Ralph Goodale's 25% Debt-to-GDP Target: A Critical Analysis

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In the 2004 budget, Federal Finance Minister Ralph Goodale committed the federal government to reducing its debt to gross domestic product (GDP) ratio to 25% by the end of the 2014 fiscal year[1]:

> Mr. Speaker, on the matter of debt, Canadians instinctively know that paying it down is the right thing to do—for themselves and for their government. [...] By prudently managing our finances today, we make sure we have the resources we will need to better satisfy [...] growing demands. So I am proposing that Canada set a reasonable goal of lowering its federal debt-to-GDP ratio to 25 per cent within 10 years.[2]

This is not the first time that the federal government has set for itself a fiscal target in this manner; indeed, the establishment of such targets have been common since the Liberal party was elected to government in 1993. In 1994, in his first budget as finance minister, Paul Martin set a goal of reducing the deficit to three per cent of GDP by 1996-97. Martin continued to set two-year targets for deficit reduction in subsequent budgets until the elimination of the deficit in 1998. All targets were met ahead of schedule.[3]

Whenever commitments like these are made, whether they concern deficits, debt, or anything else, their achievability and desirability must be scrutinized to ensure that the government is acting in the public interest. This paper will provide such scrutiny with respect to Goodale's debt-to-GDP target. Following some background discussion of debt definitions and a brief contextual survey of the Canadian postwar history of debt

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[1] A federal government fiscal year extends from April 1st of the year previous to March 31st of the given year. In this paper, the terms "fiscal year 1994" and "1993-94" (and analogously for other years) will be used interchangeably. All annual data used in this paper is expressed in fiscal years.

[2] Finance Canada, *Budget Speech 2004*. http://www.fin.gc.ca/budget04/speech/speeche.htm (accessed 7 April 2005)

[3] Finance Canada, *Budget Speech 1994-1998*. 1995-1998 budget speeches can be accessed at http://www.fin.gc.ca/access/budinfoe.html (accessed 7 April 2005)

accumulation and repayment, this paper will ask first whether the 25% debt-to-GDP commitment can be met in ten years and second whether such a debt reduction strategy is justifiable. This paper will argue that although Canadian historical and budgetary trends indicate that a 25% ratio can almost certainly be reached in ten years, the ends sought through reductions in Canadian public indebtedness would be more effectively served by a passive approach under which the government balanced its budget annually and allowed GDP growth alone to bring down the ratio.

Definitions of Debt and National Indebtedness

An analysis of government debt should begin by highlighting the significance of the debt-to-GDP ratio. As will be discussed at length later in this paper, debt very directly affects the financial health of a country, as higher debt leads to higher debt servicing charges, reduced government financial flexibility to respond to future challenges and potentially higher interest rates for all of the country's borrowers. However, the impact of the problems associated with a given level of debt depends on the ability of a country to service and manage that debt. An equal-sized debt will burden a poorer country much more than a richer country, as the wealthier country has more resources to draw on to service borrowing expenses, repay debt and fund responses to future problems should they arise. An accurate measure of government indebtedness must thus relate the size of the country's debt to national wealth, making debt-to-GDP an appropriate measure of Canada's debt burden.

Defining debt is also important in debt analysis. Three measures are typically used in Canada: gross debt, net debt and accumulated deficit. The difference between gross debt (the total amount of outstanding government liabilities) and the other two

measures is treatment of government assets. Net debt subtracts from gross debt the government's financial asset holdings, including loans, investments and foreign exchange accounts.[4] Accumulated deficit denotes net debt minus non-financial government assets such as land and machinery.[5] It is logical to consider assets when evaluating indebtedness as holdings can be used to facilitate debt management. Such action, however, is much quicker and easier with financial assets than with non-financial assets. As well, valuation uncertainties are likely with non-financial assets; the book valuation of a non-financial asset may not properly represent the ability of a government to generate funds from that asset. For these reasons, federal considerations of indebtedness, including Goodale's target, typically use the net debt conception of debt. This paper will thus use net debt as well.

A final word of caution is necessary about consideration of federal indebtedness in isolation from other government debts. A complete view of national indebtedness would include the debts of all governments, including federal, provincial and local. This is important when considering federal debt reduction, as federal debt reduction achieved through a downloading of fiscal responsibilities to lower levels of government causes increased debt for the governments receiving the additional responsibilities and does nothing to reduce national indebtedness. Furthermore, properly viewed government debt extends beyond financial debts to include future financial obligations such as municipal infrastructure deficits and unfunded pension plan liabilities. Reduced financial burdens are irrelevant if they cause increased burdens of other forms such as these. Therefore, though this paper focuses its analysis on the federal debt-to-GDP ratio so as to be

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[4] Finance Canada, *Glossary*. http://www.fin.gc.ca/gloss/gloss-e.html (accessed 7 April 2005)

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consistent with the scope of Goodale's target, it does so while remembering that reductions in this ratio must not increase lower level government debt or non-financial liabilities if they are to truly reduce national indebtedness.

