between the various rollover dates would significantly complicate (2). The analytical solution becomes almost completely intractable if, in addition, the size of debt issues at a particular point of time is permitted to affect the level and term structure of interest rates. The upshot is that strategies based on (2) cannot, a priori, be assumed to be equivalent to strategies derived from a more dynamic specification of the interest cost minimization problem.

In addition to minimizing interest costs by forecasting the term structure of interest rates, debt managers also can optimize across the currency in which the debt is denominated. This requires respecifying the debt manager's objective function. For simplicity, it is appropriate to transform the decision horizon to one period problem, t= 0 to t= 1. The representative debt manager's objective is now:[9]

$$\min_{Q_{df}} \quad \mathbf{E}\,[(D - Q_{df})(1 + r_{1,0}) + S_1 Q_f(1 + r^*_{1,0}) \mid X_0]$$

$$+ b\, Q_f(1 + r_{1,0})^2\, var[\, S_1 \mid X_0] \qquad (3)$$

where:

$$\frac{Q_{df}}{S_0} = Q_f \qquad D = Q_d + Q_{df}$$

where Q_d and Q_{df} are the quantities of domestic and foreign debt to be issued in units of domestic currency, Q_f is the amount of foreign currency denominated debt which has to be redeemed at t= 1, $r_{0,1}$ and $r_{0,1}$* are the one period domestic and foreign interest rates, S_t is the spot exchange rate at time t measured as units of domestic currency to one unit of foreign currency, and the conditional expectations and variances follow the specification in (1). In this problem, the "risk averse" debt manager can either issue unhedged foreign debt which will be redeemed at maturity at the unknown future exchange rate S_1 or issue domestic debt at a known cost of borrowing.

The optimal solution to (3) is given by:

$$Q_f^* = \frac{F_{1,0}^* - E[S_1 \mid X_0]}{2b\ (1+r_{1,0}^*)\ var[S_1 \mid X_0]} \qquad (4)$$

where:

$$Q_d^* = D - Q_f^* S_0$$

$$F_{1,0}^* = \frac{(1 + r_{1,0})}{(1 + r_{1,0}^*)} S_0$$

where Q_f* is the optimal amount of foreign borrowings denominated in units of foreign currency and $F_{1,0}$* is the "implied" forward exchange rate (units of domestic to foreign currency) derived by solving the appropriate covered interest parity relationship with the appropriate (t= 0) foreign and domestic interest rates used being those applicable to one period government borrowing activities in the foreign and domestic debt market. Hence, $F_{1,0}$* is a theoretically determined value and not typically the forward exchange rate observed in the foreign exchange market. Given this, (4) indicates that the debt manager should issue foreign debt whenever the implied forward exchange rate is a positively biased predictor of the future spot rate. As in the term structure problem, both b and var[·] reflect the predispositions of the debt manager which may be such that the amount of foreign issue is indeterminate.

III. Policy Implications

Historically, while contributions to the general theory of government debt management can be traced back to Adam Smith and Ricardo, the contemporary state of theory is fragmented and inconclusive (e.g., Roley 1978, 1979).[10] In stark contrast to monetary policy, debt management does not have a well-developed set of theoretical rules to guide policy. In particular, both economic stabilization and growth considerations as well as short-term and long-term interest cost minimization have at various times been identified as important elements of the government' s debt

management decisions. The various goals which have been identified are not necessarily complementary, creating a series of both empirical and normative problems for debt managers. It is argued here that observed debt management behaviour appears to be guided by prescriptions which implicitly recommend a relatively stable pattern of debt issue, at some expense to the goal of global interest cost minimization. This could be rationalized, for example, by the need to minimize significant disturbances to financial markets.[11]

In the US and Canada, the precise debt management objective function which motivates **current** government policy cannot be known with certainty. However, inferences about federal policy objectives can be gleaned from official sources such as the Government of Canada's 1988 Annual Report of the Auditor General (sec. 11.73):

> the (debt) program (has)… a single objective: to meet the Government's financial requirements while minimizing total expected debt costs over the long term. (emphasis added)

Similarly in the US, numerous references to adherence to some form of interest cost minimization can be found in Congressional testimony of Dept. of Treasury officials. Based on the considerable evidence from official sources, the **politically** sanctioned goal of long run interest cost minimization can be taken as the desired "single objective" of government debt management. Given the statement of this general objective, it is less clear that this politically sanctioned objective is consistent with global, as opposed to local, interest cost minimization.

