

# The uses of real return bonds

Real Return Bonds provide asset growth

commensurate with the liability growth of the plan sponsor

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**T**he introduction of inflation indexed bonds in the U.S. has ushered in a new era for U.S. investors. They are the only real asset class which naturally hedges inflation and the inflation uncertainty embedded in nominal financial investments. This feature is of potential value to all long-term investors; and in particular to pension funds, insurance companies and individuals seeking a predictable real return to match liabilities linked to inflation. In Canada, investors have had the benefits of inflation indexed bonds, known as Real Return Bonds (RRBs), since 1991.<sup>1</sup> These benefits include:

## 1. Serving as an inflation hedge

Nominal bonds are exposed to purchasing power risk, as inflation erodes the value of the bond. As the market's expectation for inflation increases, nominal bond value falls.<sup>2</sup> The detrimental effects of increasing inflation on nominal bond returns was clearly evident in the 1990s. In addition, because the market cannot perfectly forecast inflation, nominal bonds also subject investors to the uncertainty of future inflation rates. In the long term, the historical real return on nominal bonds has tended to be biased downward, as investors failed to account for such unanticipated inflation.

In contrast, RRBs make real payments tied to the rate of inflation, while nominal bonds make fixed nominal dollars payments. Further, RRBs also completely eliminate inflation uncertainty or the possibility of misestimating the expected average inflation rate.

## 2. A distinct asset class

For an asset class to be distinct, it must have unique characteristics not shared by other asset classes. In contrast to nominal bonds or other financial assets, RRBs are a natural hedge against inflation and the inflation uncertainty imbedded in nominal financial instruments. There is no other asset class that provides such inflation protection.

To the extent that RRB returns are positively correlated with inflation and nominal bond returns are negatively correlated with inflation, RRBs should further help to diversify fixed income portfolios.

## 3. A "matching" asset for pension funds

Most pension plans have rate of return targets

expressed in real (rather than in nominal) terms because the plan contains either an explicit indexing provision, or the plan sponsor intends to grant future inflation-based improvements on an ad-hoc basis. Intuitively, RRBs should be especially attractive to pension plan sponsors when these yields meet or exceed their real return objectives.

RRBs are also a desirable pension fund investment, given their inflation-matching and real return properties. Pension plan liabilities grow over time as benefits are updated to keep current with salaries of active members and the cost of living for retirees. Regardless of the particular arrangement, the inflation-linked growth of RRB principal and coupon payments helps ensure asset growth commensurate with inflation-linked benefit growth over the long term.

The matching of inflation-linked benefits with RRB principal growth also suggests that RRB interest rates are appropriate for calculating market values of indexed liabilities. This ensures that the market value of liabilities and RRB asset values are highly correlated as RRB interest rates change over time. RRBs provide plan sponsors with a risk-management tool to hedge asset/liability risk in real terms and secure indexed benefits at more predictable long-term costs when compared to nominal bonds.

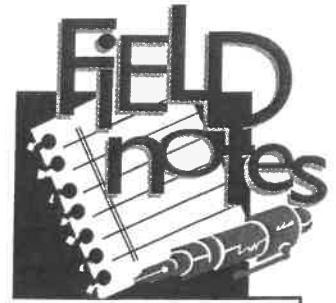
## Different Economic Scenarios

Forecasting capital markets should involve consideration of alternative economic scenarios to assess the effectiveness of investment policy recommendations. Moreover, most research supports the view for time-varying returns, risks and correlations.<sup>3</sup>

Three distinct economic scenarios were employed to determine the impact of investment policy recommendations over a long-term investment horizon (at least 10 years). These scenarios were developed from the current economic environment (see Table 1, page 41).

Efficient frontier analysis was applied to these scenarios. Efficient frontier analysis is one of the more widely accepted methods employed to evaluate alternative asset classes and asset allocation decisions. The

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efficient frontier is a curve upon which all the portfolios lie which maximize expected return for a given degree of risk and minimize risk for a given return. The efficient frontier results illustrate that RRBs can provide distinct portfolio diversification benefits. In the current economic environment, RRBs are a strong component across efficient portfolios, representing about 25% of the optimal mixes across the frontier.

In a high inflation era, RRBs dominate the efficient frontier across all risk levels. In the optimal mixes, RRBs range from 35% to almost 65% of the composition of the efficient portfolios. Those results display the unique asset characteristics of RRBs and their diversification benefits under different economic environments.

