Exploring a Medium-Term Approach for Canada's Fiscal Policy

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Abstract

The 1990s were a high point for Canadian macroeconomic policy. However, some commentators argue that the overall approach to fiscal policy remains deficient, due to a lacking medium-term framework for planning. This paper, therefore, explores a new approach to Canadian fiscal policy.

I illustrate this framework using a stochastic simulation model which takes the debt-to-GDP ratio five years ahead as the medium-term policy target. The model emphasizes the interaction between economic fluctuations and fiscal outcomes to estimate the probability of achieving this target under alternative policy choices.

This new framework, which draws on the lessons from the success of inflation targeting, appears promising. This approach: delivers an objective assessment of how new policies impact fiscal sustainability; explicitly recognizes the uncertainties of forward-looking policymaking; allows some flexibility in achieving the target; does not depart radically from current targets; may improve accountability; and is easily communicated.

Finally, the model demonstrates that the existing long-run debt-to-GDP targets are so readily-achievable that they provide little policy guidance.

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1 Introduction

The 1990s were undoubtedly a high point for Canadian macroeconomic policy with dramatic improvements in monetary and fiscal policy outcomes. In monetary policy, the Bank of Canada began targeting inflation in 1991. Today, in stark contrast to prior episodes of high and volatile inflation, the Bank employs targets to anchor inflation expectations and consistently delivers low, stable and predictable inflation. In fiscal policy, the 1990s began with large and recurrent deficits, rapid growth in the national debt and concerns about the sustainability of government finances. By the end of the decade, after a concerted shift in the policy framework – which also included explicit targets – there was a rapid turn-around to persistent federal surpluses and a steadily declining debt-to-GDP ratio.

Despite the fiscal success, economic commentators have begun to argue that unlike monetary policy, fiscal policy still lacks a credible medium-term framework (*e.g.* Reuber and Robson, 2005). Indeed, this was a key finding of a recent Federal Commission charged with investigating the chronic under-prediction of surpluses in the Federal Budgets. That review, headed by Tim O'Neill, made the case that forecasting problems are merely a symptom of a larger medium-term planning deficiency. O'Neill's report (2005) recommended fiscal planning improvements through two main changes. First, the government should cease using its annual no deficit rule; and second, the focus should shift to running a surplus over the economic cycle, rather than narrowly focusing on the budget balance in each fiscal year.

These recommendations provoked some strong negative responses. Critics argue the no deficit rule works well by imposing some discipline on spending. They also warn that even a single deficit could invite further deficits, raise debt and eventually compromise the accomplishment of returning order to the government's finances. Furthermore, targeting a surplus over the cycle is impractical to implement and enforce due to its ambiguity.

This paper attempts to contribute to the debate by exploring a new framework for the conduct of Canadian fiscal policy, as advocated by Robson (2006). I examine this alternative approach using a stochastic simulation model that takes as its medium-term anchor a five-year debt-to-GDP target. Simulating the model repeatedly produces a probability density function (a 'distribution forecast') that conveys the likelihood of various outcomes and estimates the probability of hitting the policy target. By comparing the likelihood of successfully hitting targets under alternative scenarios, one can easily and graphically convey to policymakers the trade-offs associated with competing choices.

There are many related papers which apply stochastic simulation models to fiscal policy.[1] Canadian research has focused largely on deficit avoidance, advocating for contingency reserves and demonstrating that updating fiscal plans sequentially at shorter time horizons can improve the chances of avoiding a deficit. These results have also been used loosely to inform policy decisions by determining the amount of fiscal room available for new initiatives.

The framework I propose is consistent with O'Neill's recommendations, by attempting to shift the focus from the end of year balances towards the medium term. At the same time, it does not require a radical transition from current policy. The approach also has other advantages. First, it better recognizes the unavoidable uncertainties that plague forward-looking policy making, in a manner analogous to the error band used in inflation-targeting. Second, it delivers an objective assessment of how new policy measures impact fiscal sustainability. Third, it allows some policy flexibility in achieving the target. Finally, as with inflation targets, the debt-to-GDP ratio target can be easily understood and communicated to the general public.

Relative to the existing literature, this paper incorporates a monetary policy response to macro conditions. Most importantly, the model delivers richer distribution

[1]For Canada, see among others, Boothe and Reid (1998); Hermanutz and Matier (2000); Georges and Moreau (2002); Hostland (2003); and Robson (2006). For the U.S. see CBO (2001).

forecasts where the entire densities are captured graphically from a nonparametric estimation technique. These graphs explicitly estimate and convey policy trade-offs associated with changes in trend government spending, as illustrated below.

The rest of the paper proceeds as follows: Section 2 describes the fiscal policy context. Section 3 applies lessons from monetary policymaking to motivate a new fiscal framework designed to potentially improve fiscal accountability, credibility and sustainability. Section 4 describes the simple model of government finances and the economy and illustrates the framework with some examples. Section 5 concludes.

2 Canadian Fiscal Policy Context

This section recounts the 1990s turn-around to explain the factors which gave rise to the current fiscal framework, discusses the remaining problems with the current approach and explains why the proposed solutions are unlikely to be effective.

2.1 The Fiscal Turn-around and Framework the Emerged

From 1961-1996, the Canadian federal government incurred deficits for 34 of 36 years. As a result, the national debt grew rapidly and reached a crisis in the early 1990s – a crisis which was ultimately avoided through a concerted policy effort. As Figure 1 shows, the turn-around in federal finances was dramatic. In just eight years, the federal deficit of $39 billion in 1992/93 became a surplus of $20 billion in 2000/01. Similarly, the debt-to-GDP ratio, which grew to 68 percent in 1995/96, fell steadily to only 39 percent in 2004/05.