In order to assess the applicability of the expected debt cost minimization model of Section II, further information is required on the variables which were taken to be exogenous to the debt management decision process. In the Canadian case, the 1988 Annual Report of the Auditor General (sec. 11.73) indicates:

> Consideration of other relevant federal programmes, particularly those falling under monetary, exchange rate and financial market policies…are now treated as constraints rather than as areas in which the borrowing program activity seeks to achieve a secondary program objective.

In other words, Canadian federal debt management does not consider manipulation of interest rates, exchange rates or the aggregate financing requirements as decision variables. In effect, this supports the assumptions made to reduce the complexity of the optimization problem to where future values of a small number of variables are taken to affect the decision process. Hence, forecasts of these exogenous variables should be an essential component of the debt management process.

To illustrate the potential savings associated with an activist debt management policy, consider a strategy of refunding a portion of tbill outstandings with longer term bonds. From the optimality condition (2), such a policy would be well suited to exploiting a sustained yield curve inversion, i.e., where the short term interest rate is above the long rate. This could occur through the actions of tight monetary policy "holding up" bill rates in order to promote a reduction in aggregate demand, while the longer bond rates are being driven by international investment considerations. In particular, a monetary-policy-induced yield curve inversion appeared in Canada starting in mid-1988 and continued until late 1990. During this period, the inversion of the yield curve for Government of Canada debt exhibited a basis point (bp) difference between 3 month tbill rates and the long and short bond rates that averaged approximately 350 and 200 bp respectively.

The inverted shape of the yield curve is reflected in the associated implied forward interest rates. For example, on April 26, 1989, the term structure provided an implied forward rate between the annualized three month rate (12.37) and the average rate on two year securities (11.01) which was 9.66%. In other words, assuming that three month tbill borrowings could be rolled over for one year at an average rate of 12.37, it would be necessary to rollover at 9.66 in the second year in order to have the same cost of financing as issuing a two year security at 11.01. Similar implied forward rates were present for longer term securities. Significantly, from mid-1988 to mid-1990 the stock of treasury bills outstanding increased from $88.1 to $124.15 billion while the stock of (long plus short) bonds increased from $116.6 to $134.5 billion. Put differently, the average term to maturity of the debt decreased from four years-seven months to

four years. In other words, at a time when global interest cost minimization indicated a lengthening of debt maturity composition, e.g., by refunding tbills with bonds, federal debt managers did the reverse. More detailed empirical analyses of the interest costs savings associated with increased variation in the debt maturity structure over longer term horizons, e.g., Poitras (1988), Boothe and Reid (1992), confirm the potential for "surprisingly large savings".

This analysis extends to the other 'risky' debt management strategy considered in Section II. While there is potentially high interest cost savings in issuing foreign currency securities, current Government of Canada policy restricts such financing for Exchange Fund purposes only. While, historically, foreign (esp., UK and US) currency borrowings provided a primary source of Government of Canada borrowings, debt managers have not utilized foreign borrowing to supplement the aggregate program for over two decades. This approach to foreign borrowing is seemingly inconsistent with the increasing globalization of capital markets. Many of the conventional arguments against such issues, e.g., such borrowing may create undesirable distortions in foreign capital markets, are no longer valid. In this vein, debt managers in many European countries attempt to identify the lowest borrowing cost available in the international, not just the domestic, capital markets.

