The Erosion Effects of Income Taxes and Inflation on GIC Investment Returns

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Abstract

*This report develops an algorithm which is used to compute the **real** (after-inflation) and **after-tax** returns (RATs) on Guaranteed Investment Certificates (GICs) during the period 1974 to 2003. For our analysis, we assume these products were periodically rolled-over into identical term instruments at the (historical) rates quoted by the major banks and trust companies at the beginning of the year. Our main finding is that annualized RAT returns have been negative for Ontario investors in the top marginal tax rate for a majority of the investigated time period. Even when positive, RATs rarely exceeded one percent during most years. More precisely, any Canadian investor whose marginal tax rate exceeded 35.5% earned, on average, a negative RAT return from 1-year GICs which were continuously rolled over during the last 30 years. And, for longer maturity 3-year and 5-year GICs – for which the quoted interest rates are typically greater -- the breakeven tax rate was only slightly higher. We conclude by arguing that for many Canadians, the strategy of rolling over so-called risk-free GICs outside of a tax shelter is a sure way to destroy long-term wealth.*

1. Introduction and Motivation

A recent study by O'Neill (2003) computed the real (after-inflation) rates of return on term deposits and GICs since 1971 and concluded that fixed term investments have produced positive real returns since 1979. The study argued that GICs preserve purchasing power over long horizons and are therefore safe, relative to mutual funds and similar products that are exposed to the vagaries of the stock market.

Unfortunately, such studies often fail to take into account the annual taxation of accrued interest income earned on GICs held outside of tax shelters. The combined effects of annual taxation of accrued interest and annual inflation can erode most of the nominal returns from GICs, as we show in this paper. Income taxes are imposed on accrued nominal interest income, and the entire inflation impact is imposed on the after-tax returns. For example, if a 1-year GIC offered a

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nominal return of 5%, then an investor with a 40% marginal tax rate would earn 3% (=(1-0.40) * 5%) in after-tax returns. If inflation was 1.2% during that year, the real after-tax return (RAT) would be 1.8% (= 3%-1.2%). This sequence of calculations emphasizes that the entire impact of inflation is imposed on after-tax returns, since tax is triggered on nominal returns. The calculation is more complex when after-tax returns and inflation effects are compounded, and GICs are rolled over a longer investment horizon. We illustrate the detailed mechanics of this calculation in the next section.

Along the same lines, Mintz (2004) argues that even with low inflation rates of 2%, a taxpayer in a 30% tax bracket earning 4% on a GIC ends up paying an effective rate of 60% on the real or inflation-adjusted return. In this case, the tax liability would be 1.2 percentage points (= 30% * 4%) and the real return would be 2% (= 4 % - 2%), thereby making the effective tax rate equal to 60% (=1.2% / 2%).

Indeed, the combined effects of income taxes and inflation can erode a substantial portion of pre-tax nominal returns. In our illustrative example using historical data and assuming annual taxation of accrued interest, an 11% nominal return on a 5-year GIC bought in 1984 and rolled over continuously in 5-year GICs until the end of 2003 yielded an annual real after-tax return (RAT) of only 1.024%.

The objective of this paper is twofold. First, we present and explain the algorithm for computing real after-tax returns from a GIC of any maturity based on the assumption -- and current tax law in Canada -- that accrued interest is taxed annually. Our algorithm emphasizes how one must exercise caution by first deducting income taxes from nominal returns, and only afterwards adjusting for inflation. Second, we apply this algorithm to 30-years of historical data over a variety of sub-periods and GIC product terms and conclude that a surprisingly large number of so-called risk-free returns are actually negative when measured properly. Our results contradict the positive and reassuring message conveyed by the O'Neill (2003) study as we demonstrate how nominal safety can produce real erosion once returns are computed on an after-tax basis.

In a related study documenting the impact of taxes on returns and rankings of Canadian mutual funds, Mawani, Milevsky and Panyagometh (2003)[2] show that an investor with the highest personal marginal tax rate lost approximately 135 basis points to taxes on fund distributions from the average annual pre-tax return of 9.01 percent. Furthermore, distribution policies varied significantly across mutual funds, and therefore fund management (through distribution) could impact the (present value of) tax liability of the unit holder.[3] While mutual fund management can impact the tax efficiency of their distributions and thereby the after-tax returns of their unit-holders, GIC issuers cannot have any such impact. In other words, mutual funds compete on pre-tax nominal returns as well as on sound distribution policies, while GIC issuers compete solely on pre-tax nominal returns.