There are three key features to the approach that put government finances back on track: 1) a strong policy response; 2) conservative budget forecasting; and 3) a political consensus that is now a *de facto* rule to avoid deficits.

To understand why fiscal outcomes changed so dramatically after 1995 in particular, one must go back to December 1994, when the Mexican peso crisis began.

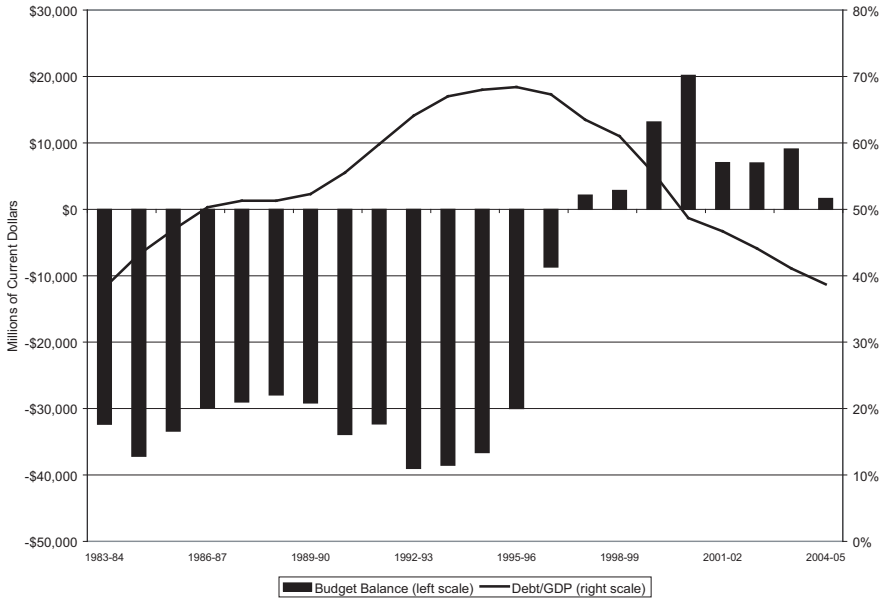

Figure 1: Canadian Federal Government Deficits and Debt-to-GDP

Within a few short months Mexico's currency lost roughly 40 percent of its value relative to the U.S. dollar. This event caused international investors to re-examine the prospects for Canada's currency. As a highly-publicized Wall Street Journal article noted, the Canadian and Mexican economies shared many troubling characteristics: current account deficits; high levels of public indebtedness with significant shares owed to foreign creditors; political instability; and finally, central banks intervening on foreign exchange markets to defend their currencies (Wall Street Journal, 1995).

The situation was indeed dire. To calm nervous foreign investors, the newly-elected federal Liberal Party responded soon after with a decidedly tough Budget in February 1995. Without such a bold response, it was feared that the continued flow of funds out of the country could lead to a run on the currency. Ultimately the political resolve to tackle the deficit problem stuck, and is probably best typified by then Finance Minister Paul Martin's famous commitment that the government would hit its fiscal targets to reduce the deficit, "come hell or high water" (Martin, 1995).

To reach these targets the government employed the second crucial element to the fiscal turn-around: conservative budget forecasting. In budgeting its fiscal position, the Department of Finance takes as its starting point the mean of a survey of private sector forecasters for the key macroeconomic variables (output, interest rates, inflation and the labour market). These forecasts translate into forecasts for government revenues, spending, and debt service costs.[2] Finally, the bottom line budget balance is cushioned through the addition of a 'contingency reserve' and 'economic prudence' factor. These extra funds are set aside to help the government achieve a given budget balance during adverse economic circumstances; when not needed, they are applied to pay down the federal debt.

Robust economic growth in the Canadian economy in the second half of the 1990s also helped the fiscal transition. Earlier in the decade economic growth was sluggish owing to structural adjustments associated with changes in monetary and trade policies (the adoption of inflation targets in 1991; and Free Trade Agreements with the U.S. in 1989 and NAFTA in 1994). As trade-related adjustments were made[3] and the monetary transition was largely complete, the U.S. economy began to boom resulting in strong economic growth in Canada. With growth accelerating, automatic stabilizers kicked in: tax revenues rose, some spending obligations fell (such as Employment Insurance benefits) and the government's fiscal position improved.

The final key development was a new policy consensus that was re-enforced by the fiscal success. Once the hard-fought surpluses were achieved, a *de facto* no deficit rule emerged for fiscal policymakers. To emphasize the convergence in fiscal thinking around this time, many Canadian provincial governments were also pursuing deficit-reducing strategies and adopting balanced budget legislation. As John Manley (2005,

[2]Prior to the 2000 Budget, some explicit caution was added to the private sector forecasts, such as lowering output growth forecasts and raising interest rate forecasts.

[3]With larger markets and increased competition, trade-exposed exporting and import-competing industries reallocated factors of production, adopted new production techniques, and specialized their product varieties (Trefler, 2004). Baldwin and Gu (2005) review the evidence for Canadian manufacturers.

p.24), a senior minister during the fiscal transition, recounts: "the political culture in Canada had changed ... a deficit is now simply an unacceptable outcome for political parties managing public finances in most jurisdictions in the country."

Once the fiscal turn-around was well underway, the federal government added a second target to the no deficit rule : a goal of putting the debt-to-GDP ratio on a "clear downward track". This target was later refined (in the 2004 Budget) to reduce the debt-to-GDP ratio to 25 percent by 2014, and in the November 2005 fiscal update, the government announced an additional debt-to-GDP target of 20 percent by 2020.