To illustrate how (4) could be used to identify international opportunities for interest cost minimization, observe that the nominal Canadian interest rate structure is typically higher than those in the major borrowing currencies (US$, DM, Yen). For example, at the end of April 1988, the 90-day US commercial paper rate was 6.88, the associated Government of Canada tbill rate was 8.87, and the C$/US$ spot exchange rate was 1.23.[12] This dictates that $F_{1,0}$* in (4) will be above S_0, i.e., adjusting for the term to maturity $F_{1,0}$* was 1.2360. In an environment where it is expected that the Canadian dollar will either stay the same or fall relative to the borrowing currency over the appropriate horizon, it will be optimal from the perspective of minimizing interest costs to issue foreign debt. In the case at hand, the exchange rate had fallen to 1.2112 at the end of three months, indicating that significant, potential interest savings were available. In

fact, the exchange rate continued to fall up to the latter part of 1990. Unfortunately, achieving the potential interest cost savings required debt managers to accurately forecast exchange rates and to incur all other risks associated with foreign borrowing. More detailed empirical analyses of the interest costs savings associated with foreign borrowing, e.g., Poitras (1988), Kesselman (1992), again confirm the potential for 'surprisingly large savings'.

In addition to direct costs arising from passive debt management strategies, there are also indirect costs associated with "organizational inefficiencies" in the distribution process which result in higher than required transactions costs. Included in these costs are the rents accruing to investment dealers from the marketing structures used by debt managers to distribute debt to liability purchasers. Depending on the specific government issuer involved, there are a wide range of potential inefficiencies, e.g., restrictions on entry to the distribution process, inadequate 'product' diversification, and inefficient cross-subsidization payments.[13] In the Government of Canada debt program, significant barriers to access are imposed both on the auction and 'firm allotment' distributions, e.g., prohibition of direct public participation and limitations on foreign dealer participation. Interdealer competition is also restricted in various ways, e.g., limitations on the maximum allowable fraction of a given primary offering which can be purchased by an individual dealer. Other restrictions on entry include limitations on access to preferential financing afforded by the regular and special Purchase and Resale Agreement facility.

One potential result of the organizational inefficiency inherent in government debt management is inadequate product diversification, which permits investment dealers to capture intermediation profits by rebundling government offerings for resale at higher prices. For example, this occurs in the case of "bond stripping", where a coupon bond is rebundled into an annuity and a zero coupon bond which, if market conditions permit, can be resold at a higher price than the unbundled coupon bond.[14] Other examples of inadequate product diversification can occur with the offering schedule and maximum outstandings for a given issue. These features increase interest cost by reducing either primary or secondary market liquidity in specific issues, resulting

in higher prices. For example, the Government of Canada primary bond offering schedule features more frequent distributions than observed for the US Treasury's regularized schedule. These issues tend to have differing terms and, relatively, smaller outstandings. The upshot is less liquidity in both the primary and secondary markets than would be the case with a US-style regularized offering schedule. This facilitates dealer intermediation by having higher offering prices (making issues easier to sell), closer tailoring of issue terms to account demands and a lower inventory capital requirement associated with marketing a given government financing requirement.

Section IV: Reform Proposals

Current practice grants a monopoly over specifics of government debt issues to the bureaucratic debt managers. These agents operate in an environment in which there are limited managerial incentives to engage in risk taking behaviour.[15] In particular, requirements and incentives for advancement in the civil service differ markedly from the market-oriented intermediaries, i.e., the investment dealers, responsible for distributing the debt to liability purchasers. Based on the empirical discussion in Section III, bureaucratic objective functions applicable to local interest cost minimization tend to be characterized by 'high' levels of risk aversion and 'diffuse' forecasting distributions. Given this, there are also limited incentives to engage in 'risky' restructuring of the relationship with investment dealers, e.g., by providing for greater levels of interdealer competition or capturing dealer intermediation profits arising from inadequate diversification of debt management 'products'. It follows that potential reforms of the current debt management process must address: 1) changes to the nature of bureaucratic decision making; and, 2) changes to the organizational structure within which market intermediation takes place.

Regarding reforms associated with bureaucratic objectives, based on the optimality conditions provided in Section II, changes in administrative behaviour would be aimed at reducing either the

risk parameter b or the perceived var[·] of the applicable forecasting distribution. Such changes would be aimed at producing debt management strategies oriented to global interest cost minima. This begs an important question: is it possible to accomplish such reforms within the current administrative structure? At present, debt management activities are conducted by government departments and central banks;[16] entities which are also responsible for a wide range of other activities, e.g., tax policy and economic stabilization. An alternative to the present organizational structure would be to create separate funding authorities with specific mandates to globally minimize interest costs. While there are current examples where such financing authorities have been successful, e.g., the Export Development Corporation (Canada) and the International Financing Corporation (World Bank), the size of the borrowing programs for these entities is relatively small. In turn, any attempt to change the government's administrative structure will, almost certainly, generate rent-protecting activities by the current debt management authorities.

