Public Utilities Board (PUB)

2019 GRA Information Requests on Intervener Evidence

October 10, 2018

PUB (CAC) 1-1

Document:	The Role of the DCAT and Interest Rate Forecasting in the 2019 GRA PUB (MPI) 2-39	**Page No.:**	5-6
PUB Approved Issue No.:	4. Financial Forecast		
Topic:	Update of Interest Rate Forecast and Justification for Use of Naïve Forecast		
Sub-Topic:			

Preamble to IR (If Any):

"Reliance on the naïve interest rate forecast for 2019 GRA also ignores recent developments in which the Bank of Canada has already twice raised the overnight lending rate this year, labelling the Bank of Canada's "policy rate" to be "not material" (2019 GRA Information Requests – Round 1 CAC (MPI) 1-6)."

Question:

a) In regard to the above statement and issue, please elaborate on the concept of materiality as it relates to interest rate forecasting, and how Dr. Simpson and Ms. Sherry would distinguish between what is material and what is not material.

b) Please provide Dr. Simpson and Ms. Sherry's interpretation of the line graph in PUB (MPI) 2-39 on the relationship between the GOC 10-year Bond rate and BoC overnight rate.

c) Please provide a comparative table demonstrating the relationship between actual interest rates versus the Naïve and 50/50 forecasts from the 2017 & 2018 GRAs to illustrate the forecasting accuracy discussed in Dr. Simpson's evidence.

Rationale for Question:

To understand the reasonableness of using Naïve vs. 50/50 interest rate forecasts.

RESPONSE:

a) MPI has used the term "not material," which we would assume to mean irrelevant to the issue at hand, i.e. the future course of interest rates in Canada in general and the future course of the 10-year Government of Canada rate in particular. We interpret the term to suggest that existing evidence and research does not support a link between a rising Bank of Canada overnight lending (policy rate) and rising interest rates.

b) Although the line graph depicts daily rates, which are not normally used to capture the long-term trends that would be of concern to monetary policy and long-term interest rate forecasting, there is a clear upward trend in both series, suggesting that the recent Bank of Canada policy rate changes are "material" to changes in the GoC 10-year bond rate even at this simplistic level of analysis.

c) Our evidence refers to "Figure INV- 11: Historical Analysis of SIRF, 50/50 and Naïve Forecast from 2005 to 2018 GRA" from the MPI GRA, lines 13-14.

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Document:	The Role of the DCAT and Interest Rate Forecasting in the 2019 GRA	**Page No.:**	4
PUB Approved Issue No.:	7. Update of DCAT		
Topic:	Setting Equity Target Range		
Sub-Topic:			

Preamble to IR (If Any):

"Absent such events, the current POP and DCAT methodologies should continue to inform the setting of the RSR range."

Question:

Please explain why Dr. Simpson and Ms. Sherry believe the POP methodology is currently informing the setting of the RSR range.

Rationale for Question:

To understand the assertion that POP is currently used for setting the RSR range.

RESPONSE:

We are not aware of any PUB decision that explicitly asserts that the POP would no longer be used to set the RSR range with or without the use of other information, although we would acknowledge that recent emphasis and discussion has concentrated on the use of the DCAT to inform, if not set, the RSR range.

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Document:	MPI'S Investment Portfolio: Asset / Liability Analysis and Previous Recommendations	**Page No.:**	
PUB Approved Issue No.:	8. Performance of the Investment Portfolio 21. Asset Liability Management Study		
Topic:	Minimum Risk Portfolio		
Sub-Topic:			

Preamble to IR (If Any):

Question:

Is it Mr. Viola's view that MPI's minimum risk portfolio should be based on real interest? Please explain how the minimum risk portfolio would likely change if based on real interest versus nominal.

Rationale for Question:

To understand how the minimum risk portfolio for ALM modelling purposes might change if based on real vs. nominal interest rates.

RESPONSE:

Real Interest Rate Risk

Yes. I believe the minimum risk portfolio ("MRP") should reflect the factors that impact the liabilities. It is my understanding that MPI's liabilities are i) **long-term** in nature (e.g., duration ~ 10 years for Basic, and longer for Pensions), and ii) exposed to some **inflation** risk.