2.2 Remaining Problems and Proposed Solutions

Despite the remarkable success, there were however, also some adverse consequences of the deficit-cutting process. For instance, federal transfers to the provinces were reduced, effectively off-loading part of the problem to the next level of government.[4] Undoubtedly the most controversial legacy of this new approach to federal finances, was the conservative budgeting that resulted in recurrent surplus 'surprises' and weakened the credibility of federal budget forecasts. In particular, over the ten-year period between 1994/95 and 2003/04, the budget balance was under-predicted by a cumulative $64 billion. Excluding in-year policy initiatives raises that number to $102 billion (PEAP-CIRANO, 2005). To put this fiscal forecasting performance in context internationally, the International Monetary Fund (IMF, 2005) compared Canada to 10 other industrialized countries since the mid 1990s. This study finds that Canada's budget forecasts are by far the most cautious of all of the countries considered over the last 10 years.

[4] As the federal financial situation improved, funding levels were gradually restored. Nonetheless, the federal government was evidently unable to commit to a given level of provincial transfers. Smart (2005) provides an example of the on-going renegotiation. The Canada Health and Social Transfer's funding commitment - which was subsequently separated into CHT and CST components - was 'unexpectedly' increased in every federal budget since the initial cuts in 1995. As a result, recurrent changes in funding arrangements caused considerable uncertainty for provincial budgeting.

Another concern was the foundations created to deposit year-end surpluses.[5] This was likely done to avoid applying surplus funds to the national debt as required by accounting rules.

A final problem with the current framework is that the strict adherence to deficit avoidance has made fiscal policy procyclical. This is the exact opposite of what good economic policy would dictate, potentially hindering economic growth,[6] and increasing interest rate variability by eliciting stronger monetary policy responses.

In fact, the O'Neill Review (2005) concludes that the no deficit rule is the root cause of the overly-cautious forecasts which led to the systematic under-estimation of the budget balance. The problem is systematic because small unidirectional errors compound when aggregated to produce a large bias. To replace the no deficit rule, O'Neill recommends achieving a surplus, on average, over the economic cycle.[7] This approach would allow for deficits in some circumstances, and would not require contractionary fiscal policy in a downturn as is implicit in the no deficit rule. O'Neill argues, that by removing the incentives for excessive caution, his approach would result in more accurate fiscal projections.

As O'Neill reports from his consultations, some fiscal experts argue that strict deficit avoidance has benefitted Canada and the 'slippery slope' argument applies, whereby one deficit could plunge the nation back into crisis. There are, however, other practical limitations of the 'surplus over the cycle' recommendation. One concern is that defining and predicting the business cycle is an inherently difficult task in real-time.[8] This problematic real-time estimate is the key input used to estimate the

[5]These foundations, which are independent non-profit entities at arm's length from the government, were first created in 1997. Examples include the Canada Foundation for Innovation and the Canada Millennium Scholarship Foundation. The Auditor General's report (2005) notes that $9 billion was transferred to various foundations and remains critical of their limited Parliamentary oversight.

[6]Aghion and Howitt (2005) suggest that procyclical fiscal policy – which increases macroeconomic volatility – may be harmful for growth, especially in economies with less developed financial systems.

[7]This is similar to the UK's fiscal target which couples the 'surplus on average' target with a goal of keeping the debt-to-GDP ratio low (below 40 percent) and stable.

[8]This is demonstrated by the intense debate surrounding the NBER's Business Cycle Dating

cyclically-adjusted budget balance, which indicates whether the surplus over the cycle requirement is being satisfied.

3 Policy Lessons and Defining a New Fiscal Framework

This section identifies relevant lessons from the conduct of monetary policy and applies them to the fiscal environment.

3.1 Monetary Policy Insights

Monetary policymaking addresses two key types of uncertainty that are readily applicable to fiscal policy discussions. The first uncertainty pertains to formulating the economic projections that underlie policy choices; the second relates to hitting the policy target.

Because of the well-known 'long and variable' lags in the monetary transmission mechanism, monetary policy is necessarily forward-looking. As a result, significant effort goes into the economic forecasts that inform these policy choices. Allan Greenspan, former Chairman of the U.S. Federal Reserve (and perhaps the world's most famous economic forecaster), described the task of forecasting as follows:

> Forecasts can usefully be described only in probabilistic terms – point forecasts need to be supplemented by a clear understanding of the nature and magnitude of risks surrounding them ...
>
> Consider not only the most likely future path for the economy but also the distribution of possible outcomes about that path to reach a judgment

Committee's pronouncements for recessions in the U.S. economy. Orphanides and van Norden (2002) demonstrate the difficulties associated with estimating the output gap in real-time as revisions in output gap estimates as new information arrives can typically be as large as the output gap itself.

about the probabilities, costs, and benefits of various possible outcomes under alternative policy choices.

Alan Greenspan (2005), *Reflections on Central Banking*

In a recent paper, Svensson and Williams (2005) take this approach, in the context of monetary policy. Their model produces distribution forecasts for both target variables and policy instruments in an environment characterized by model uncertainty. Their results support Greenspan's view that policymakers must go beyond forecasting means of target variables and consider the entire forecast distributions. This approach represents a significant advance over traditional instrument rules, such as Taylor rules, by generalizing beyond a unique appropriate policy response.

Over the last decade, central banks are increasingly aiming at an explicit target for inflation. Currently there are the 21 inflation targeting countries (Pétursson, 2004); the chosen target is the annual percentage change in the total Consumer Price Index. No country, however, aims at an exact target. Rather, in an effort to explicitly acknowledge the inherent uncertainties of the task, all countries operate with some (often symmetric) error band around their target.

The inflation targeting experience has been largely viewed as a success. The main appeal of the framework is that it provides a credible medium-term anchor for policy (by anchoring inflation expectations) while permitting policymakers sufficient flexibility (to respond to short-term economic fluctuations) in achieving the target. This approach stipulates a policy goal or desired outcome rather than an explicit policy rule or input. Another advantage of using an inflation target is that it is clear and narrowly-defined making it easy to communicate to the public.