[2] This study can be downloaded from http://www.ctf.ca/ctjindex/issues.asp and then looking up the article in volume 51, no. 2 (2003).

[3] The average absolute value of the difference between pre-tax rankings and pre-liquidation after-tax rankings caused by mutual fund distributions was 28. In other words, the average fund moved 28 places higher or lower in a ranked list of the 343 funds in the study.

Evolution of Tax Rules

The rules for taxing interest income earned on multi-period compound interest GICs have changed over time. Prior to November 12, 1981, interest income earned on GICs and Canada Savings Bonds could be reported on a cash[4], a receivable[5], or an accrual[6] basis, as long as the reporting method was applied consistently for all debt instruments from a particular source.

The November 1981 federal budget changed this to require interest income to be taxed every three years effective January 1, 1983, thereby reducing the deferral previously available. These three-year rules were introduced to restore equity and neutrality, as well as curtail some abuses arising from issues such as striped bonds. Interest income could also be reported on an accrual basis by filing an irrevocable election[7] for specific debt instruments for all subsequent years. Taxpayers not electing to report interest income on an accrual basis were required to include in income any unreported interest income accrued after December 31, 1981 on each third anniversary of the debt contract.[8] The third anniversary was deemed to be December 31 of the third taxation year following the year in which the debt obligation was acquired.[9] However, for debt instruments acquired before 1982, the first third anniversary date was deemed to be December 31, 1987.[10]

Recognizing interest income every three years on GICs with maturities greater than three years could be detrimental to the extent that the aggregate three-year income may be partially taxed at a higher marginal tax rate. In addition, the $1,000 investment income deduction[11] available annually would not be fully used if interest income is reported only every three years. However, the offsetting benefits include three-year deferral, as well as potential preservation of the personal exemption in the intervening two years for low-income Canadians (including children).[12] The net costs or benefits for any given taxpayer are difficult to generalize, since tax planning schemes may involve spreading income over several years, or concentrate income in a specific year (to utilize tax credits or to offset low employment income, for example).

In our analysis below, we assume that interest income earned on multi-year GICs held at December 31, 1982 was first taxed on December 31, 1987, and every three years thereafter. We also separately show the effects of reporting accrued interest income every year on GICs of all maturities, as required under current law. Reporting of annual accrued interest income may be more realistic for small investors with limited financial assets, and the $1,000 annual investment income deduction not fully utilized.

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[4] Paragraph 12(1)(c) of the ITA.
[5] Ibid. The receivable basis requires interest income to have been earned with the investor having the right to require payment. In the tax context, "receivable" means legally receivable, and not receivable in the accounting sense that has a much broader definition.
[6] IT-396R, paragraphs 1 and 5, dated May 29, 1984.
[7] Subsection 12(8).
[8] Subsection 12(4).
[9] Paragraph 12(11)(b).
[10] Ibid.
[11] Section 110.1
[12] Recognizing interest income annually may lead to the loss of the personal exemption every year.

The rules were changed again in the April 26, 1989 federal budget to require accrued interest income to be taxed annually instead of every three years. Taxpayers got an opportunity until December 31, 1989 to invest in compound interest GICs that would continue being subject to the three-year accrual rules rather than annual accrual. Since January 1, 1990, compound debt instruments such as GICs have been taxed annually on accrued interest income, and issuers have had to report the annual accrued interest on T5 information slips. In our analysis below, we assume that annual interest income accrued on multi-year GICs held at December 31, 1989 continue to be taxed every three years until the GIC is rolled over into a new GIC. Interest income on new (or rolled over) GICs invested on or after January 1, 1990 is considered taxed on December 31, 1990, and every December 31st thereafter.

In sum, our subsequent analysis and historical numerical results assume a hypothetical investor who purchased – and then rolled over – 1, 3 and 5-year compound GICs, and deferred the tax reporting of interest income until the latest possible date for that particular product under the tax rules in effect at that time.

The remainder of this paper is organized as follows. In the next section we illustrate the mechanics of computing a real after-tax (RAT) ex-post[13] return for any multi-period fixed income product that is taxed annually on its accrued interest (as required under current law), and provide a numerical example. Section 3 describes the sources for our data series for GIC returns, inflation rates and historical tax rates. Section 4 discusses our main results and Section 5 concludes with some normative guidance on long-term portfolio construction in the presence of inflation and income taxes.