History of Canadian Federal Debt

To contextualize the drivers behind Goodale's objective, an overview of how Canadian indebtedness has evolved is necessary. To that end, figure 1 illustrates the federal debt-to-GDP ratio over time since 1962.
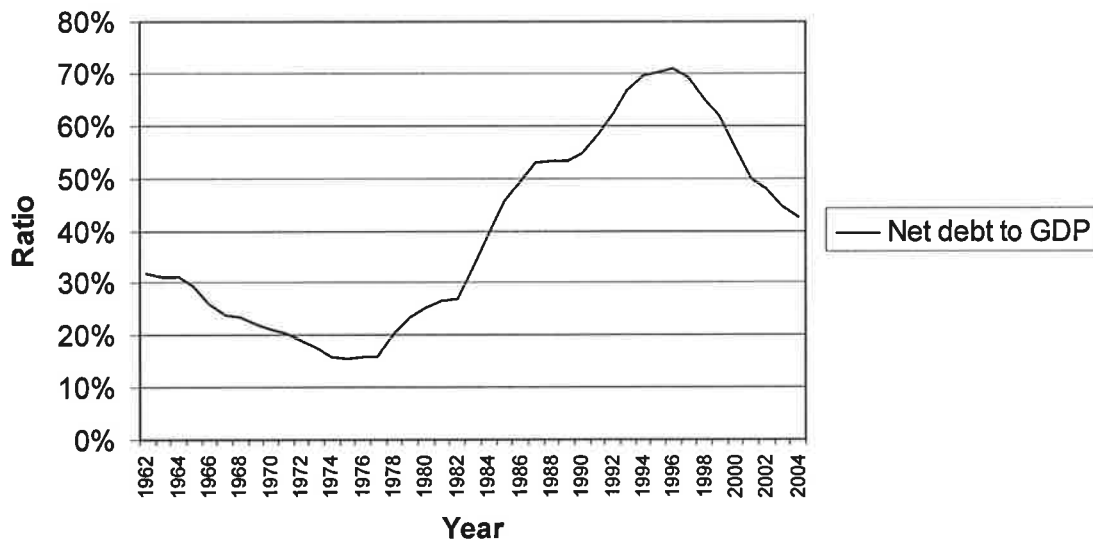
Figure 1: Canadian federal net debt-to-GDP ratio over time[6]

Following the Second World War, the federal government steadily reduced the indebtedness it had accumulated to finance the war effort, ultimately bringing the debt-to-GDP ratio to a low of 16% by the end of the 1974 fiscal year. Increased deficits then caused the ratio to rise. Steady growth in the ratio was seen for two decades thereafter, interrupted only briefly in the late 1980s as the Conservative government of Brian

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[5] Finance Canada, *Implementation of Full Accrual Accounting in the Federal Government's Financial Statements*. http://www.fin.gc.ca/toce/2001/fullacc_e.html (accessed 7 April 2005)
[6] Data taken from CANSIM II matrices 3800002 and 3850010.

Mulroney sought to bring balance to the national finances. Though then-Finance Minister Michael Wilson was successful in stabilizing the debt ratio from 1987 through 1990, with the recession of the early 1990s national indebtedness started rising once again.

It was in the mid-1990s, with a revival of the economy and the election of the Liberal party to government on a platform including fiscal restraint, that growth in the federal debt-to-GDP ratio was brought to an end. The ratio peaked at 71% in 1996 and has been declining ever since. At the end of the 2004 fiscal year the federal debt-to-GDP ratio stood at just under 43%.

Three consequences of this increased indebtedness can be identified. First, as illustrated in Figure 2, debt service costs as a share of government expenditure rose steadily through the period of debt ratio increase (barring a brief decline in 1993-94 explained by a drop in interest rates.) At the peak of Canada's debt-to-GDP ratio in 1996, 27% of federal expenditure was dedicated to debt financing. In political terms, this meant that over a quarter of all tax revenue was unavailable for social expenditure; in economic terms, this implied a large amount of distorting taxation.
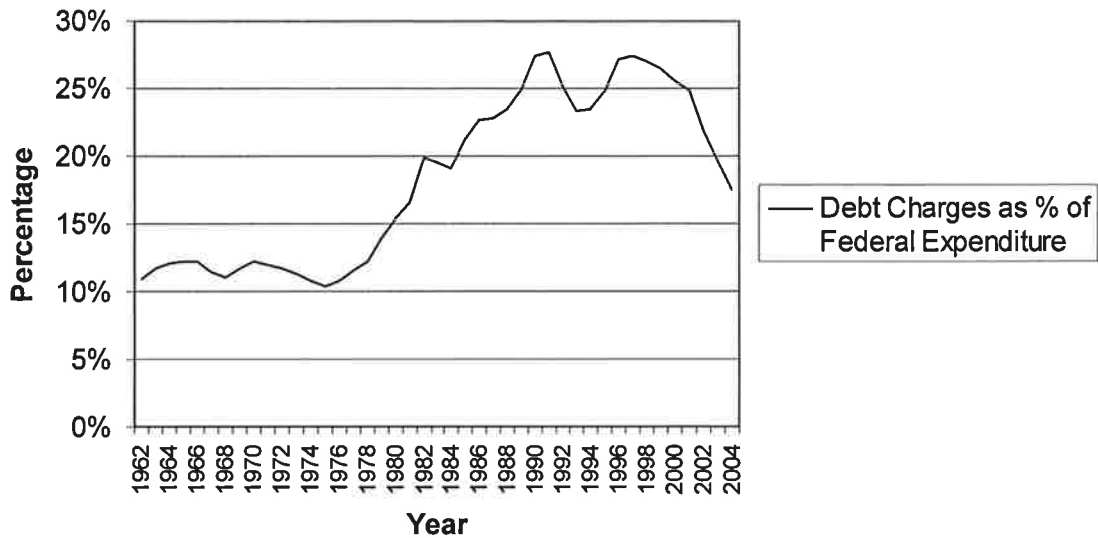
Figure 2: Interest charges as a share of federal expenditure over time[7]

A second consequence of increased indebtedness was an increase in the trend of Canadian interest rates stemming from increased demand for borrowing. Although Canada is sometimes analyzed using the small open economy model under which all desired funds can be borrowed at the world interest rate, economists such as Jean-François Fillion have argued that in practise there is a gap in Canada between domestic and foreign interest rates that reflects the economic conditions of the country.[8] Though the link between rates and demand for funds is not as strong as it would be in a closed economy, Fillion's analysis implies that higher government debt does indeed lead to higher national interest rates, causing reduced national investment and, thus, reduced growth.

