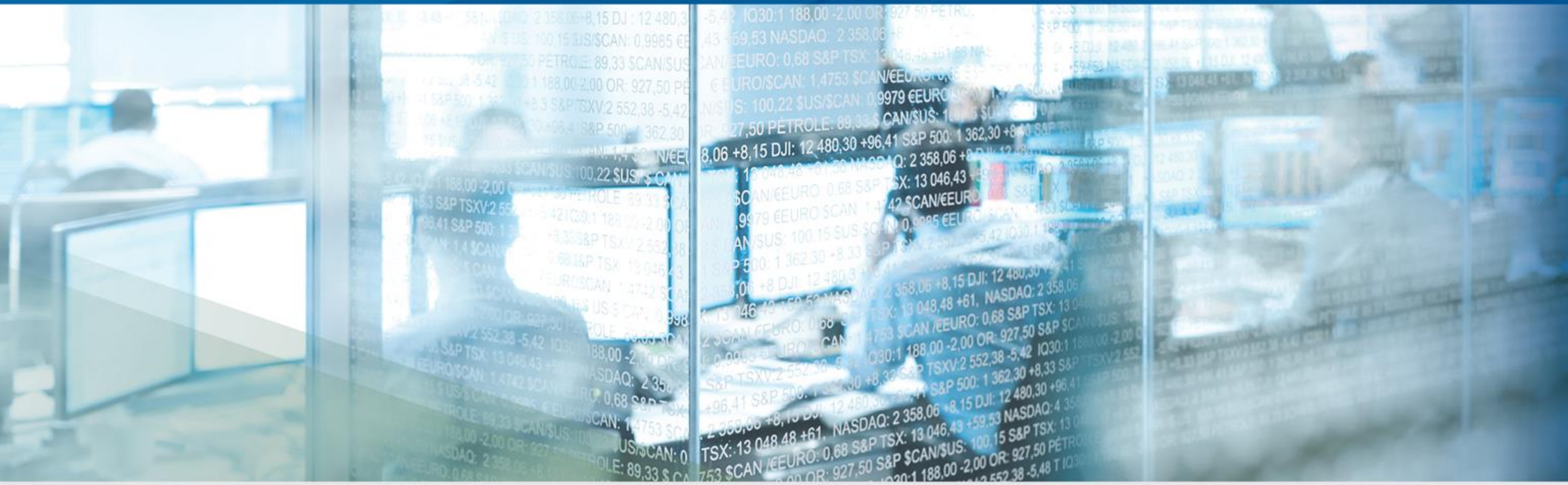
October 18, 2016



Liability Driven Investing

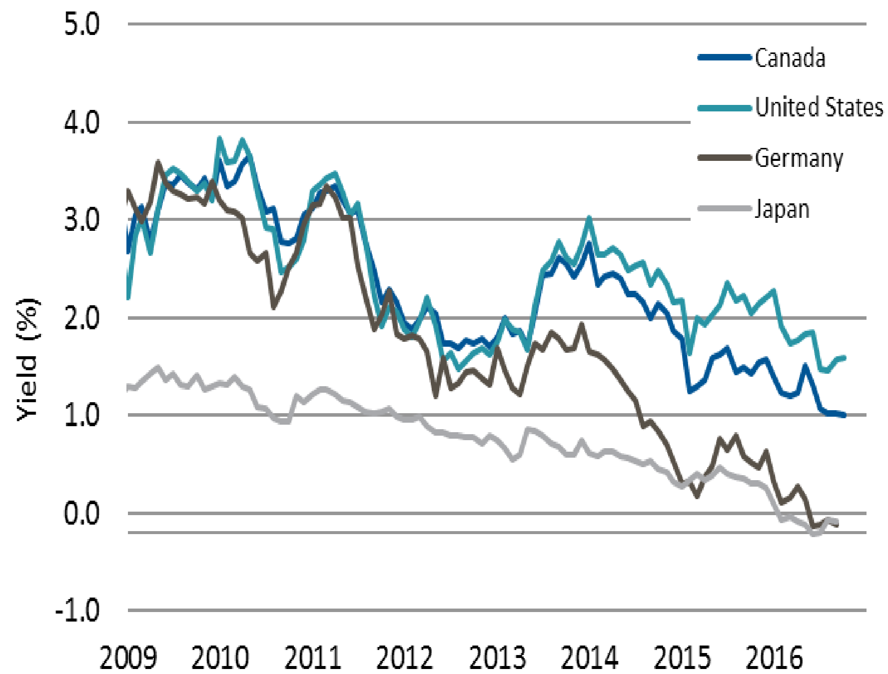
Update for a Low Rate Environment

STÉPHANE JEAN, FCIA, FSA
Head of Liability Driven Investment

Current Low Rate Environment

Government of Canada Yields

Global 10-Year Yields



Sources: Fiera Capital & Bloomberg data as of September 30, 2016.