2. Analytics and Numerical Example for Annual Taxation of Accrued Interest

The mathematics underlying the calculation of a real after-tax (RAT) return for a fixed income product that is taxed annually on its accrued interest is relatively straightforward.[14] This section reviews the algebra of such a calculation. With historical data in hand, we arbitrarily start on January 1st of a particular year and assume that $1 is invested in a GIC with a maturity of m years, where $m=1,3,$or 5 years for this study. GICs with maturity greater than one year most commonly re-invest all interest income and are sometimes referred to as *compounding* GICs.

We denote the value of the Consumer Price Index (CPI) at the start of any given year, by the symbol CPI_i, where i is the year in question. We let τ_i denote the highest marginal tax rate (federal plus provincial) in Ontario for that particular year and let R denote the quoted (nominal) interest rate on the GIC. The real after-tax return (RAT) is computed using these three input variables as follows (the symbol Π denotes the multiplication operator):

[13] It could be argued that investors consider expected inflation rates when deciding whether to invest in GICs, and therefore the relevant measure of interest is the expected real after-tax return.

[14] All the analysis in this paper assumes that individuals have exhausted the then section 110.1 annual investment income deduction of $1,000 that was available up to and including 1987.

$$RAT = \left(\frac{CPI_1}{CPI_{m+1}} \prod_{i=1}^{m} (1 + R(1 - \tau_i)) \right)^{1/m} - 1. \qquad (1)$$

Intuitively, the internal part of the expression multiplies-out the after-tax value of the funds within the GIC to obtain a total return. Note that we allow tax rates to change each year (period) but the interest rate *R* remains fixed, since it is the quoted fixed rate for the term of the GIC. Accrued interest is assumed to be taxed annually, hence the amount invested grows at the rate of $R(1-\tau_i)$ instead of *R*. The formula then scales this value by the cumulative point-to-point change in the CPI over the period, thus netting-out inflation. Finally, it computes the n'th root (and subtracts one) to arrive at an annualized rate of return. Equation (1) clearly demonstrates the risk in committing to a long-term GIC. Once a particular interest rate *R* has been locked-in, the random evolution of future income taxes and CPI are unknown. This creates substantial uncertainty and potential for loss in consumption power if either inflation or income taxes are higher than anticipated. We find that investors are compensated for this risk – albeit minimally – as evidenced by the higher RAT returns for longer-term GICs, which we document in section 4.

Note that equation (1) computes the RAT return for one particular product maturity – for example, *m=5* years. If, upon maturity, the remaining funds are re-invested in another GIC product, the calculation starts anew and a second (or third or fourth) RAT return is computed. For example, there were 4 five-year terms in the period January 1984 to January 2004 and the above methodology therefore produces four RAT numbers. The reported RAT for the period 1984 to 2004 would be the geometric average of these four numbers.

Note also, that for sub-periods during which interest income could be taxed on a cash or receivable basis, the variable *R* in equation (1) would represent a total return as opposed to an annualized return.

Along the same lines, when computing a RAT return for a 1-year GIC, equation (1) would collapse to a simple-looking formula:

$$RAT = \frac{1 + R(1 + \tau)}{1 + \pi} - 1, \qquad (2)$$

where the symbol π denotes the inflation rate for that particular year.

The following example illustrates how RATs are calculated based on the raw historical data from Table 1 and based on annual taxation of accrued interest income. Assume that on January 1, X1, the (average) interest rate on a 5-year GIC was 11%.