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[7] Data taken from CANSIM II matrix 3800034.
[8] Jean-Francois Fillion, quoted in William Scarth and Harriet Jackson, "The Target Debt-to-GDP Ratio: How Big Should It Be? And How Quickly Should We Approach It?" in Thomas J. Courchene and Thomas A. Wilson, eds., *Fiscal Targets and Economic Growth* (Kingston: John Deutsch Institute, 1998), 284.

A third consequence of increased indebtedness is increased vulnerability of national finances to interest and growth rate fluctuations. Oliver Blanchard decomposes the growth rate of a given country's debt-to-output ratio into:

$$\frac{db}{dt} = \frac{PDEF_t}{Y_{t-1}} + (r-\theta)*\frac{D_{t-1}}{Y_{t-1}} \,,$$

where db/dt is the change in the debt-to-GDP ratio from time t-1 to time t, $PDEF_t$ is the primary deficit at time t, r is the nominal interest rate on public debt, θ is the growth rate of nominal GDP, D_{t-1} is debt at time t-1, and Y_{t-1} is nominal GDP at t-1.[9] The first term of this decomposition is the primary balance of the government, which is at the discretion of policy-makers, and the second term is a rate component that is beyond direct government control.

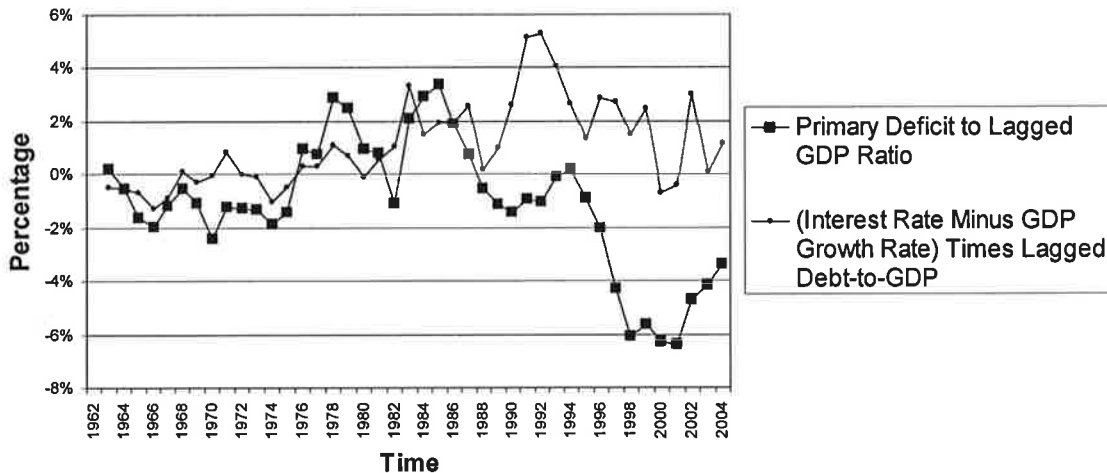Figure 3 breaks down the Canadian experience using Blanchard's formula:

Figure 3: Breakdown of growth in debt-to-GDP over time[10]

Consider also the rate difference over time illustrated in figure 4:

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[9] Oliver Blanchard, "Suggestions for a New Set of Fiscal Indicators". In H. A. A. Verbon and F. A. A. M. Van Winden (eds.), *The Political Economy of Government Debt* (Amsterdam: Elsevier Science Publishers, 1993), 314. Though no derivation of this formula is provided by Blanchard, one is provided in Appendix 1 of this paper.
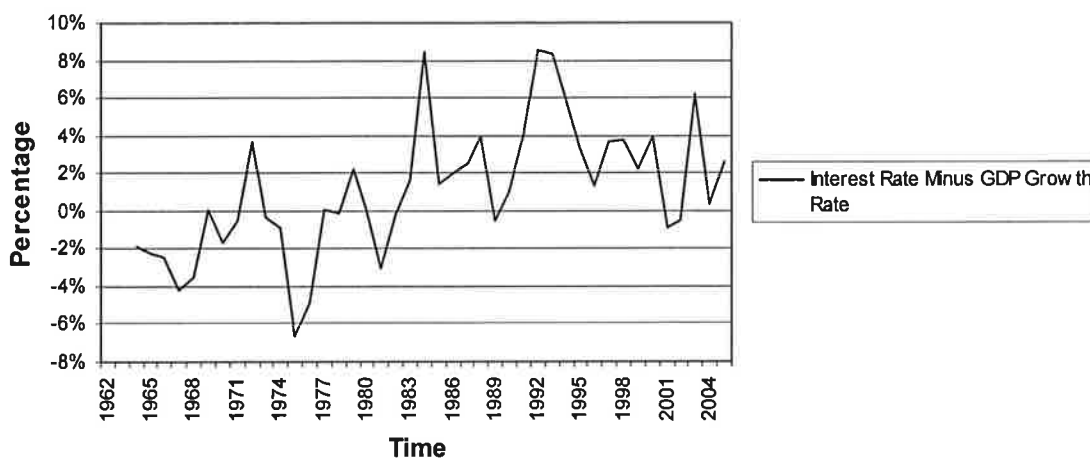
Figure 4: Difference between interest rates and GDP growth rates over time[11]

As reflected in these two figures, the experience of the Conservative government of the 1980s and early 1990s illustrates the impact of high debt on fiscal vulnerability. Through the 1980s the government had steadily reduced its primary deficits to stabilize indebtedness growth. Very low GDP growth in the early 1990s, however, caused the rate difference to rise; this high rate difference alongside the existing high debt ratio brought the rate component of indebtedness growth to its postwar high, causing the large increases in debt-to-GDP of the period. Although the magnitude of the rate difference of the early 1990s was not unprecedented, as can be seen in figure 4, its effect on debt ratio growth was unprecedented, owing to the high level of existing debt. This illustrates how a high debt-to-GDP ratio makes national economic stability vulnerable to changes in economic conditions.