Based on the empirical discussion in Section III, current government debt management practices are locally optimal. Rational bureaucratic behaviour is consistent with high values for either b or var[·] allowing debt management practice to be oriented to "getting the debt sold". For a number of reasons, this leads to debt management practices which facilitate various rent extraction desires of investment dealers. Hence, from a public choice perspective, any assessment of a proposed reform to, say, change the risk aversion of the government debt manager, has to also assess the reaction of investment dealers to potential losses in rents. Given the essential role of the dealers in the intermediation process, the potential for complete Tullock costs is significant.[17] Avoidance of the Tullock costs would, almost surely, require organizational reform of the bureaucracy/dealer intermediation process for issuing government debt, i.e., fundamentally changing the distribution mechanism involved in how debt issued by governments is distributed to liability purchasers.

To illustrate how dealer rents would be affected by the reform process, consider the (seemingly innocuous) reform associated with increasing variability of the debt maturity

composition in order to capture potential gains associated with (2). By design, this reform would increase dealer uncertainty about the maturity composition of a given offering. This has a number of potentially rent reducing implications. For example, given that liability purchasers have relatively fixed demands for specific maturity ranges which will, typically, be mismatched with the maturity composition of the government's debt offering, the market clearing function would require dealers to take on larger primary issue inventories. The maturity composition of these inventories would likely be "lumpy" and concentrated in the maturity ranges with the lowest potential for capital gains. Hence, dealers would likely be confronted with increased risk and capital costs. Unfortunately, it is not possible, ex ante, to precisely estimate the size of these costs relative to the size of the government's interest cost savings. A similar analysis would apply to the other type of debt management strategy reform examined in Section II: issuing foreign currency denominated debt.

By construction, interest cost savings associated with debt management reform would have to be matched by revenue losses for the liability purchasers and intermediaries. Ignoring the impact on liability purchasers, competitive factors in the market for dealer services will determine the extent to which dealer rent reductions inherent in debt management reform can be recaptured in other areas of the dealer intermediation process, e.g., by widening the bid/offer spread on secondary market government debt trading.[18] Competitive factors will also be relevant to the ability of dealers to impose Tullock costs associated, for example, with rent-protecting disruption of the intermediation process. The present 'oligopolistic' dealer structure restricts the government's potential recovery of the bulk of the higher-than-required transactions costs. While incidence of the resulting revenue losses among the various participants is unclear, market considerations indicate that reduction in government interest savings may be the most significant. It follows that, in addition to reforms aimed at altering bureaucratic behaviour, the reform process must also include changes aimed at altering the competitive structure of the dealer industry.[19]

To structure such an organizational reform process requires identifying the services provided

by investment dealers which are essential to both the debt marketing process and to other bureaucratic functions. This requires assessment of the impact of specific reforms on all relevant dealer services, not just the subset concerned with marketing government debt. For example, dealers provide an information flow, through the debt management bureaucracy, which supports various other government activities, e.g., monetary policy and market surveillance. In this case, the dealer service is not directly priced and not publically observable.[20] Reforms aimed increasing competition in the market for government debt intermediation would also have to assess the impact on dealer information flow. This impact could be either negative or positive. For example, consider reforms aimed at facilitating direct public participation in primary debt distributions or enhanced use of direct-to-public marketing using bank distribution networks.[21] By reducing the percentage of a given offering which is marketed using investment dealers, there is a reduced need to monitor dealer information about the status of various accounts.

