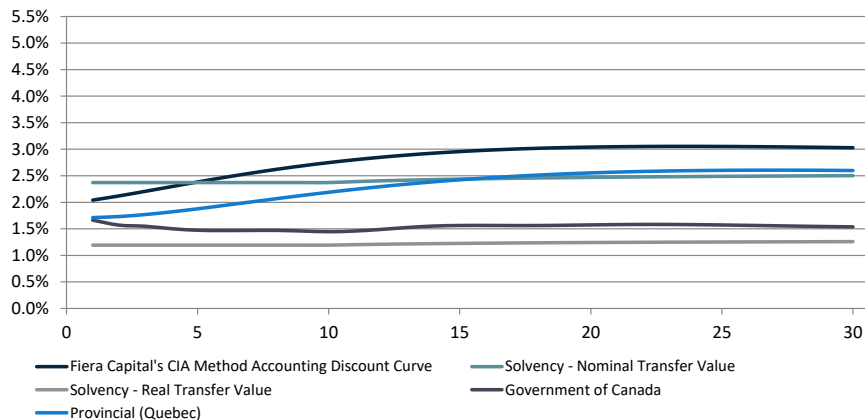
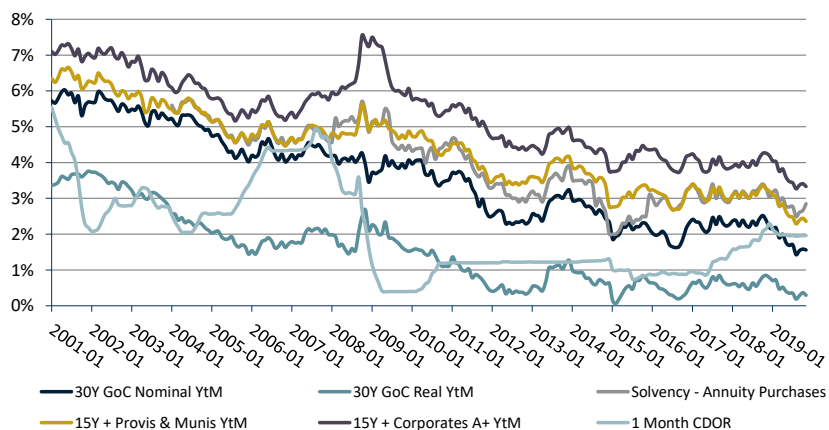


LDI Monitor - November 2019

Canadian Discount Curves as of 2019-11-29 *



Historical Interest Rates in Canada



Monthly LDI Highlights

During the month of November, long-term interest rates slightly decreased driving liabilities up. Spreads on provincial bonds (15 yr+) and long-term corporate bonds decreased by around 5.9 bps and 5.4 bps respectively, over the month. Sample Canadian pension plan asset portfolios had positive returns (1.77% to 2.37%) for the month. The sample accounting liability returns were positive over the month (from 0.4% to 0.8%) while the solvency liability returns were negative and between -1.1% and -0.9% depending on the Plan's maturity.