Table 1
Raw Data for Numerical Example

	5-year GIC Rate	**Highest Tax Rate**	**CPI Value**
January 1, X1	11%	50.3%	63.524
January 1, X2		52.0%	

January 1, X3		54.9%	
January 1, X4		52.5%	
January 1, X5		46.1%	
January 1, X6			78.414

A taxable investor that invested \$1 in an average 5-year GIC on January 1, X1 would accumulate $\$1(1+0.11)^5 = 1.685$ on December 31, X5 before taxes and inflation. On an after-tax basis, the 11% annual accrued interest payment would trigger an annual tax liability. (1-0.503)*11% or 1.05468 would accrue to the investor by the end of the first year, and (1-0.520)*11% or 1.0528 would accrue to the investor during the second year. At the end of the fifth year (i.e., one instant prior to January 1st, X6), the after-tax nominal (pre-inflation) value accumulated in the GIC is the product of (1.05468)(1.0528)(1.04959)(1.05221)(1.0592), or \$1.2988. Note that the accumulated amount at the end of five years reflects compounded interest (or interest on interest). Even though the nominal quoted rate remains 11% per annum for the entire 5-year period, the interest factors differ each year because the highest marginal tax rates were different each year during the 5-year period in question. If tax rates had been the same over the 5-year period, the computation would be a much simpler $(1+.11(1-\tau))^5$.

It is critical to note that under current tax rules, even though the actual 11% interest income compounds and grows unfettered within the GIC, the tax liability on accrued interest income is assumed to be paid annually from external sources, thereby implicitly reducing the net growth rate for the investor. Mawani, Milevsky and Panyagometh (2003) make a similar realistic assumption for annual taxes paid on distributions from mutual funds in their study comparing pre-tax and after-tax rankings of mutual funds. Thus, although it might appear that the \$1 invested grows to \$1.685 when the GIC matures in five years, it is important to remember that income taxes have been paid annually on accrued interest income – likely from other sources – and the after-tax maturity value of the GIC is (only) \$1.2988 per dollar invested.

The penultimate step is to acknowledge that the after-tax amount of \$1.2988 reflects nominal purchasing or consumption power. Rational investors sacrifice current consumption (or invest) in order to enjoy higher consumption power on at least an expected basis. Therefore, the \$1.2988 after-tax nominal accumulated amount needs to be adjusted for inflation by dividing-out the compound 23.43% inflation rate
(= 78.414/63.524 = 1.2343, or 23.43%). The 23.43% reflects the change in the CPI during the 5-year period in question. This leads to a real after-tax value of \$1.05224 at the end of five years. Ergo, the real after-tax return (RAT) is the fifth root of this quantity (minus one), which leads to a RAT value of 1.024%.

Therefore, the annual real economic return (or increase in consumption power) from the 5-year 11% GIC purchased on January 1, X1 and redeemed on January 1, X6 was just over 1% on an after-tax, after-inflation basis, assuming annual taxation of accrued interest income since X1.

This (enormous) reduction of close to 10 percentage points is an erosion of more than half the nominal return due to taxes, plus an additional eroding impact of a cumulative 23% inflation over the five year period. By definition, RAT returns are negative if the cumulative inflation rate

exceeds the total after-tax return from the GIC. As we show later on in the paper, this occurred over many years during the 1974 to 2004 period.

If income taxes were to be ignored all together as in O'Neill (2003), and only the cumulative 23.4% inflation taken into account, the pre-tax after-inflation annualized return would be calculated as follows. The maturity value would be grossed-down by the inflation factor which leads to $(1.685/(1+0.2343))^{0.2} - 1 = 6.422\%$. While inflation still erodes 4.578 percentage points from the nominal return of 11%, the 6.422% rate is much higher than the after-tax real return of 1.024% calculated above. Our RAT algorithm demonstrates that it is theoretically and technically incorrect to compute an after-tax value of the 6.422% by carelessly lopping-off a 50% tax rate from this number. Indeed, the proper way to compute the RAT return is to subtract income taxes on accrued interest income each and every year, thereby reducing the cumulative compounding effect.

Our choice of the *highest* (Ontario) marginal tax rate to compute after-tax returns may be controversial on the grounds that investors in the highest marginal tax rate may not be the appropriate clientele for GICs. We therefore augment our study with additional analysis that inverts equation (1) and *solves* for the implied tax rate τ that would yield a *RAT* return of zero. Investors facing a marginal tax rate greater than the breakeven implied rate would realize negative RATs, while investors facing marginal tax rates below the implied breakeven rate would realize positive RATs. Results on the frequency of positive and negative RATs are reported in section 4. We also report the estimated proportion of the Canadian population that falls into the marginal tax bracket that yields positive and negative RATs.