In evidence two years ago, I described five (5) beliefs that supported my recommendations and one of these beliefs relates to the MRP. This belief is re-stated below, along with some implications and clarifications about investing in it.

Belief #2 (MINIMUM RISK PORTFOLIO): Determining the Minimum Risk Portfolio is the first step towards responsible long-term management of the portfolio.

"I believe that MPI's minimum risk portfolio **(MRP) should include at least some long-duration real return bonds (RRBs), given the nature of MPI's liabilities (long term, with some inflation exposure)**. Note, however, that Belief #2 simply supports the definition of the primary risk, but says nothing about whether to buy any assets that make up the MRP (e.g., RRBs). The belief says nothing about how much risk should be taken in relation to it. Appropriate and prudent answers to these follow-on questions requires additional beliefs …"[1]

Difference between Real and Nominal MRP

The significant difference in the composition of the MRPs is shown below, as summarized in Round 1 IRs and table 8 of my evidence this year.

	Basic			Pension		
	Nominal	**Real**	Diff	Nominal	**Real**	Diff
Treasury Bills		**26**	26	- 17	**- 11**	6
Short-Term Provincial Bonds	28	**8**	- 20			-
Mid-Term Provincial Bonds	18		- 18			-
Long-Term Provincial Bonds	54		- 54		**30**	30
Long-Term Corporate Bonds			-	117		- 117
Real Return Bonds		**66**	66		**81**	81
	100	**100**	-	100	**100**	-

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As noted in evidence:

> "In the case of **Basic** … the Nominal Liability Benchmark includes a 54% allocation to long-term provincial bonds while the Real Liability Benchmark has 66% in RRBs."[2]

In the case of **Pensions**, the **Nominal** Liability Benchmark includes a 117% allocation to long-term corporate bonds and no RRBs, while the **Real** Liability Benchmark has 81% in RRBs.

These liability benchmark compositions are based on Mercer's work, and reflect Mercer's construction methodology for asset classes. For example, it may be the case that Mercer assumed that the RRB asset class (in both potential portfolios and Liability Benchmark Portfolio) is "market-weighted" (i.e., have low tracking error[3] relative to an index, such as the FTSE TMX Canada Real Return Bond Index™). This may explain, in part, why the T Bill exposures are negative in both the nominal and real liability benchmarks for **Pensions** (-17% and -11% respectively). This short/negative T Bill position "levers" up duration (e.g., above the duration of the passive benchmark index alone, such as the FTSE TMX Canada Real Return Bond Index™ noted above, if that index's duration is too low).

2 Source: *Asset/Liability Analysis and Previous Recommendations*, page 9

3 Tracking error measures the risk that a portfolio underperforms the benchmark that it is trying to outperform or track. Tracking error is measured as the volatility or standard deviation of the performance difference between the actual and benchmark portfolio.

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Document:	MPI'S Investment Portfolio: Asset / Liability Analysis and Previous Recommendations	**Page No.:**	6
PUB Approved Issue No.:	8. Performance of the Investment Portfolio 21. Asset Liability Management Study		
Topic:	Asset Mix		
Sub-Topic:			

Preamble to IR (If Any):

"Re-examine the decision to concentrate risk in fixed income, rather than better diversify the sources of risk across the whole portfolio, and avoid "crowding out" risk-reducing RRBs."

Question:

a) Please explain Mr. Viola's view on how MPI should design its portfolio for Basic, which currently is proposed to be 100% fixed income, to diversify the sources of risk across the whole portfolio.

b) In Mr. Viola's view, what level of Real Return Bonds should be incorporated in the Basic and Pension portfolios?

Rationale for Question:

To understand how the Basic and Pension portfolio could change to address inflation risk.

RESPONSE:

a) Basic Portfolio Design

The benefits of diversification are generally understood and accepted, so they are not repeated here. However, it is important to highlight **the key role that correlations play in generating the benefits of diversification**.

In my evidence two years ago, I described an inconvenient truth about risk, which is that **risks don't add** (i.e., 1 + 1 ≠ 2). I also stated a consequence of this truth, which is the important role that correlations play in optimizations.