On balance, there is considerable incentive for the prevailing status quo of investment dealers and debt management bureaucrats to impose significant Tullock costs on reforms aimed at organizational inefficiencies. At best, the present arrangements are only capable of an 'incrementalist' reform process based on marginal adjustments to debt management policy. By design, this process depends on a significant contribution from policy analysis. However:

> At least two activities, or perhaps two stages of the same activity exemplify '(policy) analysis'; first, analysts gather information so as to reduce the uncertainty about the consequences of alternative decisions; and, second, they interpret the data so assembled under agreed upon rules to facilitate choice among alternatives. The first activity might loosely be called 'forecasting', whereas the second is a generic 'cost-benefit' analysis. (Quigley and Scotchmer 1989)

This paper has argued that current debt management practices have not adequately understood the relevant cost effectiveness (cost-benefit) problem. In particular, there has been an observed unwillingness or inability to adequately incorporate forecasts of the relevant policy variables into debt management decisions. Hence, it seems unlikely that the 'incrementalist', policy-analysis-based approach to debt management reform is capable of achieving global interest cost minima.

V. Summary

This paper has provided a theoretical analysis of the potential for economic reform of government debt management. Analytical solutions to a stylized form of the debt cost minimization problem are proposed. In opposition to conventional cost effectiveness models, the introduction of uncertainty into the analysis, e.g., regarding the level and term structure of future interest rates, requires consideration of both the degree of debt manager risk aversion and the distribution used to forecast interest rates. The optimal solutions reveal a dependence of debt maturity composition on interest rate expectations and current yield curve shape. In addition to exploiting expected yield curve changes, the problem of minimizing interest costs also depends on issuing securities denominated in both foreign and domestic currencies. In this case, the optimality conditions reveal a dependence on expected exchange rates as well as domestic and foreign interest rates. When the globally optimal solution is compared to current practice, potential shortcomings are identified. It follows that debt management reform aimed at achieving long-term interest expense minima depends on enhancing the bureaucracy's ability and willingness to exploit expected changes in yield curve shape.

Given that the achievement of the global interest cost minimum depends intimately on the administrative process within which debt managers operate, it is significant that the current administrative process is not designed to reward either forecasting accuracy or the risky behaviour required to incorporate such forecasts into debt management decisions. In the current environment, rational decision making can be approximated by assuming a combination of risk aversion and diffuse forecasting distributions. The upshot is that significant deviations from the absolute interest cost minimum are required in order to generate activist debt management behaviour. Conventionally, debt managers are content to pursue more normative objectives, such as limiting the market impact of the government's financing activities. Based on an examination of current debt management practices, it appears that consistently achieving the global interest cost minimum will require fundamental organizational changes in the administrative process within

which debt management decisions are made.

Two general directions for reform were proposed: 1) creation of separate government funding authorities with specific mandates to achieve global interest cost minima; and, 2) organizational restructuring of the market for dealer intermediation services to provide for enhanced competition. Reforms aimed at these changes will, almost surely, generate significant Tullock costs. Specifically, the government debt management bureaucracy will attempt to retain its monopoly on debt issue which is a source of various rents accruing to investment dealers. It is unlikely that an 'incrementalist', policy-analysis-based reform process is capable of producing the requisite changes. This puts considerable onus on the political process to generate the required reforms. Unfortunately, the technical nature of many debt management issues means that politicians have to rely on the debt management bureaucracy for substantive policy input. Combined with the considerable political influence of special interests associated with investment dealers, there appears to be no realistic potential for significant organizational reform of government debt management.

REFERENCES

Acheson, K. and J. Chant, "Bureaucratic Theory and the Choice of Central Bank Goals", in Toma and Toma (eds.), Central Bankers, Bureaucratic Incentives and Monetary Policy, Dordrecht, Netherlands: Nijhoff, 1986.

Auditor General of Canada, Report of the Auditor General of Canada, 1988, Ottawa: Supply and Services, 1988.

Boardman, A., A. Vining and W. Waters, "Costs and Benefits Through Bureaucratic Lenses: Example of a Highway Project", Journal of Policy Analysis and Management (forthcoming).

Boothe, P. and B. Reid, "Debt Management Objectives for a Small Open Economy", Journal of Money Credit and Banking (Feb. 1992): 43-60.

Buchanan, J. and G. Tullock, The Calculus of Consent Ann Arbor: U. of Michigan P., 1962.

Carroll, K., "The effects of multiple objectives in the theory of public sector supply", Public Choice, (1993): 1-20.