There are two key messages from monetary policy making. First, there is – and always will be – considerable uncertainty in the forecasts used to inform policymakers. As a result, in constructing the forward-looking projections that underlie policy formation, an explicit distribution forecast is superior to a point estimate. Second,

clear and easily-communicated targets with some degree of flexibility can work well.

3.2 Fiscal Policy Considerations

The use of distribution forecasts is also expanding in fiscal policy. Stochastic simulation models, in particular, are a tool increasingly used because they convey the additional information of the uncertainty surrounding traditional point estimates. For example, rather than simply forecasting a surplus of, say $3 billion (which will undoubtedly differ from the actual outcome), distribution forecasts allow for the possibility of many potential outcomes and estimate the likelihood of each outcome being realized. In general, the farther a potential outcome is from the point estimate, the less likely it is to occur, though the probabilities need not be symmetric or monotone as one moves in either direction from the point estimate.

Using this additional information the researcher can estimate not only the probability of a given outcome, but also the probability of achieving a given target (*i.e.* the probability of all outcomes better than or equal to the target). For instance, this approach can estimate the probability of the national debt being at or below a target level at a particular point in the future. This information can then be used to select among various possible paths for policy to achieve this target.

Since 2000, the Congressional Budget Office (CBO) in the U.S. produces what it describes as "fan chart" forecasts for the federal budget balance. These projections, at horizons ranging from two years to as far as 75 years ahead, graphically illustrate the confidence intervals around the 50^{th} percentile which constitutes the CBO's baseline forecast. Crippen (2003), a former CBO Director, emphasizes that these forecasts are not fiscal predictions *per se*, rather they are what would happen if current policies were maintained. Effectively, by using a consistent benchmark that assumes status quo fiscal policies, one can better analyze the potential impacts of policy changes.

Canadian researchers are also working on this policy agenda. Two examples are Boothe and Reid (1998) and an extension on this basic set-up by Hermanutz and

Matier (2000). Both papers focus mainly on deficit avoidance as a primary fiscal policy objective. The first advocates the use of contingency reserves as insurance against deficits. The second demonstrates how shorter-term sequential policy updating can increase the fiscal room available for new initiatives.

As stochastic modeling techniques continue to advance, there is a strong case for further exploring how this approach can aid the practice of policymaking. In particular, in searching for a potential medium-term anchor for fiscal policy, the researcher must explicitly address the following considerations: What variable should policy target as an outcome? What should be the target for this variable? Over what time horizon is the target to be met? Finally, how will policy adjust to meet this target? In other words, the researcher must have a clear view of where policy is going and how it intends to get there.

Insights from the previous monetary policymaking section can guide our thinking on these issues. The evidence shows that a successful approach will likely involve: a new institutional arrangement that targets a clear medium-term policy goal that is easily communicated; an approach that allows some flexibility in achieving the target, and also acknowledges the uncertainty of hitting that target.

As many commentators note, the joint fiscal targets used in Canada's current policy framework lack the appropriate time horizon: the short-run annual no deficit rule is too short-sighted and insufficiently flexible, while the long-run 2014 and 2020 debt-to-GDP targets are too far in the future to guide current policy. Moreover, the annual budget balance is not necessarily an informative target for the health and sustainability of government finances. Transitory factors could well cause the budget to slip into deficit for a year without compromising the fiscal situation. The ability to finance government consumption and investment is ultimately determined by overall economic resources: GDP. Therefore, the debt-to-GDP ratio *is* a more appropriate variable to target, because it conveys information about the amount of public borrowing that is affordable given the ability to repay that borrowing.

The policy target that I propose brings the long run debt-to-GDP ratio targets into the medium-term by aiming for a particular value five years into the future. Since this approach is not a radical departure from the current long-term targets, this would ease the policy transition.[9] A five-year time horizon is also convenient because it roughly coincides with the length that a governing majority can maintain power.

For the purposes of illustration, and consistent with the latest Budget estimates, I select a 30 percent debt-to-GDP target five years after the latest available data, *i.e.* 2009/10.[10] Such a target could be re-evaluated every five years much like the inflation target, as issues such as the aging population would likely lower the sustainable target.

The question of how exactly to adjust policy is a difficult one. Unlike monetary policy which has one instrument that can be adjusted frequently,[11] fiscal policy has many instruments – there are thousands of tax rates and spending programs – but is essentially re-adjusted once a year in the annual Budget. Taking into consideration spending pressures and potential tax changes, policy adjustments would be debated and agreed to by Parliament, as is currently the case. Ideally, the key difference is that alternative policies would be judged as acceptable by the extent to which they changed the probability of hitting the target five years out. For instance, policies such as Bush's 2001 tax cuts would significantly lower the probability of hitting a given target. I now illustrate how this proposed framework might function in practice.

[9]Though annual Budgets generally use a rolling two-year planning horizon, the mid-year October fiscal updates consider the five-year outlook.

[10]This target is admittedly arbitrary and ignores considerations of the 'optimal level' of public debt in Canada. Indeed, others have tried to estimate this; see, for example, Rudin and Smith (1994) or Lloyd-Ellis and Zhu (forthcoming). Unfortunately, there is little consensus on this issue and it remains beyond the scope of this paper.

[11]In Canada, the policy instrument is the overnight rate. Policy announcements generally occur during eight pre-determined Fixed Announcement Dates each year.