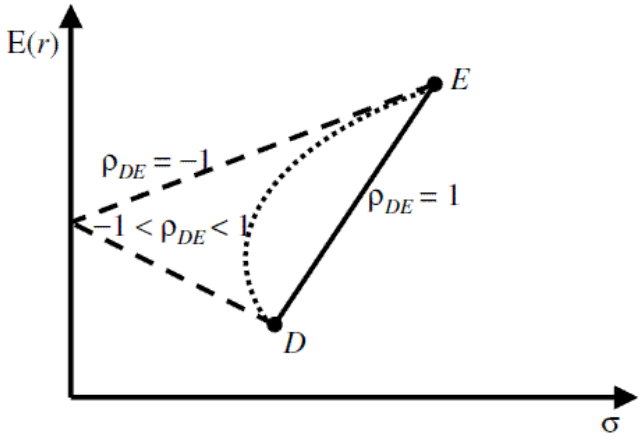
> *The effect of an investment on total portfolio risk depends on the characteristics of other assets in the portfolio because correlations are not perfect.*[4]

In my evidence two years ago, I also stated Belief #4 (TOTAL PORTFOLIO):

> *The additional risk to the Total Portfolio is the relevant risk to consider if risk beyond the Minimum Risk Portfolio is taken.*[5]

In other words, the attractiveness of any asset class should be assessed, not in isolation, but in the context of the other assets that are in the portfolio or contemplated to be in the portfolio. This is illustrated below in the efficient frontier below.

If correlations are perfect (ρ = +1.0 or -1.0), there are no benefits from diversification because return/risk tradeoffs would be "linear" (straight lines, constant return/risk slope).



The efficient frontier only "bends" when correlations, in this case between Debt (D) and Equity (E), are between -1 and +1.

When correlations are equal to – 1 or + 1, there is no "free lunch". This means

4 Source: *Asset/Liability Analysis and Previous Recommendations*, page 6

5 Source: *Asset/Liability Analysis and Previous Recommendations*, page 17

you cannot get higher returns at the same level of risk.

MPI has stated that it has a low tolerance for risk in the **Basic** Portfolio, and therefore MPI has decided to allocate 100% to fixed income in that portfolio. I would argue that the decision to impose a constraint (0% to other asset classes) has a cost (i.e., lower risk-adjusted returns).

This 100% fixed income constraint has the effect of concentrating risk in various forms of interest rate risk (0% coming from equity risk). The various risk premia from fixed income were described in evidence as "building blocks" and relate to these interest rate risks:

a) **Term/duration risk:** not matching asset and liability durations;
b) **Inflation risk:** buying nominal bonds, rather than RRBs;
c) **Credit risk:** including corporate bonds and Provincials (not Federal); and
d) **Illiquidity:** including private debt.

In the case of real estate and infrastructure, both types of assets have equity and fixed income characteristics. For example, any leverage/borrowing to finance real estate or infrastructure investments has term/duration risk and likely inflation risk.[6] The equity component of real estate or infrastructure depends on the sector/type of the underlying gross exposures. For example, infrastructure that has regulated return or revenue streams (e.g., electricity **transmission** across power grids) has less equity risk than infrastructure that is less regulated (e.g., electricity **generation** using oil or gas, whose spot prices are volatile).

This concentration of risk in fixed income in MPI's **proposed portfolio** for Basic is illustrated on the next page by comparing a more diversified **current portfolio** and a portfolio described by Mercer as having the **same risk** as the current portfolio.

6 As a real estate "borrower" (rather than a lender), there would be no credit risk of course. The inflation risk is that inflation turns out to be lower than expected, which results in a loss in purchasing power as a borrower.

The current portfolio (C) and MPI-proposed portfolio (P) have a significant allocation to Provincial Bonds, and smaller allocation to Corporate Bonds, as shown on the right.

In other words, the sources of risk in the current and MPI-proposed portfolios have concentrated risk in inflation and credit.