DiLorenzo, T., "The Rhetoric and Reality of Tax Reform", Cato Journal (Fall 1985): 401-6.

Downs, A., An Economic Theory of Democracy New York: Harper and Row, 1957.

Havrilesky, T., "A Public Choice Perspective on the Cycle in Monetary Policy", Cato Journal (Winter 1990): 709-18.

Kesselman, J., "Innovation in Public Debt Management to Reduce the Federal Deficit", Canadian Public Policy (1992): 327-52.

Lindblom, C., The Intelligence of Democracy, New York: Free Press, 1965.

McChesney, F., "Rent Extraction and Rent Creation in the Economic Theory of Regulation", Journal of Legal Studies (Jan. 1987): 101-18.

Miller, G., "Debt Management Networks", Public Administration Review (Jan./Feb. 1993): 50-58.

Niskanen, W., Bureaucracy and Representative Government, Chicago: Aldine-Atherton (1971).

Poitras, G., "Do Changes in Debt Maturity Composition Affect the Term Structure: Some Canadian Evidence", Applied Economics (1989a).

_____, "Debt Management Follies: Government of Canada Debt Management and the Minimization of interest costs", unpublished SFU working paper, (1988).

Quigley, J. and S. Scotchmer, "What Counts? Analysis Counts", Journal of Policy Analysis and Management (1989): 483-89.

Roley, V., "Federal Debt Management Policy: A Re-Examination of the Issues", Federal Reserve Bank of Kansas City, Economic Review, (1978): 14-23.

_____, "A Theory of Federal Debt Management", American Economic Review, 69 (1979): 915-926.

_____, "The Effects of Federal Debt Management on Corporate Bond and Equity Yields", Quarterly Journal of Economics, (Nov. 1982): 645-667.

Spindler, Z., "A Rent Seeking Perspective on Privatization", North American Review of Economics and Finance (1990): 87-103.

Spindler, Z. and X. de Vanssay, "Is Tax Reform in the Public Interest? A Rent Seeking Perspective", unpublished working paper, (1992).

Spindler, Z. and M. Walker, "Canadian Tax Reform as Public Choice", Contemporary Policy Issues (1988): 70-84.

Tobin, J. (1963), "An Essay on the Principles of Debt Management", in Fiscal and Debt Management Policies, Commission on Money and Credit, Englewood Cliffs, NJ, pp. 144-218.

Tollison, R. and R. Wagner, "Romance, Realism, and Economic Reform", Kyklos (1991): 57-70.

Tullock, G., "Rent Seeking and Tax Reform", Contemporary Policy Issues (Oct. 1988): 37-47.

Tullock, G., The Economics of Special Privilege and Rent Seeking Boston: Kluwer, 1989.

Walker, M., ed., Privatization: Tactics and Techniques Vancouver: Fraser Institute, 1988.

Weingast, B. and M. Moran, "Bureaucratic discretion or congressional control? Regulatory policymaking by the Federal Trade Commission", Journal of Political Economy (1983): 662-64.

Appendix

Solution to the Term Structure Problem:

Letting L equal the objective in (3), the first order conditions give:

$$\frac{\partial L}{\partial Q_1} = (1+r_{1,0})(1+E[i_{1,1}]) - (1+r_{2,0})^2 + 2b\ Q_1(1+r_{1,0})^2\ var[i_{1,1}] = 0$$

Solving for Q_1* and dividing through by $(1 + r_{1,0})$ gives:

$$Q_1^* = \frac{\rho_{1,2} - E[i_{1,1}]}{2b\ var[i_{1,1}]\ (1+r_{1,0})}$$

where the implied forward rate $\rho_{1,2}$ *is given by*:

$$1+\rho_{1,2} = \frac{(1+r_{2,0})^2}{(1+r_{1,0})}$$

This is the result given in the text.