4 Modeling and Illustrating the New Framework

This section simulates a model of the interaction between economic fluctuations and government finances to illustrate how this new policy framework could be applied in practice. The basic methodology is the following: shock terms represent the key uncertainties. These shocks are drawn randomly from distributions estimated from the data. Each model simulation takes on a particular realization of values for the shock terms. These shocks, in turn, generate times series for the other variables in the model. Repeated simulations of the model generate probability density functions (PDFs) for the time path of the variables. The PDF for the target variable indicates the probability of achieving the desired policy target, conditional on the assumed policies going forward. This entire process can be repeated under different fiscal policy assumptions (for spending or taxes) to evaluate the impact of policy changes and clarify trade-offs.

4.1 The Model

The model illustrates this new framework in a highly-stylized, reduced-form manner. The goal of the exercise is to model how economic fluctuations and policy choices impact federal government finances. Fiscal policy responds to fluctuations in two ways: 1) through automatic stabilizers; and 2) through discretionary policy changes. This model focuses only on automatic stabilizers, assuming status quo tax policies and an exogenous program spending growth commitment.[12] This approach allows for the comparison of alternative policy choices against a consistent benchmark.

The Appendix describes the data; summarizes the model variables; explains the 'timing' of events in the model and how it is simulated; and provides sensitivity analysis to illustrate the robustness of the results.

[12]See, for instance, Kneebone and McKenzie (1999) that estimates the respective impacts of both responses for Canadian federal and provincial fiscal policy.

4.1.1 Model Description

Two random elements in the model - a shock to real output growth and a shock to government tax collection - attempt to capture the underlying real-world uncertainty. As in other models, output shocks represent the fact that one can never be certain how the economy will evolve. However, in extending earlier models to capture another key source of fiscal uncertainty, I incorporate the idea that even if the growth forecast was correct, the relationships between revenue and tax bases are uncertain.[13]

For the output shocks, the model uses historical data (annualized quarterly real GDP growth rates) over 1991:1-2005:1, coincident with the Bank of Canada's inflation targeting regime. As in the data, real potential output grows by roughly 3 percent annually. Actual output fluctuates around potential based on the realization of the shock term, denoted by ε. Shocks are drawn from the normal distribution with a mean and standard deviation of 2.9 and 2.3 percent respectively to match the data. The shocks follow an AR(1) process to capture the persistence in output growth – as estimate by a simple linear regression – given by:

$$RealOutputGrowth_t = \varepsilon_t + 0.5\varepsilon_{t-1} \tag{1}$$

where $\varepsilon_t \sim N.I.D.(\mu_\varepsilon = 2.9, \sigma_\varepsilon = 2.3)$.

The monetary authority in the model (the Bank of Canada) adjusts short-term interest rates, i_{s_t}, in response to macroeconomic conditions to maintain 2 percent inflation in every year using a Taylor rule specified by:

$$i_{s_t} = i^* + 2(\pi - \pi^*) + \frac{1}{2}(y_{gap_t}) \tag{2}$$

where the weight of 2 on the deviation of inflation, π, from its target, π^*, and $\frac{1}{2}$ on

[13]Hermanutz and Matier (2000) assume a one-to-one relationship between revenue and nominal GDP. However, Crippen (2003), examines past CBO forecast in the U.S. to reveal that forecasting errors are roughly twice as large for revenue than spending. Revenue is harder to forecast because of its many sources and the ability of taxpayers to change the timing and nature of their income.

the output gap are taken from research conducted by the Bank of Canada (Armour et al, 2001). I assume a 'neutral' interest rate, i^*, of 4.5 percent.

The fiscal authority (the Department of Finance) collects tax revenue, administers program spending, services the interest on federal debt, and applies the year-end budget balance to the national debt. No in-year adjustments are made for taxes or spending. On the revenue side, tax collections fluctuate stochastically:

$$\frac{T_t}{Y_t} = \frac{T_{04}}{Y_{04}} + \tau_t \tag{3}$$

where the Tax/GDP ratio, $\frac{T_t}{Y_t}$, is set at its 2004 value of 15.4 percent. Shocks to this ratio, τ_t, in each period are i.i.d where $\tau_t \sim N(\mu_\tau = 0, \sigma_\tau = 0.5)$.[14]

On the spending side, the trend growth rate of government spending, $\overline{G}$, is exogenously specified. Stated differently, I assume the government can commit to a given program spending growth path. Total program spending, G, is not known however, since cyclical program spending responds to changes in economic conditions:

$$G_t = \overline{G_t} - 0.6(y_{gap_t}) \tag{4}$$

where the last term in (4) represents the impact of Employment Insurance benefits and other automatic stabilizers.[15] The effective rate of interest on government debt, r, is determined by:

$$r_t = c + \alpha(i_{s_t}) + \beta(i_l) \tag{5}$$

where i_{s_t} is the short term interest rate determined by the Taylor rule in equation (1); i_l is the long term interest rate assumed to be 5.5 percent; as in Hermanutz and Matier (2000), the constant, c , reconciles the difference between the market and effective interest rates.[16]

[14]The mean is zero because tax policy is assumed to be unchanged over the modeling horizon. Consistent with this set-up, the standard deviation matches that of the residuals from regressing the Tax/GDP ratio on a constant.

[15]The $0.6B decrease in spending for every 1 percentage point of the output gap follows the 2003 Federal Budget's sensitivity analysis (pg. 219).

[16]In the calibration, $c = 2.45$; $\alpha = 0.24$ and $\beta = 0.6$ represent the federal government's liabilities portfolio.