The above analysis shows from where the federal government's focus on debt reduction stems. Rapid increases in national indebtedness over two decades engendered

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[10] Data taken from CANSIM II matrices 3800002 and 3800034.

large debt service costs, increases in the cost of borrowing for Canadians, and increased sensitivity of government finances to changes in rate conditions. The mindset of fiscal restraint brought on by this experience induced the federal government through the mid-1990s to eliminate both its primary and overall budget deficits and, subsequently, to devote large sums to debt repayment. Goodale's 25% target for 2014 reflects a continuing prevalence of the mindset brought on by the Canadian indebtedness experience of the late 1970s through the early 1990s.

Attainability of the 25% target

Having discussed the context and impetuses underlying Goodale's 25% debt ratio target, we now turn to the question of whether such a goal is realistic. This analysis will illustrate that, assuming at minimum annually balanced budgets, a 25% ratio is mostly a direct consequence of expected GDP growth over the next ten years. While some debt repayment will likely be necessary to ensure that the target is met in the given time frame, annual debt repayment amounts needed will likely be less than the annual debt repayment seen in recent years, making the target attainable.[12]

To begin, note that if the debt-to-GDP ratio is to be 25% at some point in the future, the definition of the debt ratio requires that at that time,

$$\frac{D_c - D^p}{(1+\theta)^t * GDP_c} = .25 \, ,$$

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[11] Data taken from CANSIM II matrices 3800002 and 3850010.

[12] Though this conclusion is not novel, it uses a methodology that, to the author's knowledge, is unique to the literature on the given subject. For alternatives, see Jim Stanford, "The Dark Side of Debt Reduction", *Policy Options* 25:4 (2004), 22-25, and Armine Yalnizyan, "Squandering Canada's Surplus: Opting for debt reduction and 'scarcity by design' ", Canadian Centre for Policy Alternatives report (April 2004), http://www.policyalternatives.ca/documents/National_Office_Pubs/socialwatch2004.pdf (accessed 7 April 2005)

where D_c is the current federal net debt, GDP_c is current nominal GDP, D^p is total debt repaid from now until the time the target is reached, θ is the annual growth rate of GDP[13], and t is the number of years until the target is reached. This definition will serve as the base for the analysis that follows.

As of the end of the 2004 fiscal year (the point from which the ten year target was set), Canadian nominal GDP stood at $1,228,668,000,000 and federal net debt stood at $523,648,000,000. Using these values, it can be easily calculated that in the absence of any repayment of or additions to net debt a growth rate of nominal GDP of 5.48% would be required to bring the ratio down to 25% in ten years.

To conceptualize how such a growth rate concords with historical trends, consider Figure 5:
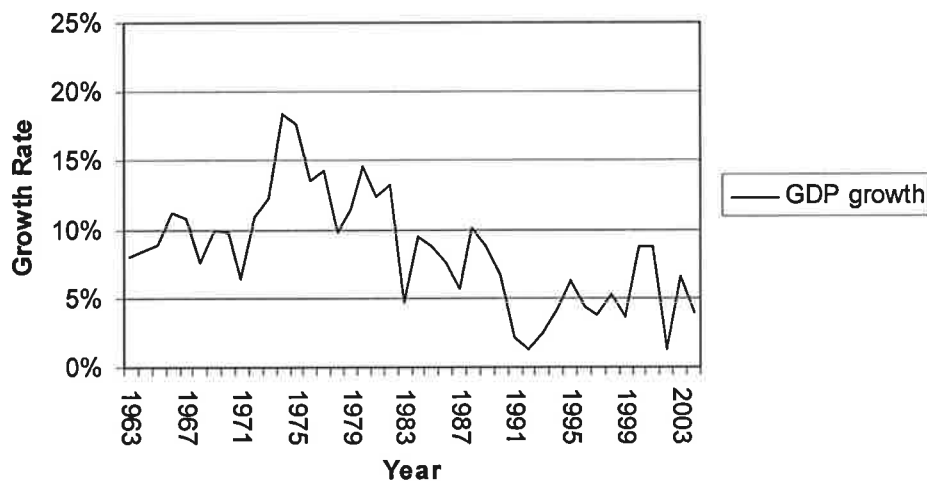

Figure 5: Growth rate of Canadian nominal GDP[14]

As reflected in the figure, a growth rate of 5.48% would be more than consistent with pre-1990 historical trends but would, depending on point of departure, be either at

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[13] For simplicity in illustrative purposes, a constant growth rate of nominal GDP is assumed.
[14] Data taken from CANSIM matrix 3800002.

the maximum or above the rates of growth of the more recent past. The 1991 adoption in Canada of policies of inflation control and targeting that are unlikely to be abandoned in the near future make inferences as to reasonable rates of growth based on the high inflation pre-1990 years implausible; as such, analysis is most reasonably made based on consideration of periods from the early 1990s onward. From 2000 to 2004, nominal GDP growth averaged 5.8%, from 1995 to 2004 it averaged 5.29%, and from 1990 to 2004 it averaged 4.65%. As such, historical trends indicate that growth in nominal GDP alone is not certain to be enough to reach the target. Clearly, however, growth will be the most significant source of debt ratio decline if rates of growth are consistent with recent trends.