3. Data Source

For this analysis, we required historical data on GIC rates, inflation, as well as income tax rates. GIC rates for one, three and five-year terms were obtained from Statistics Canada Cansim Table #176-0043, *Financial Market Statistics*[15]. For the period 1974-1980, the data series for one and five-year terms for *Canada Trust GIC Rates* were used. Arithmetic averages of the corresponding one-year and five-year rates were used to estimate three-year GIC rates during the period in which the 3-year numbers were missing. From 1980 to 2003, the data series for all three terms (1, 3 and 5-year) for *Canada Bank GIC Rates* were used, with the exception of 1981 and 1982 during which an arithmetic average of one and five-year terms was used for the three-year rate.

Since the three and five-year term GICs have a fixed rate over the entire term, the rate that corresponds to the year in which the GIC was purchased (i.e., when the last GIC matures and must be rolled over) was used in our algorithm. For example, if a 5-year GIC was purchased in early January 1984, it would be rolled over in early 1989 at the 1989 rate. All investments are assumed to begin in 1974, thereby allowing the final rolled-over GIC to mature in 2003 for all three terms (1, 3 and 5-year terms).

[15] http://cansim2.statcan.ca/cgi-win/cnsmcgi.exe?Lang=E&RootDir=CII/&ResultTemplate=CII/CII___&Array_Pick=1&ArrayId=1760043

In order to demonstrate the eroding impact of taxes and inflation over a long horizon, one and five-year GICs were simulated to be rolled over ten, 20 and 30-year horizons. For the three-year GIC, rollovers were simulated over nine, 21 and 30-year horizons (time horizons in this case must be multiples of three).

Historical combined (federal – provincial) top marginal tax rates in Ontario were sourced from Saez and Veall (2000) and used to calculate the annual erosion caused by income taxes on accrued interest income. CPI data (with a base year of 2000) were also sourced from Saez and Veal (2000) for the 1974 - 2000 period, and from Statistics Canada for the 2002-03 period.

Historical upper and lower bounds of income tax brackets were sourced from annual versions of *The National Finances* and *Finances of the Nation*. The fractions of the population in those approximate brackets were sourced from the CRA annual income statistics reports in *Interim Basic Table 2A - Taxable returns by total income class.*[16]

4. Results

Table 2 shows that all 1, 3 and 5-year GICs that started investing in 1974 yielded negative real after-tax returns (RATs). The culprit for this quite jarring result is both the high inflation of the early 70s as well as the high marginal tax rates that were imposed at high-income levels. RATs improved over time as inflation was brought under control and marginal tax rates started to come down. However, annual RATs rarely exceeded 1%. In all cases, and consistent with theory, longer-term maturities yielded higher RATs than shorter-term maturities, reflecting the higher returns demanded by longer-term investors for the greater risk of not being able to switch investments or renegotiate returns. Table 2 also shows that RATs have been increasing over time, illustrating that the positive effects of lower inflation and lower marginal tax rates outweigh the negative effects of lower nominal rates offered on GICs.

Our analysis provides evidence of yet another risk that might be priced and compensated by the market, and that is the risk of unexpected taxation increases. In other words, an investor who buys a long-term GIC faces the well-known risk that unexpected inflation might erode the purchasing power of the deposit, and thus demands a compensating risk premium. But, in addition, a long-term investor who locks-up the funds also runs the risk of incurring higher taxation in the future – to the extent that government policy is unpredictable – and might demand compensation for this risk as well. While it is difficult to disentangle the two effects, our results do not negate either hypothesis.

Table 3 shows that the proportion of all GICs yielding positive (negative) RATs for their holders ranged from 75 percent (25 percent) for 5-year term holders in 1984 to 33.33 percent (66.67 percent) for 3-year term holders in 1995. Clearly, a substantial segment of the investing public consistently realized negative RATs, thus not making GICs their natural habitat. *Ceteris paribus*, GICs with longer maturities were more likely to yield positive RATs than GICs with

[16] http://www.ccra-adrc.gc.ca/tax/individuals/stats/menu-e.html

shorter maturities, reflecting the risk premium demanded and earned for locking-in over longer maturities, as discussed above.

The breakeven marginal tax rates at which the inverted equation (1) yields a *RAT* return of zero are shown for various GIC terms and investment years in Table 4. Investors facing a marginal tax rate greater than breakeven rates realize negative RATs, while investors facing marginal tax rates below the breakeven rates realize positive RATs. Longer maturities are able to handle higher tax rates, reflecting the relatively higher pre-tax nominal returns for longer-term maturities. For example, in 1974 an investor with a marginal tax rate of 35.55% earned a RAT return of exactly zero percent on a 1-year GIC rolled over every year.