4.1.2 Out of Sample Forecasts - A Reality Check

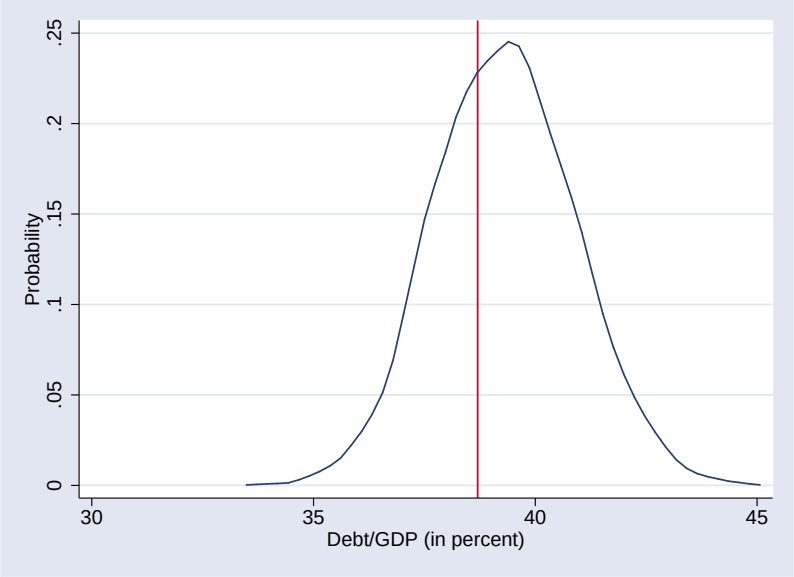

Figure 2: Out of Sample Forecast
Estimate of the Debt-to-GDP Ratio in 2004/05, line represents actual

To ensure the model is capable of generating 'reasonable' results, I compute an out of sample forecast for the target and compare against the actual outcome. To do so, I cut the sample at the end of the 2001/02 fiscal year and set trend program spending growth to 9.2 percent as occurred between 2001/02 and 2004/05. (Actual program spending still fluctuates due to economic conditions.) The model is simulated three years ahead to compare the estimated density for the debt-to-GDP ratio in 2004/05. Figure 2 shows that the model's forecast is not rejected by the data. Indeed, the model does a good job of predicting the actual outcome which is indicated by the vertical line: the model's prediction is 39.3 percent versus the 38.7 percent which occurred and the actual outcome falls in the 37^{th} percentile of the forecast.[17] I interpret the

[17]One objection to this exercise is that the forecaster does not know in 01/02 what spending will be in the future. The is true, however, spending growth is the result of policy decisions, thus if policymakers can credibly commit to a given path of spending *ex ante*, they can exercise this type of control over the likelihood of hitting a given target.

fact that the model can reasonably explain history as providing evidence that the results which follow have merit.

4.2 Selected Simulation Results

This section illustrates how different fiscal policies can lead to dramatically different likelihoods of achieving the medium-term target. The analysis in this section is similar to Robson (2006). As an illustrative example, I compare the estimated densities for the debt-to-GDP ratio in 2009/10 under two scenarios for government spending. In the first 'low spending' scenario, trend government spending growth is set to 3.5 percent, equal to the rate recorded over the last 10 years. The second 'high spending' scenario captures the experience over the past 5 years, when spending growth rose significantly to 8.2 percent. How is the government's ability to hit the proposed target affected if this higher rate of spending persists?

Figure 3 shows the estimated densities in the two scenarios. The solid vertical line represents the policy target. The solid bell-shaped curve is the density in the low spending scenario; the dashed bell-shaped curve is the density in the high spending scenario. Higher spending drastically reduces the probability of hitting the target, shifting the debt-to-GDP outcomes to the right. In the low spending case, the government achieves the (30 percent debt-to-GDP in 2009/10) target in 94 percent of the simulations (*i.e.* the integral of the density to the left of the target). Alternatively, in the high spending case the government is successful in just 35 percent of the simulations.

This simple example more directly illustrates to policymakers, Members of Parliament and the public, the longer-term implications of changes in spending policies on the national debt, and by implication, the sustainability of government finances.

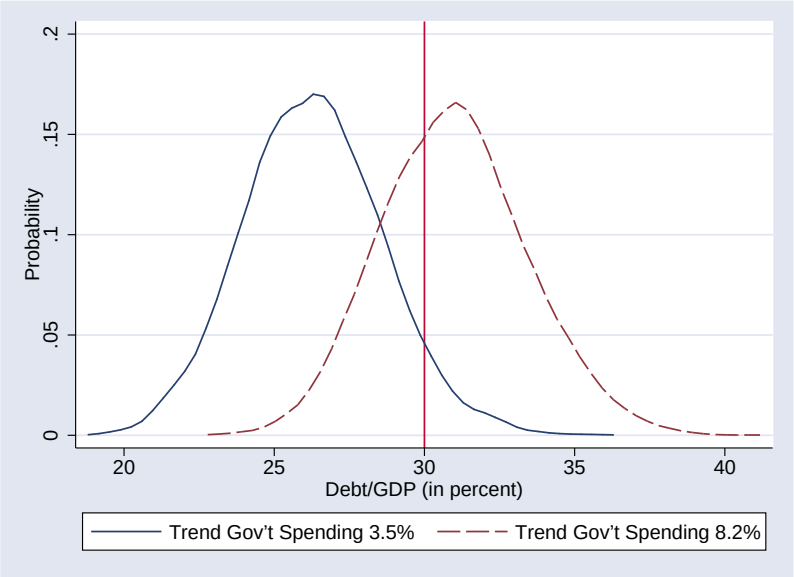

Figure 3: Estimated Distribution for the Debt-to-GDP Ratio in 2009/10
Compares Spending Growth of Past 10 Years (3.5%) to Past 5 Years (8.2%)

4.3 Estimating The Policy Trade-Off Frontier

This type of analysis provides a context for deciding on baseline spending and tax arrangements such that the probability of missing the stated debt-to-GDP target is comfortably small. In fact, running the model many times for various spending policies generates an explicit policy trade-off frontier, shown in Figure 4. The results assume no tax changes; trend program spending growth is specified on the horizontal axis. The figure essentially presents policymakers with a menu of choices. For instance with spending growth of 5, 6, and 8 percent respectively, the probability of hitting the target is 0.75, 0.5, and 0.25. Thus, a somewhat minor increase in spending growth, from 5 to 8 percent annually, can reduce the chance of hitting the target from a comfortable 3-in-4 to only 1-in-4.[18]

[18]Incidently, if an economist were asked to choose from this menu, she would likely choose spending growth of roughly 3 percent since that would satisfy the conventionally-acceptable level for an error of only 1-in-20, *i.e.* the five percent significance level.