Which Liabilities to Hedge?

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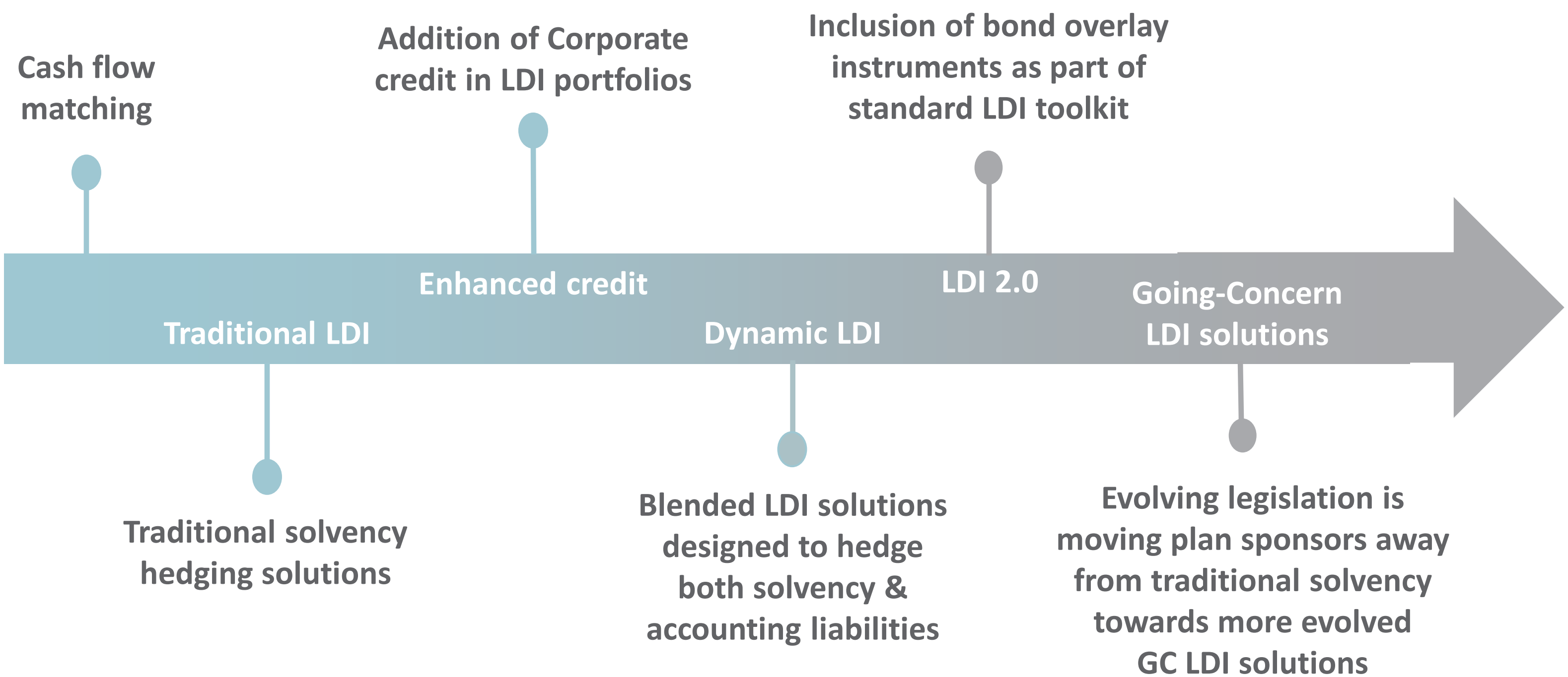
LIABILITY MATCHING PORTFOLIO AS A % OF TOTAL ASSETS