Asset Class Breakdown

	(C) Current	(B) Same Risk	(P) Proposed	(P)-(B) Difference
Private Debt	-	15.0	-	-15.0
Corporate Bonds	2.0	-	20.0	20.0
Provincial Bonds [1]	68.0	38.0	80.0	42.0
Federal Bonds [2]	-	-	-	-
Federal RRBs	-	45.0	-	-45.0
T Bills	-	-30.0	-	30.0
Fixed Income	70.0	68.0	100.0	32.0
				-
Equities [3]	15.0	23.5	-	-23.5
Real Estate	10.0	5.5	-	-5.5
Infrastructure	5.0	3.0	-	-3.0
	100.0	100.0	100.0	-
Return	4.2	4.9		
Surplus Volatility	3.8	3.8		

The "Same Risk (B)" portfolio has a higher return than the current portfolio because B is better diversified. B has more equity risk, less inflation risk, but the total risk of 3.8% is the same.

If investment management were a hockey game, it appears that strategy B works better because it has both a stronger goalie (RRBs) and is more aggressive on offense (more equities). That combination of higher RRBs and higher equities yields better return/risk tradeoffs than one which has a weaker goalie (nominal bonds) and more aggressive defensemen (credit risk, less liquidity in fixed income).

b) Level of RRBs in Basic and Pension Portfolios

The optimal allocation to RRBs, or any other asset class, depends on the:

1. **definition** of risk; and
2. **tolerance** for risk.

1. Definition of Risk

MPI uses surplus volatility to measure the risk of assets in relation to liabilities. If the liabilities are exposed to inflation risk, then the **Liability Benchmark Portfolio** should include some inflation-hedging assets (e.g., RRBs).

2. Tolerance for Risk

MPI's tolerance for risk should impact how much it allocates between riskier assets (e.g., equities), and those assets that hedge surplus volatility (e.g., RRBs). At lower levels of risk tolerance, more RRBs would be held in the portfolio, with a shift from the "risky bucket" to a "risk-free" or at least "minimum risk" bucket. Mercer's analysis in MPI Exhibit 12 clearly shows the improved return/risk ratios available when RRBs are included across the risk spectrum in the portfolios.

Basic Portfolio: If MPI were to rely on Mercer's analyses in MPI Exhibit 12, then the RRB allocations for Basic would reflect MPI's risk tolerance as follows:

a) **~ 40% RRBs if risk tolerance remains the same** (current risk of 3.8%);
b) **66% if MPI has no tolerance for risk** and takes the minimum risk by investing in the Liability Benchmark Portfolio; and
c) **between ~ 40% and 66% for "lower" risk tolerances**.

Similarly, for the **Pension** Portfolio:

d) **~ 45%[7] RRBs if risk tolerance remains the same**;
e) **81%[8]** if MPI **has no tolerance for risk**; and
f) **between ~ 45% and 81% for "modest" risk tolerance**.

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7 MPI Exhibit 12, page 23 of 36

8 MPI Exhibit 12, page 19 of 36

Document:	MPI'S Investment Portfolio: Asset / Liability Analysis and Previous Recommendations	**Page No.:**	9, 21
PUB Approved Issue No.:	8. Performance of the Investment Portfolio 21. Asset Liability Management Study		
Topic:	Asset Mix		
Sub-Topic:			

Preamble to IR (If Any):

Mr. Viola has provided an estimate of the impact of removing Real Return Bonds (RRBs) from the portfolio, to demonstrate Mercer's observation that their absence removes an opportunity for improvement at lower levels of risk.

Question:

Please explain the estimates provided of the impact of removing Real Return Bonds on returns of the portfolio.

Rationale for Question:

To understand the implications of excluding RRBs from MPI's Basic and Pension portfolios.