Now consider how much debt repayment would be necessary with rates of growth lower than 5.48% to bring the ratio to 25% in ten years. For this analysis, assume that governments increase the annual amount of debt they repay at the rate of growth of GDP. Since, all else being equal, increases in GDP increase government revenue, increasing debt repayment at the rate of growth of GDP reasonably assumes a relatively constant proportion of government revenue devoted to debt repayment.

Therefore, let $D^p = \sum_{i=1}^{t} (1+\theta)^i D_a$, where D^p, as above, is total debt repaid and D_a is the present value of annual debt repayment amounts, discounted at the rate of growth of GDP. More simply phrased, D_a denotes the annual amount of debt repayment expressed in the dollars of the date the target is set.

It is shown in Appendix 2 that the above equation is equivalent to:

$$D^p = D_a * \frac{(1+\theta)^{(t+1)} - (1+\theta)}{\theta}, \text{ meaning that}$$

$$.25 = \frac{D^c}{(1+\theta)^t GDP^c} - \frac{D_a}{(1+\theta)^t GDP^c} * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)}.$$

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This can be rearranged to give

$$D_a = [D^c - .25(1+\theta)GDP^c] * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)},$$
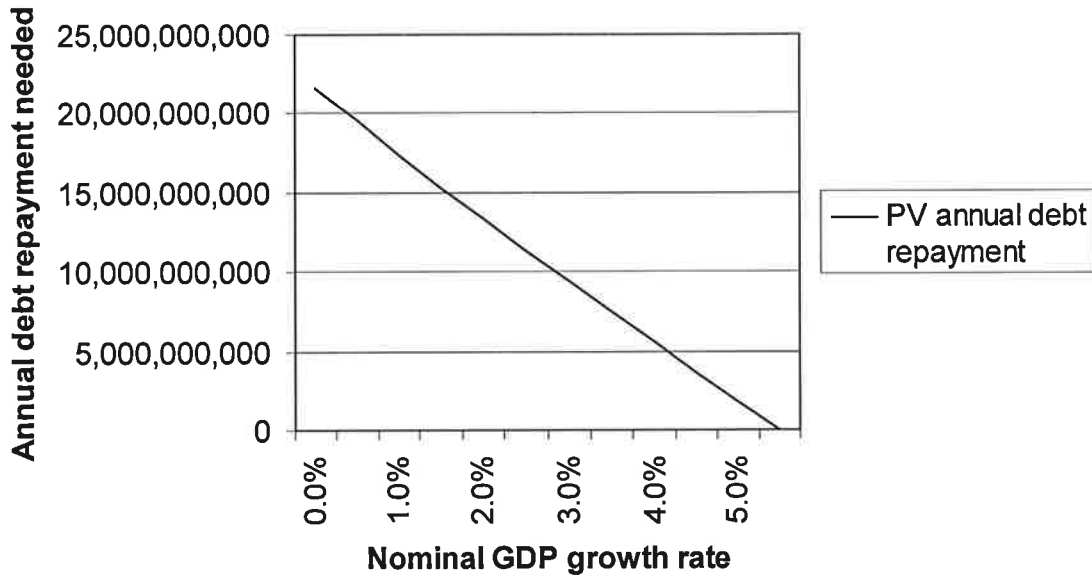
which gives the relationship between nominal GDP growth rates and present value amounts needed to achieve the 25% target in a period of t years.

Substituting into this the ten year time frame and 2004 values for federal net debt and nominal GDP gives

$$D_a = [523,648,000 - 307,167,000,000*(1+\theta)GDP^c] * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)},$$

which gives combinations of possible growth rates conducive to Goodale's target.

Figure 6 graphs this function for illustrative purposes:

Figure 6: Combinations of present value annual debt repayment and nominal GDP growth conducive to attaining the 25% target in ten years

It is interesting to note that the relationship between the two variables is almost perfectly linear. A linear regression of the given curve indicates that approximately $3.9

billion in present value annual debt repayment is needed to offset each percentage point of decreased nominal GDP growth.

Table 1 gives discrete examples of combinations of debt repayment and nominal GDP growth that would reduce the ratio to 25% in ten years:

PV annual debt repayment	Nominal GDP growth rate
21,605,482,893	0.01%
19,531,976,477	0.50%
17,445,577,737	1.00%
15,388,393,358	1.50%
13,359,919,685	2.00%
11,359,659,816	2.50%
9,387,123,593	3.00%
7,441,827,592	3.50%
5,523,295,115	4.00%
3,631,056,181	4.50%
1,764,647,517	5.00%
0	5.48%

Table 1. Discrete combinations of present value annual debt repayment and nominal GDP growth conducive to attaining the 25% target in ten years

Analysis of this table requires both the historical trends of nominal GDP growth discussed previously and, as given in table 2, recent amounts of federal debt repayment:

Recent federal net lending	
1998	8,116,000,000
1999	6,436,000,000
2000	13,965,000,000
2001	18,783,000,000
2002	11,057,000,000
2003	9,183,000,000
2004	4,928,000,000

Table 2. Recent federal net lending[15]

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[15] Data taken from CANSIM II matrix 3800034.

It is clear from comparison of recent nominal GDP growth rates, recent federal debt repayment, and the combinations of present value annual debt repayment needed to achieve the target that reaching 25% in ten years is possible given past trends. Even under the most pessimistic of recent trends in nominal GDP growth, the 1990-2004 average of 4.65% required annual debt repayment remains less than 2004 net lending and considerably less than net lending in years previous. Conversely, annual debt repayment consistent with 2004 levels, the lowest amount of annual debt repayment since 1998, would imply a needed annual growth rate of 4.15%, an average growth rate which would be lower than growth in all but three of the years since the recession of the early 1990s. Given these growth figures, it seems reasonable to deem a 25% debt-to-GDP ratio within ten years attainable. It further seems likely, given trends in economic growth, that the amount of debt repaid to achieve the target will not, in present value terms, need to be as large as it has been in the recent past.