Solution to the Foreign Borrowing Problem:

Observing that $var[\cdot] = Q_f^2\ (1 + r_{0,1}^*)^2\ var[S_1]$

$$= (Q_{df}/S_0)^2\ (1 + r_{1,0}^*)^2\ var[S_1]$$

and letting L equal the objective in (3), the first order conditions give:

$$\frac{\partial L}{\partial Q_{df}} = -(1+r_{1,0}) + \frac{E[S_1]}{S_0}(1+r_{1,0}^*) + 2b\ \frac{Q_{df}}{S_0^2}\ (1+r_{1,0}^*)^2\ var[S_1] = 0$$

Solving for Q_f*, the optimum value of Q_f, and manipulating gives the result in the text where:

$$F_{1,0}^* = \frac{(1+r_{1,0})}{(1+r_{1,0}^*)}S_0$$

NOTES

1. In this article, debt management is interpreted in the narrow sense to include only management of the interest expense. The related issue of maximizing the return on assets which originate from the issuance of liabilities, e.g., foreign exchange fund assets, is not directly examined.

2. In effect, this article is loosely structured as a "Rent-Seeking Impact Statement", e.g., Spindler and de Vanssay (1992).

3. Alternatively, it is possible to view government debt issues as transfers between issuers and purchasers, with rents accruing only to the intermediaries. Both approaches ignore the real efficiency losses associated with higher costs of capital which must be incurred by other, less creditworthy capital market participants. "All-in" interest expenses include transactions costs, e.g., commissions, and other expenses associated with making the given debt offerings.

4. The potential for diversity in perspectives among different groupings of bureaucrats, e.g., Boardman, et.al. (1993), is not examined.

5. A Tullock cost arises in the process of rent-seeking, rent-defending and rent-avoiding. These costs can be distinguished from loss of either consumer surplus, i.e., Harbergerian costs, or producer surplus, i.e., Ricardian costs.

6. By construction, the debt manager is not allowed to manipulate the level of rates to reduce interest expenses. It is possible to relax the assumption of an exogenous term structure but this significantly complicates the analysis.

7. Various problems arise in cost effectiveness and cost-benefit analysis when uncertainty is explicitly introduced into the decision problem.

8. Where appropriate, conditioning information notation for the relevant expectations and variance have been suppressed for convenience.

9. This problem could be extended to two periods which would involve combining both the foreign borrowing and term structure decisions. The resulting optimality conditions are more complicated and, for reasons of brevity, are not given here.

10. This is not to say that the substantial literature on the theory of debt management is not without insights. For example, based on a portfolio selection model, Roley (1979) demonstrates that the market will be able to absorb a larger amount of government debt if a greater variety of debt instruments is used to finance the debt. Similar insights can be found in the earlier literature, e.g., Tobin (1963).

11. An illustration of the importance of the economic stabilization objective is provided in Roley (1978).

12. The US commercial paper rate is used because this is reflects the actual cost of Canadian borrowing in the US money market, i.e., the US Tbill rate is not applicable. The commercial paper rate has been adjusted from a discount rate to a true yield.

13. Miller (1993) provides a discussion of some of the organizational inefficiencies which appear in US debt management networks.

14. While the US Treasury has captured these intermediation profits with the STRIPS program introduced in the mid-1980's, the Government of Canada does not have a comparable program.

15. Similar observations have been made about the role of bureaucratic decision making in other areas of economic policy, e.g., Acheson and Chant (1986).

16. In the US, the most important organizational entities are the Treasury Department, the Board of Governors and the New York Federal Reserve Bank. In Canada, the Department of Finance and the Bank of Canada are the relevant entities.

17. The reaction of the investment dealers to the possibility of float compensation charges associated with settlement on Government of Canada treasury bill auction positions is an excellent example of dealers' ability to disrupt the debt distribution process.

18. Higher prices for government debt will tend to reduce the demand of liability purchasers. In turn, this may have a (partially) offsetting impact on prices; higher prices may be required to induce liability purchasers to hold the given debt stock.

19. In the US, the Salomon Bros. Tbond scandal (Miller 1993) is a byproduct of the competitive conditions in the primary dealer market.

20. Rent-seeking bureaucrats will seek to overvalue this information flow, arguing for cross-subsidization through measures aimed, for example, at reduced competition in the market for dealer services.

21. While the US Treasury does permit limited public participation in the auction process, the Government of Canada prohibits such participation.