### Applications For Pension Plans

For pension plans, the impact of economic risk on liabilities is an important consideration in long-term asset allocation decisions and the setting of investment policies. These risks can be analysed by projecting both assets and liabilities over time under various economic scenarios. Adding volatility to capital market and liability projections produces a range of possible outcomes for each scenario. In addition to adding realism to the projections, this is useful for analyzing downside risk and identifying opportunities.

To illustrate the impact of including RRBs as a separate asset class, 10-year projections of annual pension expenses and the ratio of assets to liabilities at market value for a pension plan that provides full cost of living increases to retirees were prepared.

Each projection consists of 500 Monte Carlo simulations allowing reasonable deviations from the scenario forecasts. All the simulations start with the current environment and trend towards the 10th year projected position of each scenario (see Table 2, page 42).

### 1. Pension expense

Under current market expectations (Scenario II), the median projected 10th year pension income was 3% under both asset mixes. There was no material difference in the median results between asset mix A and B, because

the projected returns for nominal bonds and RRBs are similar. This result is expected for an indexed pension plan in an era of stable inflation and relatively high real yields.

Under disinflation (scenario I), the median results were more favourable for asset mix A (without RRBs). Conversely, under higher inflation (scenario III), the median results were more favorable for mix B (with RRBs).

When considering results across all 3 scenarios, asset

mix B (with RRBs) provides a significant reduction (42%) in the range of 10th year pension expense for scenarios with average annual inflation in the 1% to 4.25% range. Also, when considering the results within scenarios I (disinflation) and III (higher inflation), the 10th year pension expense shows less downside risk when RRBs are included in the portfolio.

### 2. Solvency ratio

When considering median results across the different scenarios, the ratio shows a modest reduction in the higher inflation scenario when RRBs were not included in the asset mix, offset by a modest increase in the low inflation scenario. Within both scenarios I (disinflation) and III (higher inflation), the

ratio of assets to the liabilities at market values in the 10th year shows less downside risk when RRBs are included.

### Inflation Protection

An allocation to RRBs provided significant inflation protection in two ways. First, when considered across different scenarios with average annual inflation ranging from 1% to 4.25%, RRBs reduced the range of 10th year median pension expense by 42%. Secondly, within each specific scenario, there was less downside risk when RRBs significantly replaced nominal bonds.

These results emphasize the concept that RRBs have a unique role to play in pension investing because RRBs provide asset growth commensurate with liability growth. This means that RRBs tend to provide higher asset growth

Table 1

## Testing under different scenarios

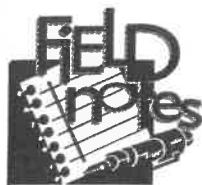
*The return of RRBs compares favorably with other assets, under different economic scenarios.*

### Projected Over 10 Years

Scenario	I	II	III
Average Inflation Rate	1.00%	2.50%	4.25%
SMIU Return	6.90%	6.85%	6.75%
RRB Return	5.60%	7.15%	9.00%
Cdn. Stocks Return	7.00%	8.50%	10.25%
Foreign Stock Return	7.00%	8.50%	10.25%

Scenario II (current expectations) was derived by assuming the Scotia McLeod Universe Bond Index (SMIU) and RRBs would remain unchanged for the next ten years. The 3% differential between the 1995 year end Canada bond yield (7.5%) and the RRB yield (4.5%) is deemed to be the market's expectation for inflation over the next 20-30 years. Given the 1995 inflation rate of 2%, we surmised a modest increase to 2.75% in 2005, resulting in an average inflation rate of 2.5% over the 10 year period. This would be consistent with a Canada bond yield in the 7%-7.50% range in 2005. Scenario I (disinflation) was obtained by reducing the expected 10th year inflation rate by 2% to 0.75%. Scenario III (higher inflation) was obtained by increasing the expected 10th year inflation rate by 2% to 4.75%. The projected spread between SMIU and long Canada bond yields in 2005 is in the .25%-.75% range, consistent with historical experience. The yield and inflation assumptions were used to estimate average total returns over the 10 year projection period, as illustrated above.

The expected yield on RRBs was held constant at 4.5%, and real stock returns at 6%, to test the sensitivity under different economic conditions.



in economic conditions that produce experience losses on the liability side of the balance sheet, and vice versa, resulting in more predictable costs.

### Applications For Indexed Annuities

Real return bonds are a natural hedge for life annuities indexed to the cost of living. Existing examples of indexed annuities include Workers' Compensation (WC) awards and disability benefits provided by casualty insurance companies. Managing risk for life annuity portfolios is typically accomplished by projecting cash flows, assets and liability values under alternative economic and demographic scenarios.