Desirability of the 25% target

Having concluded that Goodale's debt ratio target is achievable, this paper now turns to the question of whether the target is in the Canadian public interest. The desirability of the target is as important as its achievability; just as a desirable end is useless if impossible, a possible end is meaningless if it is not deemed valuable. Two methods of analysis, positively-based cost-benefit analysis and normatively-based intergenerational equity, will be used to evaluate Goodale's target. Though the cost-benefit method will not provide a clear case for debt reduction, the second, intergenerational equity, will justify debt reduction but will not offer the ten year window as the optimal timetable.

The use of debt by government can yield numerous benefits to society. The most obvious, analogous to the reason households hold debt, is the availability of funds for public purposes. Clearly, if the government can invest in projects that bring more benefit to society than the cost of borrowed funds, it is in government's interest to do so. This motivation is stronger for government than it is for individuals because of the wide array of possible government investment projects, both in terms of physical capital investment and, more vastly, human capital investment, including but not limited to health care, education and other social programs.

A second benefit of government debt comes from government programs that correct capital market issues. As argued by Aiyagari and McGrattan, the use of debt by government to borrow on behalf of "liquidity-constrained" individuals who for some period of time lack the collateral needed to act independently, such as borrowing to give consumption to young individuals and taxing in later periods of life to recoup amounts expended, is a means by which government debt can be used to correct an inefficiency in capital markets. Similarly, government debt-based programs can be used to prevent excessive capital acquisition by individuals seeking to self-insure in the absence of proper insurance markets.[16]

A third possible, though controversial, benefit of debt comes from use of fiscal policy to smooth the business cycle, either through policies with automatic stabilizers or through active use of debt-financed expansionary fiscal policy during downturns that is repaid through surpluses during upturns. Regardless of whether one believes these types of policies should be pursued by government or not, in an analysis of static debt targets

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[16] S. Rao Aiyagari and Ellen R. McGrattan, "The optimum quantity of debt", *Journal of Monetary Economics* 42 (1998), 448.

such use of debt need not be considered as it is expected that its average contribution to debt levels over time would be zero.

Against these benefits must be weighed the costs discussed in the historical survey section. The first comes from debt service charges, incurring a distortion cost (since most if not all taxation used by government is distortionary) as well as a leakage of resources to foreigners in indebted open economies. Secondly, higher government borrowing leads to higher interest rates for all borrowers through an increased premium on national rates over the world rate, leading to reduced capital investment. Finally, at the highest end of government indebtedness, debt leads to increased sensitivity of government finances to changes in economic conditions.

Numerous economists have attempted to derive an optimal debt-to-GDP ratio that brings together these costs and benefits. William Scarth, surveying the literature on optimal debt ratios, notes that estimates of optimal ratios range from 66% to -300% of GDP.[17] The stylized nature of each of these models combined with the disparity in results, however, implies that hypothetically optimal ratios may be entirely dependent on the assumptions and parameter estimations of the models. Furthermore, striving for a perceived optimal debt ratio purely on the basis of its optimality ignores the costs associated with the transition period; the cost of achieving a goal may negate any benefits no matter how desirable the goal may be. This is particularly important given that many of these models show the cost of deviating from the optimal level of debt to be quite

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[17] William Scarth, "What Should We Do About the Debt?" In Christopher Ragan and William Watson (eds.), *Is the Debt War Over? Dispatches from Canada's Fiscal Frontline* (Montreal: Institute for Research on Public Policy, 2004), 244-7. Note that negative debt ratios imply a recommendation that governments should have positive holdings of interest-bearing assets to generate revenue so as to avoid distortionary taxation.

low.[18] Thus, a pure cost-benefit analysis of debt undertaken in this manner yields little insight as to whether any particular debt target should be striven for.

The best cost-benefit analysis structure of debt reduction analysis is likely that of Bev Dahlby, who endeavours to calculate the marginal benefit of debt repayment through a calculation of the marginal cost of public funds.[19] The method used in his model brings together both direct debt servicing costs as well as the structural economic costs engendered by government debt as described above. In this manner, Dahlby estimates the marginal benefit of a dollar of debt repayment to be 1.2, denoting a 20% return on the government's investment in reduced debt. He believes that few other targets of government expenditure engender such a high return. However, as Dahlby points out himself, three obvious criticisms can be levied against the analysis. First, Dahlby assumes all taxes are equally distortionary, not considering the consequences of government choosing lower distortion taxes like consumption taxes. Second, the model considers a closed economy where increased debt has a direct crowding-out effect on investment. It is conceivable to believe the cost of borrowing to be lower in the Canadian small open economy case where crowding out is reduced or eliminated. Third, the questionable assumption of Ricardian equivalence is made in this model; Dahlby implies in his conclusion that relaxation of this assumption could influence his result in either direction. Dahlby's paper is at this point an unpublished work-in-progress; it will be interesting to see the result he generates if he is able to adjust for these factors, all of which have the potential to reduce the appeal of debt repayment as a source of societal returns. At

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[18] Scarth (2004) 246-7.
[19] Bev Dahlby, "The Marginal Cost of Funds from Public Sector Borrowing." Forthcoming, obtained from author on request. Referenced in Bev Dahlby, ""What Does the Debt Cost Us?" In Christopher Ragan and

present, however, his results are not robust enough to serve as a justification for debt repayment, appealing as his method may be.