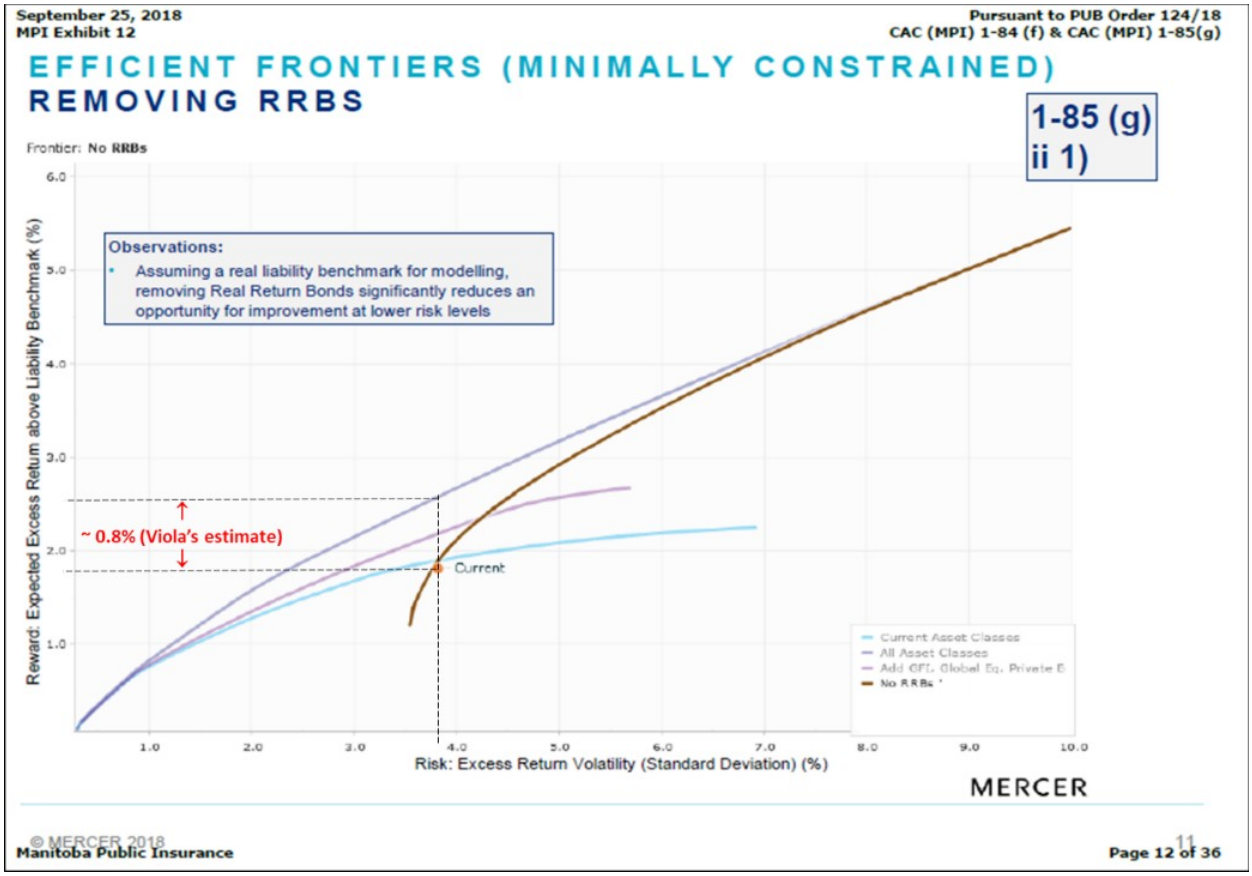
RESPONSE:

Mercer's "observations" in MPI Exhibit 12 indicate that "removing Real Return Bonds significantly reduces an opportunity for improvement at lower risk levels."[9]

9 MPI Exhibit 12, page 12 of 36

0.8% Return Reduction in Basic Portfolio

The 0.8% adverse impact of removing RRBs from the **Basic** Portfolio is inferred from Mercer's analysis in MPI Exhibit 12, page 12 of 36 (below).



At "current" risks levels (vertically at x = Risk = 3.8%), Mercer's efficient frontier suggests that the expected excess return above the Liability Benchmark drops by ~ 0.8%, from a visual inspection of the graph. In other words, the upper efficient frontier is the most efficient, while the one labelled "No RRBs" excludes RRBs. The vertical distance between those two graphs (measured at the current risk level of 3.8%) measures the cost of removing RRBs (lower "excess return above Liability Benchmark"). Mercer did not include a "table" of statistics for returns in the above graph, so the vertical difference or cost of the constraint appears to be ~ 0.8% as the difference calculated below.