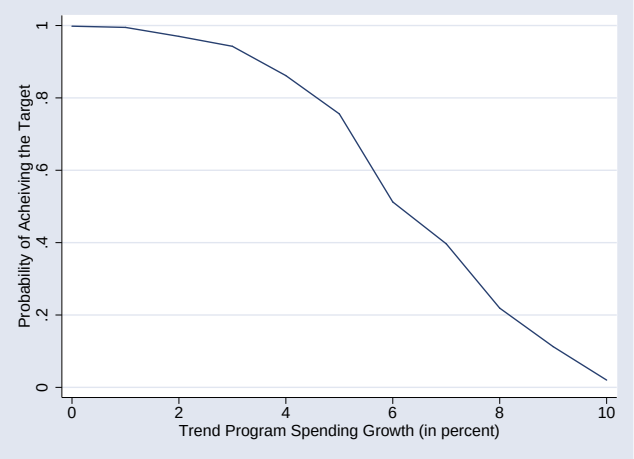

Figure 4: Policy Trade-off Frontier

4.4 How Likely is Canada to Hit its Long Run Targets?

The O'Neill Report (2005) states that most fiscal policy experts view the government's 2014 debt-to-GDP target of 25 percent, as "reasonable, but easily achievable." (When the report was tabled in June 2005, the 2020 target of 20 percent had not yet been announced.) To access the validity of these views, I set trend program spending growth to its long-run average and extend the model's forecast horizon to 2014 and 2020, respectively. I estimate average long-run spending growth at 3.7 percent by computing actual spending growth over the last 21 years, which is the longest time horizon for which the fiscal data are comparable.[19]

The results support the experts' view that the current long run targets are easily achievable. Without tax cuts and assuming long-run average spending growth, the 2014 and 2020 debt-to-GDP targets are reached in an overwhelming majority of the simulations: 96.9 and 97.2 percent of the simulations respectively.

Indeed, simple calculations show both targets are so easily achievable that they fail to provide any policy guidance. The debt-to-GDP ratio currently stands at 39

[19]Public Accounts fiscal data prior to 1983/84 are not directly comparable with earlier years because of the introduction of full accrual accounting.

percent - the stock of government debt is roughly $500B and nominal GDP is roughly $1,290B. Therefore, if nominal GDP continues to grow at its trend of 4.9 percent (2.9 percent real potential output growth + 2 percent inflation), and the federal government simply manages a balanced budget over that period both targets will be achieved. The federal debt-to-GDP ratio would be 24 percent in 2014 and 19 percent in 2020: $Debt_{2014}/y_{n_{2014}} = \frac{500}{1290 \cdot (1.049)^{10}} = 24\%$, $Debt_{2020}/y_{n_{2020}} = \frac{500}{1290 \cdot (1.049)^{15}} = 19\%$.

5 Conclusions

This paper explored a new potential approach to Canadian fiscal policy. In particular, I investigated whether an explicit medium-term target might improve Canada's fiscal policy framework. The approach was illustrated using a stochastic simulation model. The model took the debt-to-GDP ratio five years ahead as the policy target, and emphasized the interaction between economic fluctuations and fiscal outcomes to estimate the probability of achieving this target under alternative policy choices.

The proposal to explicitly target a medium-term debt-to-GDP ratio appears promising and is consistent with lessons from the success of inflation targeting. To the extent that explicit fiscal targets can mitigate the time-inconsistency problem, they can increase the government's credibility. In the monetary policy setting, increased credibility serves to anchor inflation expectations, effectively making it easier for a central bank to hit its inflation targets. Similarly, in the fiscal policy setting, improved credibility may lower risk premia on the government's borrowing, reducing borrowing costs and making it easier for government to hit its fiscal targets.

Other advantages of this approach are that it: shifts the focus to the medium-term; delivers an objective assessment of how new policies impact fiscal sustainability; explicitly recognizes the uncertainties of forward-looking policymaking; allows some flexibility in achieving the target; does not depart radically from current targets; and is easily communicated.

There are, of course, potential drawbacks to this approach. First, this paper demonstrates that a problem may arise in adopting targets where much of the work in achieving them comes not from changes in the numerator - federal debt - but by changes in the denominator - nominal GDP - over which the government has little control. An alternative debt-per-capita target could largely avoid this problem. Unfortunately, this type of target may be arguably less transparent to the public and a less meaningful measure of fiscal sustainability.

Second, changing the focus from the near-term (each fiscal year's budget balance) or the long-term (the 2014 or 2020 debt-to-GDP targets) towards the medium-term using the five-year horizon proposed in this paper, may pose a practical problem that should be acknowledged. If policymakers instead use a five-year *rolling* target, they can always look ahead to the next target five years in the future and delay politically-costly adjustments. Accountability through some type of enforcement mechanism is needed to address this concern. This could come in the form of implicit political costs, as are associated with the current no deficit rule, through some explicit actions if the target is missed, or by requiring a policy response when the probability of hitting the target falls below a certain threshold.

Some caveats also apply to the results. First, the model is a reduced-form representation which ignores behavioral responses or general equilibrium feedbacks. Second, I have focused only on how discretionary spending changes impact the probability of hitting the target. Using the model to analyze alternative tax policies could be an interesting extension.