Table 2

### Projected 10th year medians

Scenario	I Disinflation		II Current Market Expectations	III Higher Inflation	
	A Without RRBs	B With RRBs	A and B Both With and Without RRBs	A With RRBs	B Without RRBs
<b>Pension Expense/ (Income) as a % of Payroll</b>	(5%)	(2%)	3%	5.5%	8%
<b>Asset to Liability Ratio at Market Values (Solvency ratio)</b>	130%	128%	126%	124%	122%

Asset Mix A: Canadian equity 30%, foreign equity 20%, nominal bonds 50%, RRBs 0%

Asset Mix B: Canadian equity 30%, foreign equity 20%, nominal bonds 25%, RRBs 25%

The following illustrations show the results of such projections for a typical portfolio of lifetime WC awards indexed to the cost of living.<sup>4</sup> The RRB strategy produces consistent cashflow shortfalls, as real RRB coupons are not sufficient to provide the indexed annuity payments. However, under each economic scenario, the shortfall decreases over time, as both RRB coupons and pension payments exhibit similar growth. These shortfalls can be rectified by using more sophisticated matching strategies involving RRB strips. Interestingly for a pension plan, a similar mismatch for retirees is usually remedied by the excess cashflow generated by active members.

As expected, the results for the nominal bond strategy are decidedly mixed, depending on the economic scenario. For disinflation and low inflation, nominal bonds provide a more favorable cashflow match. However, the worst cashflow mismatch is produced by nominal bonds in the higher inflation scenario, as nominal coupons clearly fail to match the growth of indexed benefit payments.

### Market Liabilities Vs Assets

The projection of assets and liabilities (at market value) is even more revealing about the performance of RRBs and nominal bonds when used to fund indexed annuities. Under all three scenarios, the RRB strategy produces asset values that are highly correlated with liability values. On the other hand, the nominal bond strategy shows substantial divergence between asset and liability values under the disinflation and higher inflation scenarios. Under the latter scenario, the nominal bond strategy becomes insolvent (i.e., liabilities exceed assets) in the 2nd year, even though the average inflation rate over the projection period is consistent with current expectations (i.e., 3% per annum). The RRB investment strategy remains solvent under all three scenarios.

When considered under different economic scenarios, a Real Return Bond strategy reduces divergence between asset cashflows and indexed annuity benefits, and asset and liability values (at market). The RRB strategy ensures asset growth is commensurate with liability growth under each economic scenario. For nominal bonds, asset growth is insufficient in the higher inflation scenario and more than sufficient in the disinflation scenario.

### ENDNOTES

1. The investment characteristics of RRBs are elaborated on in Carswell, John "The New Real Return Bond: Saviour or Pariah?" *Canadian Investment Review*, Spring 1992; Carswell, John, David Gregoris and Lori Reeve. "Canada's 'Whole New (Real) World'." *The Journal of Investing*, Vol 3, No. 3 (Fall 1994); Kelly, Ken. "The Case For Index-Linked Bonds in Canada" Research Paper-Fixed Income Research, Toronto, Scotia McLeod, 1991. For an alternative view of inflation indexed bonds see Kaufman, Henry. "Bad News For Inflation Fighters." *Wall Street Journal*, June 19, 1996.
2. These components are discussed in more detail in Huh, Chan. "Inflation-Indexed Bonds." Federal Reserve Bank of San Francisco Weekly Letter, No 95-32, September 29, 1995.
3. See for example Marmer, Harry S. "Optimal International Asset Allocations Under Different Economic Environments: A Canadian Perspective." *Financial Analysts Journal*, November/December 1991, 85-92.; Fama, Eugene. "Stock Returns, Real Activity, Inflation, and Money." *American Economic Review* (1981), 71: 545-565; and Fama, Eugene & Kenneth French. "Business Conditions and Expected Returns on Stocks and Bonds." *Journal of Financial Economics* (1989), 25: 23-49.
4. Cashflows, assets and liabilities were projected year by year to the RRB maturity date, December 1, 2021, for two investment strategies consisting of buying and holding an RRB, and investing in a portfolio of nominal bonds replicating the SMIU Bond Index. We used the same economic scenarios as previously, extending them beyond 10 years as follows. For Scenario I (disinflation) we assumed a short period of deflation during the 11th to 13th year. This is a good stress test because in this example pensions are not reduced if the cost of living falls. For Scenario III, we assumed that high global inflation during the first 10 years is followed by a period of low inflation so that average inflation during the full 25 year period is 3%, consistent with the difference between the current (1995 year end) nominal long Canada bond yield (7.5%) and real return bond yield (4.5%).