Given the inability of objective cost-benefit analysis to justify Goodale's chosen ten year, 25% ratio target, analysis must turn to a more normative concept, intergenerational equity. William Scarth and Harriett Jackson make the argument that the impending retirement of the baby boom generation and subsequent increase in the Canadian dependency ratio will engender significant reductions in government revenue-raising capabilities (owing to a smaller work force) as well as significant increases in government expenditure responsibilities (owing to the needs of an older population.) They project the effects of these coming demographic shifts on the federal government's financial position and conclude that reducing the debt-to-GDP ratio to between 20-25% is what would be necessary to give the government the borrowing flexibility it will need to maintain living standards in the face of these population shocks. Their recommendation is thus consistent with the debt-to-GDP ratio sought by Goodale. [20]

This is a strong argument in favour of reducing the level of national indebtedness. The shifts Scarth and Jackson discuss are foreseeable; it is only logical to want to prepare for the consequences. The question in this case is less one of the target itself and more one of the time frame. Scarth's desired date for reaching a 25% ratio following his analysis of the burdens to come was 2016[21], a target which would give the federal government three additional years of debt management, facilitating lower debt repayment and/or accommodating lower levels of economic growth. Given this, consider under

William Watson (eds.), *Is the Debt War Over? Dispatches from Canada's Fiscal Frontline* (Montreal: Institute for Research on Public Policy, 2004), 218.
[20] Scarth and Jackson (1998), 280-281.

balanced budgets[22] the relationship between annual nominal GDP growth rates and the number of years needed to achieve a 25% debt-to-GDP ratio. Such an indebtedness reduction strategy, it will be shown, is consistent with Scarth's time frame for debt reduction while liberating debt repayment funds for other socially beneficial purposes such as those described by Yalnizyan.[23]

As illustrated in Appendix 3, rearranging the debt ratio definition stated at the beginning of the feasibility section gives the following relationship:

$$\theta = (4D_c/GDP_c)^{(1/t)} - 1$$

Substituting for 2004 federal net debt and nominal GDP gives

$$\theta = (1.705)^{(1/t)} - 1$$

Figure 7 illustrates this relationship:

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[21] William Scarth, "Beyond the Deficit: Generation X and Sustainable Debt". *C. D. Howe Institute Commentary* 77 (February 1996), 2.

[22] "Balanced budgets" implies neither deficits nor debt repayment. The balanced budgets strategy is offered as an alternative to Goodale's since current political climates in Canada do not allow for deficit spending, making 0 the lowest politically palatable budget balance. An analysis of whether Canada's aversion to deficit spending is desirable is left for another paper; for our purposes we take this political mindset as given.

[23] Yalnizyan (2004), 6.
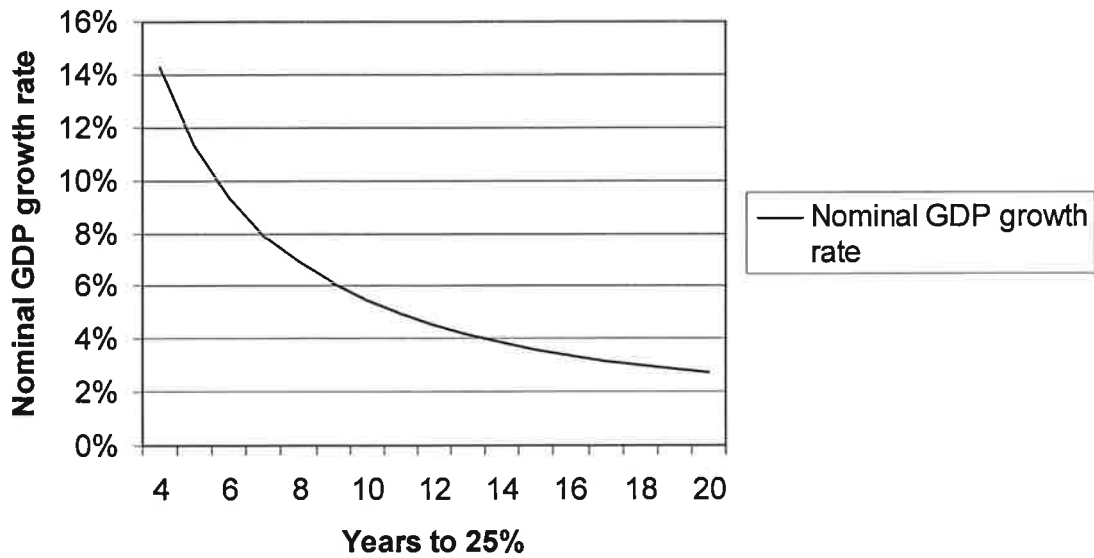
Figure 7: Number of years needed to achieve the 25% debt-to-GDP ratio without debt repayment at different rates of nominal GDP growth

As well, table 3 offers some discrete possibilities:

Years to 25%	Nominal GDP growth rate
1	70.48%
2	30.57%
3	19.46%
4	14.27%
5	11.26%
6	9.30%
7	7.92%
8	6.90%
9	6.11%
10	5.48%
11	4.97%
12	4.55%
13	4.19%
14	3.88%

Table 3. Number of years needed to achieve the 25% debt-to-GDP ratio without debt repayment at different rates of nominal GDP growth.

As illustrated in this chart, a 12 year target established at the end of fiscal 2004 would require a 4.55% nominal annual GDP growth rate to bring the debt-to-GDP ratio down to 25% by 2016. Such a growth rate would be lower than even the historical trend of GDP growth extending from 1990-2004, the lowest historical trend of all those considered in the previous section. It can thus be reasonably expected that increases in GDP alone would bring the debt-to-GDP ratio to 25% by 2016, Scarth's target, in the absence of any debt repayment. As such, a passive strategy of indebtedness reduction that neither adds to nor repays debt and allows GDP growth to reduce indebtedness until the 25% target is reached would remain consistent with the best rationale for debt-to-GDP ratio reduction while avoiding the social costs of excessive fiscal restraint.