Column 1 of Table 5 details the annual maximum income levels over the 1974-2003 period that triggered marginal tax rates of 35.55%. This maximum income level increased almost every year, reflecting the partial indexation for inflation on basic personal tax credits and exemptions. Column 2 of Table 5 details the 2003 purchasing power (as reflected by the CPI) of the amounts in Column 1. For example, $30,000 in 1994 had the same purchasing power as $36,082 in 2003. Finally, Column 3 details the percentage of Canadians whose incomes exceeded the amounts in Column 1 for each year. For example, 46.39% of Canadians earned incomes that exceeded $30,000 in 1994, and therefore had marginal tax rates that exceeded 35.55%, which then would have earned negative RATs on 1-year GICs rolled over continuously since 1974. With higher upper bounds of tax brackets reflecting lower tax rates, relatively fewer Canadians experienced negative RATs in recent years. The low inflation rates in recent years have also contributed to the lower incidence of negative RATs. This lower incidence of negative RATs has persisted despite lower pre-tax nominal rates of return.

Table 6 displays the highest marginal tax rate in Ontario during a given year, as well as the CPI level at the start of that year. Both of these numbers were used as inputs for the calculations underlying Tables 2, 3 and 4. Finally, Table 7 displays the assumed timing of tax liability on accrued interest income used in our analysis. It reflects the maximum deferral allowed to the taxpayers under the rules in effect at that time.

5. Conclusion

We have provided comprehensive documentation of the after-inflation, after-tax returns from all available Guaranteed Investment Certificate (GIC) series over the last 30 years. GICs have always been, and are expected to remain, a sizable component of Canadians' asset pool mix within the category of fixed income investments. For example, within the growing pool of assets held by Canadians, the size of the fixed income component of the asset mix is expected to double from $494 billion in 2000 to $988 billion in 2010.[17]

Our main points can be summarized as follows:

[17] 31% of $1,594 total asset pool in 2000 to 23% of $4,295 total asset pool in 2010 as described on pages 2-3 of Gerry McCaughey, CIBC Wealth Management presentation on June 27, 2001 available at http://www2.cibc.com/download/WM_June_Lunch_HO.pdf

1. During the last 30 years, Canadians with a marginal tax rate – i.e. the rate they paid on their next dollar of income - greater than 35.5% earned negative after-tax and after-inflation rates of return from investing and rolling-over short-term (1-year) GICs.
2. For those who consistently invested (and rolled over) longer-term (5-year) products, the breakeven marginal tax rate was slightly higher at 42.06%. This means that if the investor's marginal tax bracket was greater than 42.06% their RAT return was negative and if their marginal tax bracket was less than 42.06% their RAT return was positive.
3. We find support for the hypothesis that longer-term GICs compensate the typical investor for bearing both inflation risk and taxation risk.
4. Using aggregate statistics we find that close to a third of the taxpaying population during the 1974 – 2003 period of analysis fell in the category of higher than breakeven tax rates, and therefore earned negative RATs on their GICs if they were held outside of a tax shelter.
5. RATs in the early 1980s – a period in which nominal interest rates quoted on GICs were quite high – were actually lower than today's RATs. This re-enforces the importance of looking beyond the (quoted) nominal number when making investment decisions.
6. On a positive note, RATs have been going up steadily over time since 1980, illustrating that the positive effects of lower inflation and lower marginal tax rates outweigh the negative effects of lower nominal rates offered on GICs.

Aside from documenting the correct algorithm and numerical results, we believe our paper provides a sobering wake-up call to those who consistently rollover short-term GIC products outside of tax shelters such as RRSPS and RESPs. And, while it is impossible to accurately predict future inflation and income tax rates, history does not provide us with a re-assuring verdict.

In sum, if you own GICs, make sure they are sitting in a tax shelter.