LIABILITY TYPE	Funding	Solvency (cash impact)	Accounting
OBJECTIVE	Long term financing	Termination / liquidation value	Accounting for pension costs
DISCOUNT RATE	Long term equilibrium rates of return linked to asset allocation	**Active:** YTM on 7y, 30y nominal and real rates + 90 bps **Pensioners:** GoC rates + 120 bps	Fiera Capital's CIA Method Accounting Discount Rate Curve
	Based on Asset Mix	**Based on Federal Bonds**	**Based on Corporate Bonds**

Evolving Landscape of LDI solutions

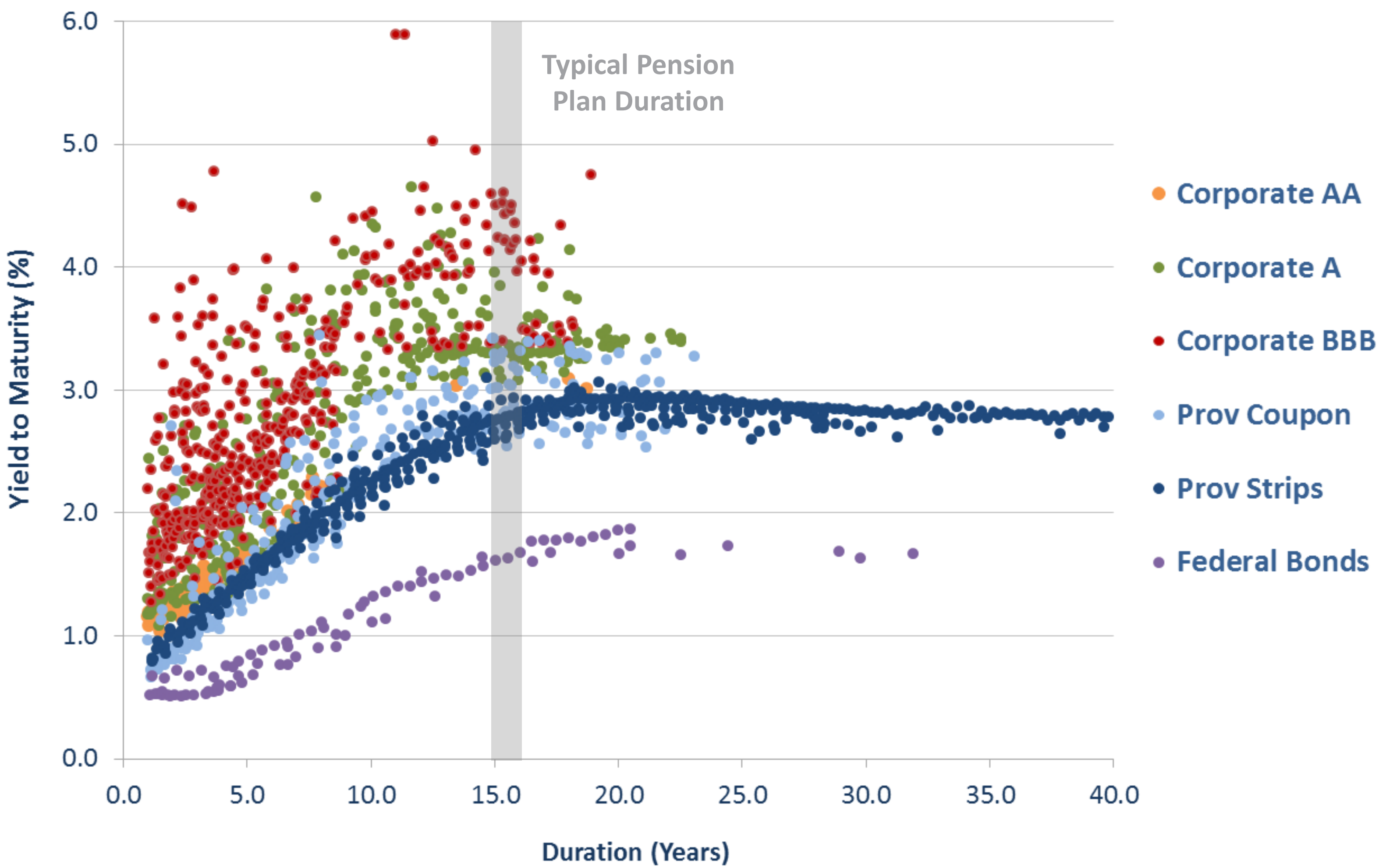


Quebec Stabilization Provision

- New Quebec legislation requires Plan sponsors to fund a stabilization provision (SP) that is established based on the:
  - Percentage of assets invested in return-seeking assets; and
  - Hedging ratio (i.e. duration of assets / duration of liabilities)