~ 2.6% "Excess return", **including** RRBs (X = top dotted horizontal line)

~ 1.8% "Excess return", **excluding** RRBs (Y= bottom dotted horizontal line)

~ 0.8% Cost **excluding** RRBs (X – Y = vertical distance, at 3.8% risk)

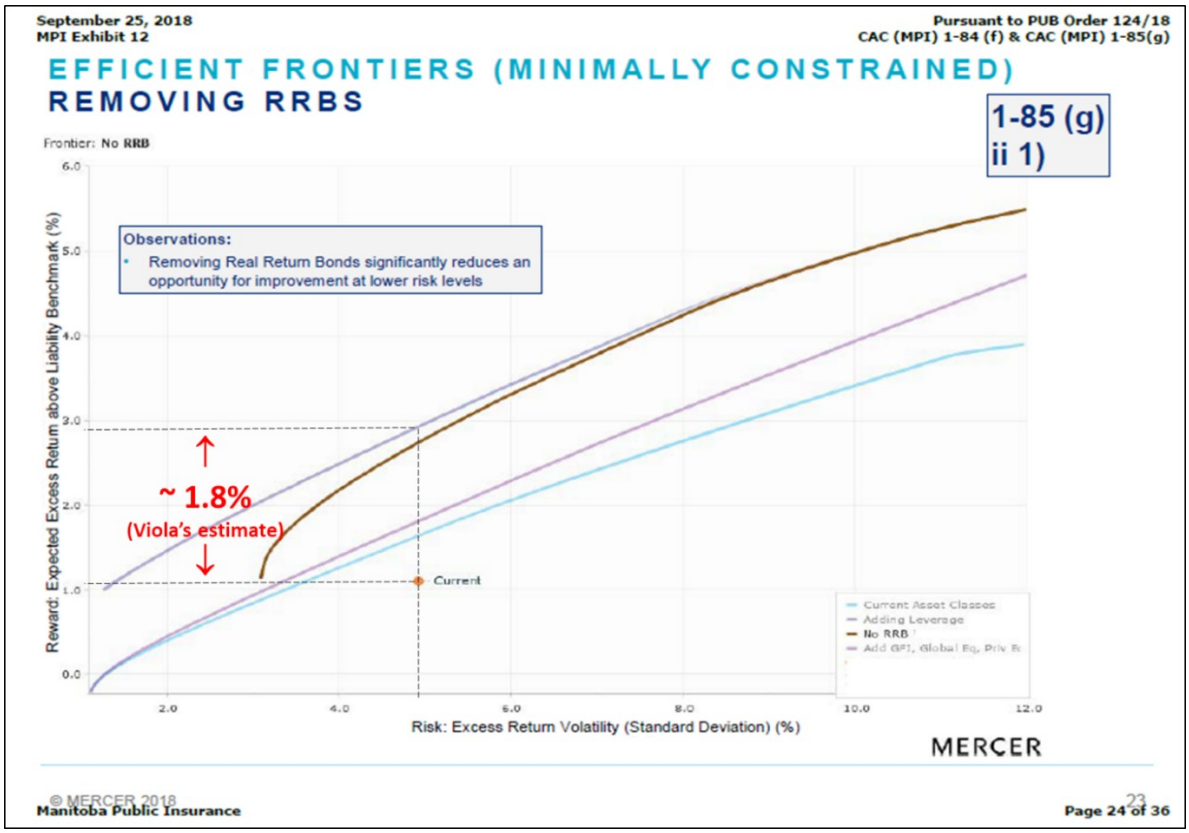
1.8% Return Reduction in Pension Portfolio

Similarly, for the **Pension** Portfolio, the return reduction appears to be ~ 1.8% from a visual inspection of the graph below (page 24 of 36 in MPI Exhibit 12).

~ 2.9% "Excess return", **including** RRBs (X = top dotted horizontal line)

~ 1.1% "Excess return", **excluding** RRBs (Y= bottom dotted horizontal line)

~ 1.8% Cost **excluding** RRBs (X – Y = vertical distance, at 4.9% risk)



The return reduction is bigger in the case of the **Pension** Portfolio, compared to **Basic**, because the **Pension** liabilities have a longer duration and therefore the Liability Benchmark Portfolio for Pensions has more RRBs (other things equal). When RRBs are removed, the reduction in return is larger in the Pension Portfolio because the elimination of RRBs means more equities are reduced as well (lowering returns).