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Table 2*: Average Annual RAT (Real After Tax) Returns (%)*

	Year in which investment was made				
Investment Term	***1974***	***1983***	***1984***	***1994***	***1995***
1-Year Term	**-1.2964**		**0.2140**	**-0.2904**	
3-Year Term	**-0.6090** ***-0.8571****	**1.1145** ***0.9714****			**0.6559**
5-Year Term	**-0.4916** ***-0.8898****		**1.2432** ***1.0004****	**0.2355**	

Notes: Table 2 displays the annualized real after-tax return from GICs of various maturities that are rolled over into GICs of identical maturities on a continuous basis until December 31, 2003. For example, an Ontario investor in the highest-tax bracket who purchased a 1-year GIC on January 1, 1974 and rolled-over the maturing value each and every year until December 31, 2003 would have earned a compound annualized return of -1.2964 percent after taxes and after inflation. If the same taxpayer invested in a sequence of 3-year GICS over the 30-year period, he or she would have earned a compound annualized return of -0.8571 percent if accrued interest income was taxed annually, and -0.6090 percent if interest income was taxed upon receipt until December 31, 1981, taxed on accrual every three years during 1982-1989, and taxed annually thereafter (as required under the tax rules in effect during these sub-periods). In contrast, an Ontario taxpayer who rolled-over 3-year GICs starting in 1983 would have earned a 0.9714 percent compound annualized return if accrued interest income was taxed annually (as required under current law) and 1.1145 percent if interest income was taxed according to the actual rules in effect during the historical sub-periods. Results are based on Statistics Canada historical returns, adjusted for inflation and taxes, and compounded annually.

Where there are two numbers in a cell, the first number is derived on the assumption that interest was taxed according to the actual rules in effect during the historical sub-periods, and the second (with asterisk *) number is derived on the assumption that accrued interest was taxed annually (as is the current law) every year.

Table 3: Percentage *of Annual RATs that were positive*

	Year in which investment was made				
Investment Term	***1974***	***1983***	***1984***	***1994***	***1995***
1-Year Term	**40**		**60**	**40**	
3-Year Term	**50**	**71**			**33**
5-Year Term	**50**		**75**	**50**	

Notes: Based on the analysis done in Table 2, Table 3 displays the percentage of years during which the real after-tax (RAT) return was positive. For example, an Ontario investor in the highest marginal tax bracket who purchased a 1-year GIC on January 1, 1974 and rolled-over the proceeds until December 31, 2003 would have earned a positive annual RAT 40 percent of the time.

Table 4: *Breakeven tax rates (at which Annual RAT return = 0)*

	Year in which investment was made				
Investment Term*:*	***1974***	***1983***	***1984***	***1994***	***1995***
1-Year Term	**35.55**		**53.52**	**41.15**	
3-Year Term	**44.33** ***42.67****	**64.15** ***62.86****			**61.75**
5-Year Term	**45.87** ***42.06****		**66.64** ***63.33****	**54.41**	

Notes: Table 4 illustrates the marginal tax rates (in percentage) at which the RAT return would be exactly zero during the period and for the rollover strategy in question. For example, an Ontario taxpayer who purchased a 1-year GIC in 1974 and rolled-over the proceeds until 2003 would have experienced a negative RAT return if their marginal tax rate was *above* 35.55 percent during each of the 30 years. In contrast, had the same person rolled-over 5-year GICs, the breakeven tax rate would have been 42.06 percent. In this case, investors would have earned a positive RAT return as long as their marginal tax rate was *less* than 42.06 percent in each year.

Where there are two numbers in a cell, the first number is derived on the assumption that interest was taxed according to the actual rules in effect during the historical sub-periods, and the second (with asterisk *) number is derived on the assumption that accrued interest was taxed annually (as is the current law) every year.

Table 5: *Breakeven Income Levels*[18]

1-Year GIC Breakeven rate = 35.55% during 1974-2003

Year	Maximum Break-Even Income level[19]	Income Equivalent in Today's $	% of Population Above B/E Level[20]
1974	$11,727	$46,259	14.69
1975	$12,915	$45,925	22.43
1976	$14,377	$47,541	30.20
1977	$15,610	$47,876	17.83
1978	$13,690	$38,520	43.25
1979	$18,239	$47,007	27.37
1980	$19,867	$46,513	34.13
1981	$21,814	$45,435	26.10
1982	$20,017	$37,606	31.92
1983	$21,223	$37,679	35.18
1984	$22,285	$37,918	37.52
1985	$23,311	$38,130	39.38
1986	$23,497	$36,909	38.12
1987	$23,755	$35,758	40.19
1988	$27,501	$39,785	34.34
1989	$27,803	$38,324	37.17
1990	$28,276	$37,180	39.38
1991	$28,784	$35,850	41.15
1992	$25,591	$31,395	43.37
1993	$29,591	$35,660	43.74
1994	$30,000	$36,082	46.39
1995	$30,000	$35,320	45.32
1996	$30,000	$34,753	46.15
1997	$30,000	$34,204	47.40
1998	$30,000	$33,889	48.88
1999	$40,000	$44,409	33.55
2000	$51,944	$56,145	19.94[21]
2001	$61,510	$64,843	17.37
2002	$63,355	$65,161	16.73[22]
2003	$64,871	$64,871	16.21