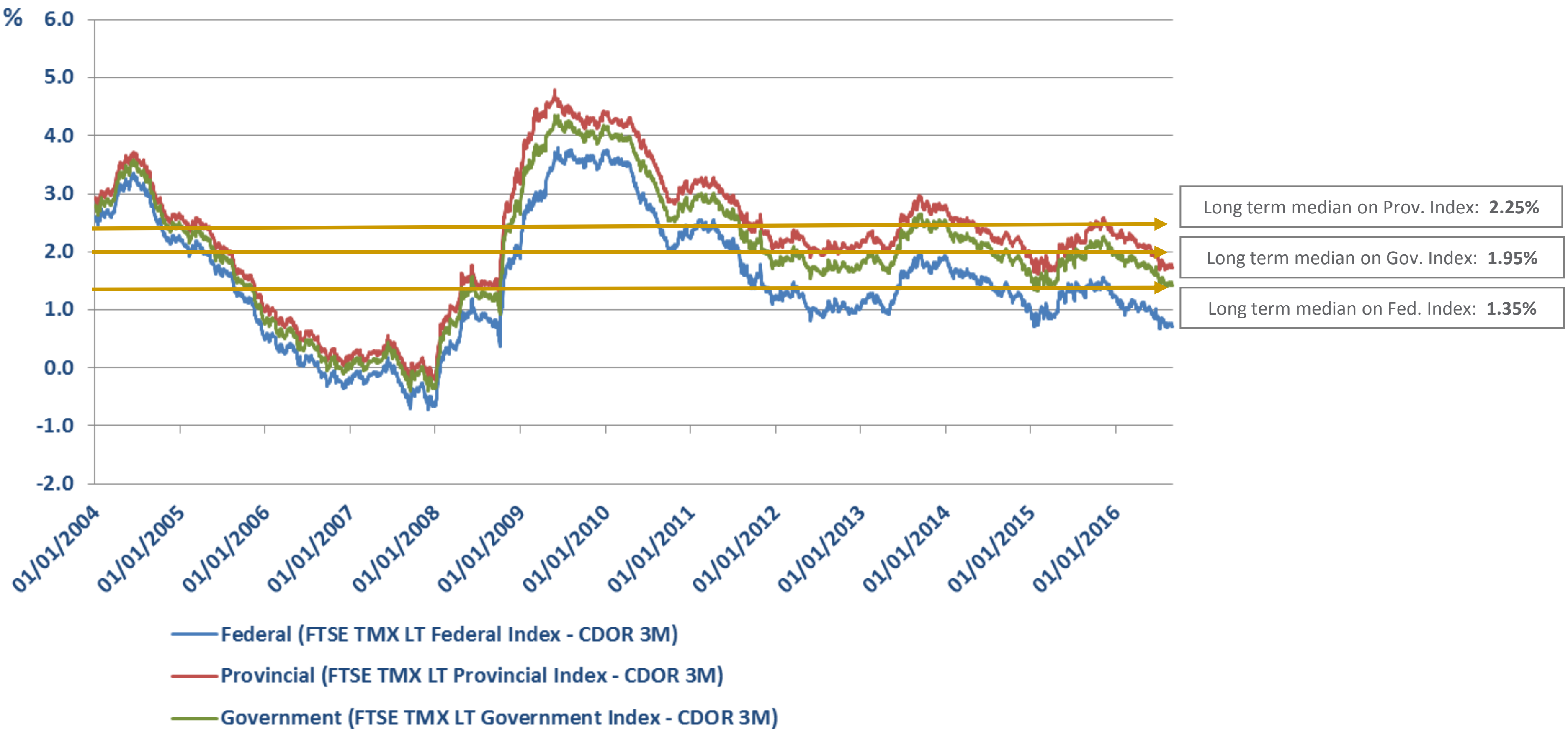
Return-seeking assets (%)	Duration of assets / Duration of liabilities				
	0%	**25%**	**50%**	**75%**	**100%**
0%	12%	10%	8%	6%	5%
20%	14%	12%	10%	8%	6%
40%	16%	14%	12%	10%	8%
50%	17%	15%	13%	11%	9%
60%	19%	17%	15%	13%	11%
70%	22%	20%	18%	16%	14%
80%	24%	22%	20%	18%	16%
100%	27%	25%	23%	21%	20%

Canadian Fixed Income Landscape



Sources: Fiera Capital & FTSE TMX Global Debt Markets as of September 30, 2016.