Conclusion

Debt reduction has been a priority of the Liberal government since the mid-1990s, and Ralph Goodale's ten year, 25% target is a continuation of this stance. Assuming even the most pessimistic trends consistent with Canadian historical experience, the target can be met if desired. However, the strongest justification for such a target does not support a ten year time constraint that would force government to expend resources on debt reduction that could serve other positive social ends. A more passive strategy of indebtedness reduction, where budgets are kept strictly balanced as per commitments and where the debt-to-GDP ratio declines steadily due to GDP growth, would thus be preferable to Goodale's target.

It should be noted in closing that this recommendation should not be seen as a criticism of past Liberal government achievements in debt reduction. It is indeed by virtue of past efforts that the federal government now finds itself in a position where it

can take a passive stance on indebtedness without compromising its needs. However, there comes a time when mantras of cutting and fiscal restraint need to be relegated in favour of other social ends. In the case of the Canadian federal government that time seems to be now.

Appendix 1- Decomposition of the debt-to-GDP ratio

$$\frac{db}{dt} = \frac{PDEF_t}{Y_{t-1}} + (r-\theta)*\frac{D_{t-1}}{Y_{t-1}} \text{ , where:}$$

- $\frac{db}{dt}$ is the change in the debt-to-GDP ratio from time t-1 to time t

- $PDEF_t$ is the primary deficit at time t

- r is the nominal interest rate on public debt

- θ is the growth rate of nominal GDP

- D_{t-1} is debt at time t-1

- Y_{t-1} is nominal GDP at t-1

To derive, use the quotient rule.

$$d\left(^D/_Y\right) = \frac{dD * Y - dY * D}{Y^2}$$
$$= \frac{dD}{Y} - \left(\frac{D}{Y} * \frac{dY}{Y}\right)$$

Since $dD = PDEF_t + r * D_{t-1}$ and $\theta = \frac{dY}{Y}$, and lagging appropriately, we get:

$$d\left(^D/_Y\right) = \frac{PDEF_t}{Y_{t-1}} + r * \frac{D_{t-1}}{Y_{t-1}} - \theta * \frac{D_{t-1}}{Y_{t-1}}, \text{ meaning}$$

$$d\left(^D/_Y\right) = \frac{PDEF_t}{Y_{t-1}} + (r-\theta)*\frac{D_{t-1}}{Y_{t-1}} .$$

This is the same as the above.

Appendix 2- Derivation of formula relating debt repayment to nominal GDP growth

If the debt-to-GDP ratio is 25% t years from now, it must be that:

$$\frac{D_c - D^p}{(1+\theta)^t * GDP_c} = .25 \text{ , where :}$$

- D_c is the current federal net debt,

- GDP_c is current nominal GDP,

- D^p is total debt repaid from now until the time the target is reached,

- θ is the annual growth rate of GDP,

- t is the number of years until the target is reached.

Assume that annual debt repayment grows at the rate of growth at GDP, making the initial value of every year's debt repayment the same.

Thus, with D_a denoting annual debt repayments valued at the initial time,

$$D^p = \sum_{i=1}^{t} (1+\theta)^i D_a = D_a * \sum_{i=1}^{t} (1+\theta)^i .$$

Let $x = \sum_{i=1}^{t} (1+\theta)^i = (1+\theta) + (1+\theta)^2 + \ldots + (1+\theta)^{10}.$ \hspace{2cm} (1)

As such, $(1+\theta)*x = (1+\theta)^2 + (1+\theta)^3 + \ldots + (1+\theta)^{11}.$ \hspace{2cm} (2)

Subtracting (2) from (1),

$x - (1+\theta)*x = (1+\theta) - (1+\theta)^{11}.$ It follows that

$$x = \frac{(1+\theta)^{11} - (1+\theta)}{\theta} .$$

Thus, $D^p = D_a * \dfrac{(1+\theta)^{(t+1)} - (1+\theta)}{\theta}$, meaning that

$$.25 = \frac{D^c}{(1+\theta)^t GDP^c} - \frac{D_a}{(1+\theta)^t GDP^c} * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)} .$$

This can be rearranged to give

$$D_a = [D^c - .25(1+\theta)GDP^c] * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)}.$$

Substituting into this the ten year time frame and 2004 values for federal net debt ($523,648,000,000) and nominal GDP ($1,228,668,000,000) gives

$$D_a = [523,648,000 - 307,167,000,000*(1+\theta)GDP^c] * \frac{\theta}{(1+\theta)^{(t+1)} - (1+\theta)}.$$

Appendix 3- Relationship between nominal GDP growth and years to 25%

Similarly to as in Appendix 2, if the debt-to-GDP ratio is 25% t years from now with no debt repayment, it must be that:

$$\frac{D_c}{(1+\theta)^t * GDP_c} = .25 \text{ , where :}$$

- D_c is the current federal net debt,

- GDP_c is current nominal GDP,

- θ is the annual growth rate of GDP,

- t is the number of years until the target is reached.

It is easy to manipulate this mathematically into:

$$\frac{4D_c}{GDP_c} = (1+\theta)^t \text{ , and from there, into}$$

$$\theta = (4D_c/GDP_c)^{(1/t)} - 1 \text{ .}$$

Substituting for 2004 federal net debt ($523,648,000,000) and nominal GDP ($1,228,668,000,000) gives

$$\theta = (1.705)^{(1/t)} - 1 \text{ .}$$

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