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Document:	MPI'S Investment Portfolio: Asset / Liability Analysis and Previous Recommendations	**Page No.:**	6, 24
PUB Approved Issue No.:	8. Performance of the Investment Portfolio 21. Asset Liability Management Study		
Topic:	Asset Mix		
Sub-Topic:			

Preamble to IR (If Any):

Question:

In light of Mr. Viola's recommendation that MPI should continue to be vigilant about placing too much reliance on quantitative considerations, what level of other inflation hedging assets (such as real estate and infrastructure) does Mr. Viola believe should be maintained in order to meet qualitative risk considerations.

Rationale for Question:

To understand the use of investment classes other than RRBs to provide a level of inflation protection.

RESPONSE:

Investment Beliefs

This question is best answered by first reviewing some investment beliefs that were described in evidence two years ago, and summarized again on the next page. These beliefs involve measuring the **additional return and risk** implications of changing the portfolio at the **total portfolio** level (not individual asset classes).

Belief #2 (MINIMUM RISK PORTFOLIO):

Determining the Minimum Risk Portfolio is the first step towards responsible long-term management of the portfolio.[10]

I also said:

Belief #2 simply supports the ***definition*** *of the primary risk, but says nothing about whether to buy any assets that make up the MRP (e.g., RRBs). The belief says nothing about how much risk should be taken in relation to it. Appropriate and prudent answers to these follow-on questions requires additional beliefs, starting with the next two beliefs below (taken together).*

Belief #3 (ADDITIONAL RISK): *Taking additional risk beyond the Minimum Risk Portfolio should be done only if the expected additional returns justify doing so.*
AND
Belief #4 (TOTAL PORTFOLIO): *The additional risk to the Total Portfolio is the relevant risk to consider if risk beyond the Minimum Risk Portfolio is taken.*
Together, Beliefs #3 and #4 imply that the attractiveness of any asset class should be assessed, not in isolation, but in the context of the other assets that are in the portfolio or contemplated to be in the portfolio, and the MRP that is defined in Belief #1 and #2.
The rationale for taking a total portfolio approach stems from the "inconvenient truth", mentioned earlier, and re-stated below.

> *The effect of an investment on total portfolio risk depends on the characteristics of other assets in the portfolio because correlations are not perfect.*

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Real Estate and Infrastructure

Mercer's quantitative analysis in MPI Exhibit 12 clearly shows that RRBs can "co-exist" with other assets that provide some inflation protection, and which offer higher returns than RRBs (e.g., real estate and infrastructure).

For example, in the case of the **Basic** Portfolio, the table below shows the figures from MPI Exhibit 12 (page 11 of 36), which is shown on the next page as well.

RRBs would represent 51% of the efficient portfolio in scenario A (Same Return) and 45% in B (Same Risk).[11]

It shows a 5:1 or 6:1 ratio of RRBs to other real assets (real estate and infrastructure) at these two levels of risk.

	Current	A	B	
RRBs	-	51.0	45.0	X
Real Estate	10.0	6.5	5.5	
Infrastructure	5.0	1.5	3.0	
Other Real Assets	15.0	8.0	8.5	Y
Total Real Assets	15.0	59.0	53.5	
Equities	15.0	14.5	23.5	
Bonds	70.0	26.5	23.0	
	100.0	100.0	100.0	
Ratio of RRBs (X) to:				
(Y) Real Estate + Infrastructure		6	5	X/Y

11 This assumes no constraint regarding leverage, and that the "3X RRB" allocation is shown at its gross, rather than, net exposure. (The conclusions would be substantially the same if a "no leverage" constraint were imposed.)

Mercer's analysis, summarized on the prior page, comes from MPI Exhibit 12 (page 11 of 36).

The red boxes show the exposures to real assets.