Historical Term Premiums



Sources: Fiera Capital & FTSE TMX Global Debt Markets as of September 30, 2016.

Bond Overlays Strategies

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- Bond overlays offer plan sponsors more options in the design and the customization of their desired interest rate de-risking strategy

- <u>Potential for increased returns</u>
  - Occurs with an upward-sloping yield curve
  - The “borrowing” inherent in the leverage usually occurs at REPO or CDOR (Canadian Dollar Offered Rate) → currently 0.6% to 0.8% depending on the term
  - The “buying” inherent in the leverage usually involves longer-term fixed income assets that have higher yields→ current FTSE TMX Long Term Bond Index ~2.6%
  - Difference creates carry that can increase expected portfolio returns

Bond Overlays Strategies (cont'd)

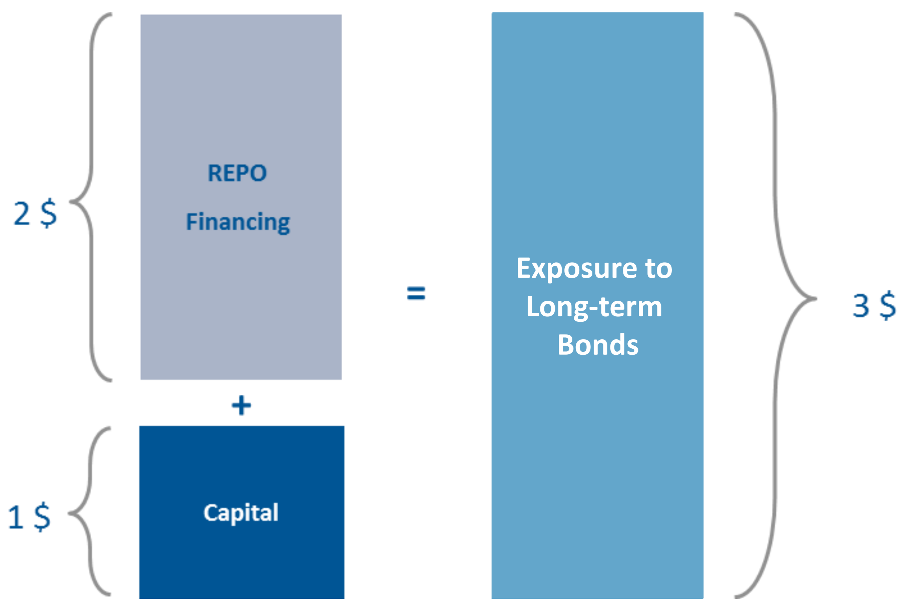
- Efficiency: allows fixed income assets to hedge more of the interest rate risk
  - For example, a 40% allocation to physical fixed income assets usually can only effectively hedge 40% - 60% of the interest rate exposure of the liabilities
  - Overlay strategy can hedge significantly more of the interest rate risk, while maintaining same allocation to physical fixed income assets (or even reduce it)
- Flexibility: the size of the overlay assets can be adjusted quickly to take advantage of market movements without selling or buying physical bonds or to adjust interest rate exposure as funded status changes
- Accuracy: overlay strategies give fund managers additional tools to construct a portfolio where duration, key rate durations and potentially credit spread duration are better matched

3X Levered Pooled Funds
Simple, flexible & robust

HIGHLIGHTS

> Offers a highly liquid and efficient duration extension tool for pension plans

> Capital efficiency



CHARACTERISTICS

> Offers 3x the dollar duration exposure for the same amount of capital

>> Duration of approx. 44-45 years

> Financial instruments used include:
- *Physical bonds*
- *REPOs*
- *Forward contracts*