As of 2019-11-29 Change from 2019-10-31 Change from 2018-12-31

| | As of 2019-11-29 | Change from 2019-10-31 | Change from 2018-12-31 |
|--|------------------|------------------------|------------------------|
| Long-Term Market Interest Rates | | | |
| | | (bps) | (bps) |
| GoC 7 Year Nominal YtM | 1.48% | 7 | -42 |
| GoC 30 Year Nominal YtM | 1.56% | -2 | -62 |
| GoC 30 Year Real YtM | 0.29% | -7 | -49 |
| 30 Year Break-Even Inflation | 1.27% | 5 | -13 |
| GoC 15 Year + YtM | 1.56% | -2 | -61 |
| Provis 15 Year + YtM | 2.36% | -8 | -84 |
| Corporate Rated A and over 15 Year + YtM | 3.33% | -8 | -86 |
| Interest Rate Swap 20 Year | 2.07% | 4 | -61 |
| Interest Rate Swap 30 Year | 2.00% | 2 | -68 |
| Short Term Financing Rates | | | |
| Overnight REPO | 1.75% | -2 | -7 |
| 1 Month CDOR | 1.96% | 0 | -34 |
| 3 Month CDOR | 1.97% | 0 | -34 |
| Pension Solvency Rates ** | | | |
| Transfer Value - Nominal 1-10 Year Fwd Rate | 2.4% | 10 | -80 |
| Transfer Value - Nominal 10 Year + Fwd Rate | 2.6% | 0 | -80 |
| Transfer Value - Real 1-10 Year Fwd Rate | 1.2% | 0 | -50 |
| Transfer Value - Real 10 Year + Fwd Rate | 1.3% | 10 | -50 |
| Annuity Purchase Rate | 2.9% | 19 | -18 |
| CIA's Prescribed Annuity Purchase Spread | 1.3% | 20 | 40 |
| Accounting Discount Rate (Based on the Fiera Capital's CIA Method Accounting Discount Rate Curve) *** | | | |
| Young Pension Plan | 3.01% | -3 | -93 |
| Steady Pension Plan | 2.98% | -3 | -91 |
| Mature Pension Plan | 2.90% | -2 | -87 |

Canadian Pension Plan Performance Matrix ***

| Assets | Young | | Steady | | Mature | |
|--|-----------------------|-------|-----------------------|-------|-----------------------|-------|
| | 60% Stocks, 40% Bonds | | 50% Stocks, 50% Bonds | | 40% Stocks, 60% Bonds | |
| | (November 2019 YTD) | | 2.07% 14.39% | | 1.77% 13.18% | |
| Accounting Liability @ Fiera Capital's CIA Curve | 0.8% | 20.5% | 0.6% | 16.9% | 0.4% | 12.5% |
| Solvency Liability @ CIA Curve | -0.9% | 16.4% | -1.1% | 12.0% | -1.1% | 7.6% |
| Economic Liability @ GoC Curve | 0.6% | 14.2% | 0.4% | 11.9% | 0.2% | 8.5% |
| Accounting Surplus | 1.6% | -4.9% | 1.5% | -2.5% | 1.4% | 0.7% |
| Solvency Surplus | 3.3% | -0.8% | 3.2% | 2.4% | 2.9% | 5.6% |
| Economic Surplus | 1.8% | 1.5% | 1.6% | 2.4% | 1.6% | 4.6% |

Accounting Liability Performance Attribution ***

| | Young | | Steady | | Mature | |
|--|-----------------------|--------------|-------------|--------------|-------------|--------------|
| | (November 2019 YTD) | | 0.2% 8.5% | | 0.0% 5.7% | |
| Change in Risk-Free Rates | 0.4% | 10.8% | 0.2% | 8.5% | 0.0% | 5.7% |
| Change in Credit Spreads | 0.2% | 6.0% | 0.2% | 4.9% | 0.2% | 3.3% |
| Time Carry | 0.3% | 3.7% | 0.3% | 3.5% | 0.3% | 3.4% |
| Accounting Liability Total Return | 0.8% | 20.5% | 0.6% | 16.9% | 0.4% | 12.5% |

Assumptions & Sources

(*) All discount curves shown are expressed as continuously compounded annual spot interest rates.
 (**) Rates are based on the CIA methodology. The annuity purchase rate and the CIA prescribed spread are based on medium duration, liabilities as defined in the most recent CIA solvency valuation guidelines.
 (***) The target duration of the accrued liabilities for the young, steady and mature pension plans are fixed to 17, 14 and 11 years respectively. Solvency, accounting and economic liabilities are assumed to discount expected nominal liability cash flows. All surplus return calculations assume a fully funded status at the beginning of the year. Asset allocation in equities is assumed to be evenly allocated amongst the S&P/TSX, S&P500 unhedged in CAD and MSCI-EAFE unhedged in CAD. Bank of America Merrill Lynch Canadian Broad Bond Market Index (CANO) is used as the benchmark for fixed income. Sources: Fiera Capital, Bank of Canada, Bank of America Merrill Lynch, Bloomberg, MSCI-Barra, S&P and the Canadian Institute of Actuaries.