[18] These are the maximum income levels that trigger tax rates less than the 1-year GIC break-even rate in each year
[19] Source for historical tax brackets: The National Finances, *Canadian Tax Foundation*, annual editions
[20] Source: CRA Income Statistics Reports
[21] 2000-03 percentages are calculated based on interpolation of the income levels in the CRA Income Statistics Reports
[22] 2002-03 percentages are calculating using 2001 income distribution and 2002-2003 marginal tax rates

Notes: Table 5 displays the percentage of Canadians who earned income sufficiently high enough to place them in a marginal tax rate higher than the break-even numbers computed in Table 4. Since these numbers are expressed in dollars relevant to the year in question, we also show equivalent purchasing power in 2003 for comparison purposes. For example, in 1975, a total of *at least* 22.43% of the population earned an income above $12,915, which would have triggered a marginal tax rate just above 35.55% (which was the breakeven number computed in Table 4). In 2003 dollars, the $12,915 would become $45,925.

Table 6: *Tax Rates and Consumer Price Index (CPI) Data*

Year	Highest Marginal Tax	CPI 2000[23]
1973	61.3	24.758
1974	61.3	27.401
1975	61.3	30.396
1976	61.3	32.687
1977	61.9	35.242
1978	61.9	38.414
1979	61.9	41.938
1980	61.9	46.167
1981	62.8	51.894
1982	50.3	57.533
1983	50.3	60.881
1984	50.3	63.524
1985	52.0	66.079
1986	54.9	68.811
1987	52.5	71.806
1988	46.1	74.714
1989	47.2	78.414
1990	48.2	82.203
1991	48.8	86.784
1992	49.1	88.106
1993	51.5	89.692
1994	51.5	89.868
1995	52.3	91.806
1996	52.0	93.304
1997	49.0	94.802
1998	49.4	95.683
1999	48.3	97.357
2000	47.9	100.000
2001	46.4	102.53
2002	46.4	105.09
2003	46.4	108.09

Notes: Table 6 displays the highest marginal tax rate in Ontario during a given year as well as the Consumer Price Index (CPI) level at the start of that year. Both these numbers were used as inputs for the calculations underlying Tables 2, 3 and 4.

[23] Source: Statistics Canada

Table 7: *Assumptions about Timing of Taxes Payable*

GIC Purchased on January 1st	Taxes Payable for 1-Year GICs on December 31st	Taxes payable for 3-Year GICs on December 31st	Tax payable for 5-Year GICs on December 31st
1974	1974	1976	1978
1975	1975		
1976	1976		
1977	1977	1979	
1978	1978		
1979	1979		1983
1980	1980	1982	
1981	1981		
1982	1982		
1983	1983	1985	
1984	1984		1986, 1988
1985	1985		
1986	1986	1988	
1987	1987		
1988	1988		
1989	1989	1991	1991, 1993
1990	1990		
1991	1991		
1992	1992	1992, 1993, 1994	
1993	1993		
1994	1994		1994, 1995, 1996, 1997, 1998
1995	1995	1995, 1996, 1997	
1996	1996		
1997	1997		
1998	1998	1998, 1999, 2000	
1999	1999		1999, 2000, 2001, 2002, 2003
2000	2000		
2001	2001	2001, 2002, 2003	
2002	2002		
2003	2003		

Notes: Table 7 displays the years in which taxes were assumed to be payable for our analysis for GICs purchased in the given years. The table reflects the maximum deferral allowable under the tax law in effect during the year of purchase. The hypothetical investor is assumed to defer paying income taxes until the latest possible date for that particular product under the tax rules applicable at that time. Also note that taxes are payable at the end of the calendar (or taxation) years.