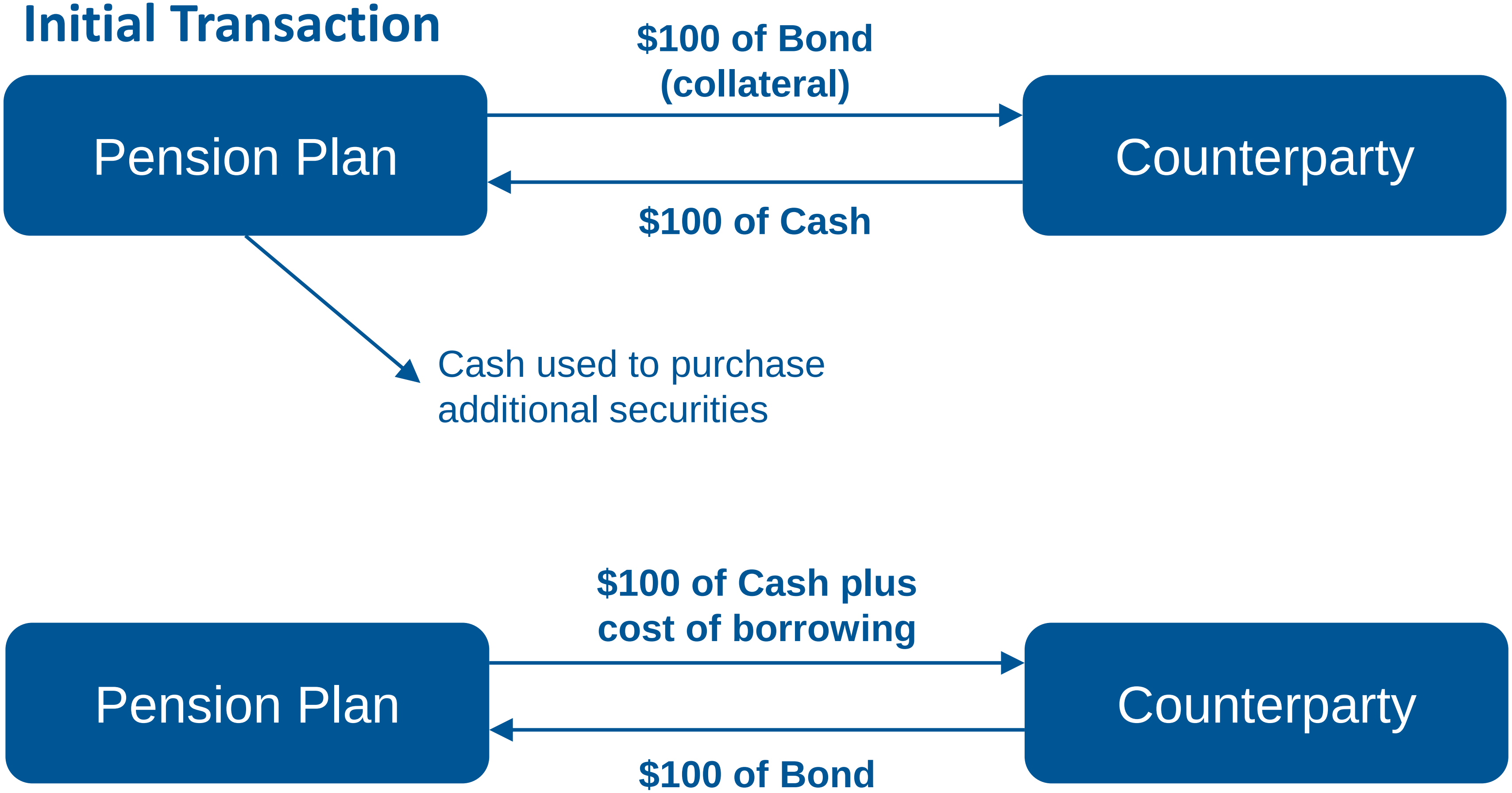
> Simplicity of legal documentation

> Semi-monthly leverage rebalancing

> Risk-controlled passive management

REPO Transactions Explained

Initial Transaction



Termination Transaction

Counterparty Risk Management

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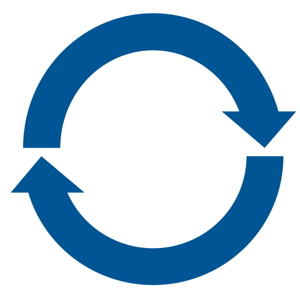
Financing Diversification Matrix by Counterparty & Maturity