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Appendix

A Summary of Model Variables

Table 1: Summary of Model Variables

Sector	Variable	Notation
Economy	Nominal Output	y_n
	Real Output	y
	Real Potential Output	y^*
	Output Gap	y_{gap}
Fiscal	Tax/GDP Shock	t
	Budgetary Revenue	T
	Actual Program Spending	G
	Trend Program Spending	$\overline{G}$
	Debt Service Costs	Int
	Budget Balance	BB
	Federal Gov't Debt Stock	$Debt$
	Effective Interest Rate on Gov't Debt	r
	Federal Gov't debt-to-GDP ratio	$Debt/y_n$
Monetary	Short term interest rate	i_s
	Neutral short term interest rate	i^*
	Long term interest rate	i_l
	Inflation	π
	Inflation Target	π^*
	Price Level	P

B Data Sources

The data pertaining to the economy sector of the model are from Canada's National Income and Expenditure Accounts, accessed from CANSIM2. Real Output, y, is v1992067, Gross Domestic Product (expenditure-based) Chained 1997 dollars, s.a.a.r. Nominal Output, y_n, v498086, is the same GDP variable measured at market prices.

The fiscal data come from Canada's Federal Government Public Accounts, Tables 1 and 2.

The monetary series for inflation is the Total Consumer Price Index (2001 Basket) v691784. For short term interest rates, I use the average yield on 91 day Government of Canada Treasury Bills, V122484; long term interest rates are Government Bonds over 10 years, V122487. All data were accessed October, 2005.

C Model Timing and Simulating the Model

Each model period represents a year. The model timing is as follows: Potential output, $\overline{y}$, grows at approximately 3 percent each year. Real output, y_t, stochastically fluctuates around potential. The levels of actual and potential real output imply an output gap, y_{gap_t}. Movements in the output gap impact cyclical program spending, relating to EI benefits through equation (4). In response to the output gap, the monetary authority adjusts short term interest rates, i_{s_t}, using the Taylor rule given in equation (2). Movements in short rates impact the effective interest rate, r_t, which through equation (5) impact the federal government's debt service costs, Int_t. There is no feedback effect from the interest rates to the economy. The rate of inflation, π, together with real output determine nominal output, y_{n_t}. In each period there is also an independent shock, τ_t, to the Tax/GDP ratio which impacts tax collections. The government's budget balance at year-end, $BB_t = T_t - G_t - Int_t$, is applied to the stock of national debt, $Debt_t$. The debt-to-GDP ratio, $Debt_t/y_{n_t}$, is then calculated. This process repeats each period until the five-year-ahead time horizon is met, for one run of the model.

The model is run 5000 times to generate 5000 observations for the variable of interest - the debt-to-GDP ratio in 2009/10. I apply a nonparametric kernel density estimator to the simulated data. This technique generates a density estimate which is essentially a smoothed histogram of the frequency of the simulated data over the range of possible outcomes. This density function, or PDF, represents the probability of various outcomes for the target in an easily-accessible figure. The kernel estimate of the density at a particular point x_i, $\hat{f}(x_i)$, is derived by the following formula:

$$\hat{f}(x_i) = \frac{1}{nh} \sum_{i=1}^{n} K\{\frac{x - x_i}{h}\} \tag{6}$$

where $n = 5000$ is the number of observations, h is the bandwidth, and K is a weighting kernel which gives less weight to observations farther from x_i. I use the Epanechnikov kernel, and select the bandwidth following Silverman (1986).

D Robustness Checks

The kernel density estimator used to compute the probability of various forecasted outcomes is from the nonparametric statistical literature. This literature finds that the choice of kernel (*e.g.* Epanechnikov versus Gaussian) is not particularly important. The choice of the bandwidth, however, is important. Therefore, I assess the sensitivity of the results, by re-estimating the PDFs for the out of sample forecasts

(from Figure 2) for various bandwidth selections.The result, which are shown in Figure 5 of the Appendix, are robust to these variations. The difference in the smoothness of the estimated densities is negligible.

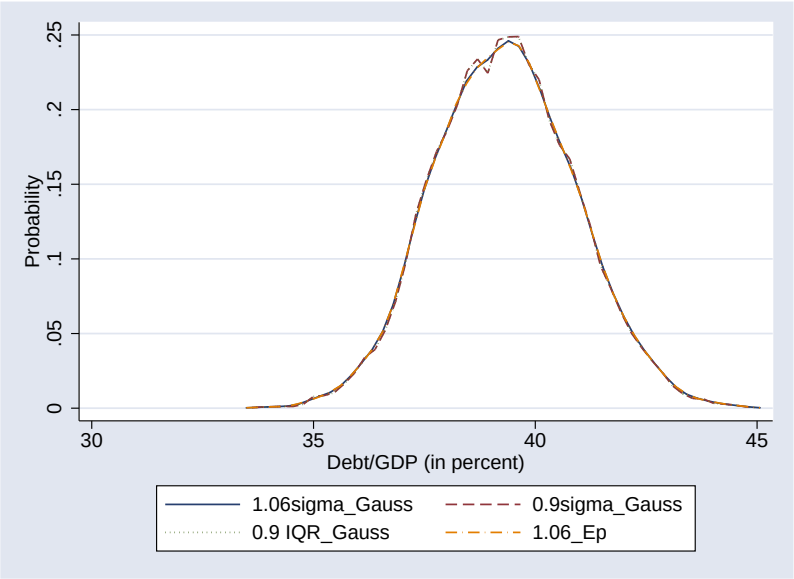

Figure 5: Sensitivity Analysis - Out of Sample Forecast
Various Bandwidths and Kernels