Broker*	Financing Maturity		
	1 month		9 months
CIBC	$15		$20
BMO	$20		$20
NBF	$20		$20
TD	$10		$10

On a monthly basis we roll forward the maturing financing instruments



** These brokers are for illustration purposes. We have agreements with TD, RBC, CIBC, Scotia, BMO and NBF.*

3X Long Term Provincial Fund
Key characteristics

	3X Long Term Provincial
Overlay Exposure	
Yield-to-Maturity	2.63%
Duration	15.2 years
Invested Capital	
Running Yield	
Bonds Exposure	3 X 2.63%
Financing (CDOR 3M) *(Duration 0.25)*	– 2 X 0.90%
Total Yield*	6.09%
Total Duration	45.1 years

** Based on a leverage ratio of 3:1.*

Sources: Fiera Capital & FTSE TMX Global Debt Markets as of September 30, 2016.

Bond Overlay Strategies
Example in the context of Quebec Bill 57

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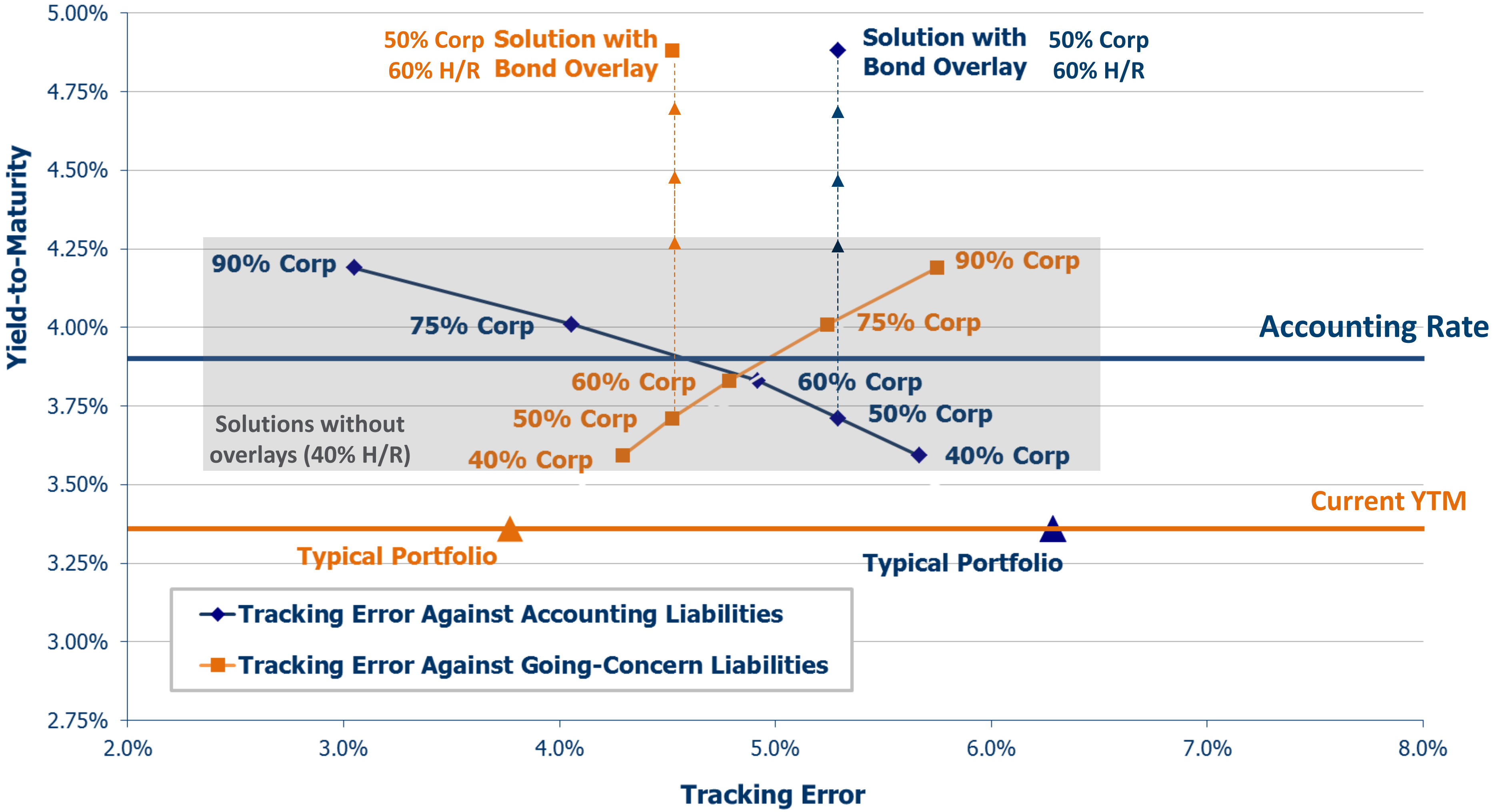
	Typical Allocation	Scenario 1	Scenario 2	Scenario 3
- Return-seeking assets - Fixed income assets - Physical - Fixed income assets - Overlay	50% 50% - %	50% 50% - %	50% 50% **25%**	50% 50% **50%**
- Duration of liabilities - Duration of assets - Hedge ratio*	15 years 7.5 years 25%	15 years **15 years** **50%**	15 years 15 years **75%**	15 years 15 years **100%**
Long-term expected return (as at December 31, 2015)	4.50%	5.25%	5.60%	5.90%
Going-concern (GC) liabilities** + Stabilization provision = total GC liabilities	$100 M +15% $115 M	$89 M +13% $101 M	$84 M +11% $94 M	$80 M +9% $87 M

** Hedge ratio = (fixed income assets %) x (duration of assets) ÷ (duration of liabilities)*

*** Going-concern liabilities are different for each scenario because of the change in the long-term expected return of the assets, which affects the discount rate used to value plan liabilities.*

Blended LDI Solutions

Going-Concern versus Accounting bases



Tracking error is estimated using historical Monte Carlo simulations of historical monthly data on variations in key determining risk factors.
Sources: Fiera Capital & FTSE TMX Global Debt Markets as of December 31, 2015.

Alternative to Real Return Bonds

Synthetic Provincial RRBs

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- Government of Canada RRBs offer low expected returns
- Provincial RRBs are usually very rare and hard to find
- Alternative: Synthetic Provincial RRBs through derivatives instruments
  - Provincial Spread Overlay added over Canada RRBs
  - Strategy can be implemented with REPOs and Reverse REPOs
  - Same expected return as Provincial RRBs (less financing costs)

3X Synthetic Provincial RRBs
Key characteristics

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	3X Synthetic Provincial RRBs
Canada RRBs Exposure	
Bonds Exposure	3 X 1.45%
Financing (CDOR 3M) *(Duration 0.25)*	– 2 X 0.90%
Total Yield*	2.55%
Provincial Spread Overlay	
Provincial Exposure	3 X 2.63%
Federal Exposure	– 3 X 1.55%
Financing	– 3 X 0.30%
Total Yield*	2.34%
Total Provincial RRBs - Yield	**4.89%**
Total Provincial RRBs - Duration	**46.9 years**

→ **Including inflation protection!**

** Based on a leverage ratio of 3:1 (real rates are converted to nominal rates).*

Sources: Fiera Capital & FTSE TMX Global Debt Markets as of September 30, 2016.

LDI Strategies in Low Yield Environment

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- Move away from traditional solvency basis in some jurisdictions will increase use of Corporate Bonds in liability-hedging strategies
- Portfolio structuring is even more important in the context of low interest rates and decreasing expected returns
  - Right balance between hedge ratio & expected return
  - Use of capital efficiency & bond overlay strategies
  - Short-term volatility vs. long-term assumptions
- Customized LDI portfolios can be positioned for movements in market rates (increase or decrease) while taking advantage of interest rate term premium when yield curve is more static

Stéphane Jean, FSA, FCIA

Head of Liability Driven Investment

Stéphane Jean is the leader of the Liability Driven Investment team and as such spearheads the team's portfolio management activities, client partnerships and growth initiatives.

Educational Background

- Fellow of the Canadian Institute of Actuaries (FCIA) – 2000
- Fellow of the Society of Actuaries (FSA) – 2000
- Bachelor of Science (B.Sc.) in Actuarial Sciences, Laval University – 1989

Professional Experience

2010 – 2016: Senior Consultant at Willis Towers Watson

1996 – 2010: Principal at Towers Perrin

1994 – 1996: Actuarial Consultant at Services Actuariels SAI

1990 – 1994: Actuarial Consultant at Laurentienne Imperiale fieracapital.com

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