	Current	A. Same Return	B. Same Risk
Fixed Income	70%	62.5%	53%
3X Real Return Bonds	--	17.0%	15.0%
Short-term Bonds (Prov)	6.5%	35.5%	3.5%
Mid-term Bonds (Prov)	12.0%	--	24.5%
Long-term Bonds (Prov)	29.5%	--	--
Mid-term Bonds (Corp)	2.0%	--	--
MUSH Bonds	20.0%	10.0%	10.0%
Public Equities	15%	10.5%	15%
Canadian Equity	10%	10.5%	15.0%
U.S. Equity	5%	--	--
Alternatives	15%	27%	32%
Private Equity	--	3.0%	6.5%
Real Estate	10%	6.5%	5.5%
Infrastructure	5%	1.5%	3.0%
Private Debt - Universe	--	15.0%	15.0%
Diversified Growth Fund	--	1.0%	2.0%
Risk/Return Metrics			
Expected 10-Year Return	4.2%	4.2%	4.9%
Surplus Volatility	3.8%	2.4%	3.8%
Information Ratio (Excess Return/Risk)	0.47	0.76	0.68
Interest Rate Metrics			
Duration	7.3	10.3	10.3
Hedge Ratio	86%	100%	100%

Conclusion

Based on Mercer's analysis, it appears that the optimal allocations to real estate and infrastructure (combined) are ~ 16% to 20% **of the RRB allocation (i.e., the inverse of the 5:1 to 6:1 ratio of RRBs to other real assets noted earlier)**. For greater clarity, if RRBs were to represent ½ the portfolio, Mercer's analysis suggests an optimal allocation to real estate and infrastructure (combined) of 8% to 10% (½ of 16% to 20%). This is an approximation, which would change along the efficient frontier as risk levels change.

A similar analysis could be performed for **Pensions**, using data from MPI Exhibit 12 (below, from page 23 of 36).

	Current	A. Same Return	B. Same Risk
Fixed Income	70%	69.0%	47.5%
3X Real Return Bonds	--	23.0%	15.0%
3X Long-term Bonds (Prov)	--	6.0%	15.0%
Short-term Bonds (Prov)	6.5%	29.0%	--
Mid-term Bonds (Prov)	12.0%	--	6.5%
Long-term Bonds (Prov)	29.5%	1.0%	1.0%
Mid-term Bonds (Corp)	2.0%	--	--
MUSH Bonds	20.0%	10.0%	10.0%
Public Equities	15%	7.5%	18.5%
Canadian Equity	10%	7.5%	18.5%
U.S. Equity	5%	--	--
Alternatives	15%	23.5%	34%
Private Equity	--	1.5%	10.5%
Real Estate	10%	5.0%	1.0%
Infrastructure	5%	1.0%	7.5%
Private Debt - Universe	--	15.0%	15.0%
Diversified Growth Fund	--	1.0%	--
Diversified Growth Fund			
Expected 10-Year Return	4.2%	4.0%	5.7%
Surplus Volatility	4.9%	1.4%	4.9%
Information Ratio (Excess Return/Risk)	0.22	0.78	0.59
Interest Rate Metrics			
Duration	7.3	15.8	16.0
Hedge Ratio	43%	94%	95%

RRBs would represent 69%[12] of the efficient portfolio in scenario A (Same Return) and 45%[13] in B (Same Risk).[14] At these return/risk levels, optimal allocations to real estate and infrastructure (combined) appear to be 6% to 8.5%.

12 69% = 3 X 23% in "3 X RRBs"

13 45% = 3 X 15% in "3 X RRBs"

14 This assumes no constraint regarding leverage, and that the "3X RRB" allocation is shown at its gross, rather than, net exposure. (The conclusions would be substantially the same if a "no leverage" constraint were imposed.)

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Document:	INV Appendix 12	**Page No.:**	16
PUB Approved Issue No.:	8. Performance of the Investment Portfolio 21. Asset Liability Management Study		
Topic:	Real Return Bonds		
Sub-Topic:			

Preamble to IR (If Any):

Mr. Viola is of the view that MPI should consider the inclusion of RRBs in its portfolio. Mercer has indicated that there are limited issuances of RRBs and that the market for the available bonds is liquid.

Question:

a) Does Mr. Viola have any concerns about the availability of RRBs for MPI's portfolio, either now or in the future?

b) Does Mr. Viola have any concerns about the inclusion of RRBs on the impact of returns realized from the Basic or Pension portfolios?

Rationale for Question:

To understand the merits of including RRBs in the investment portfolio.

RESPONSE:

a) RRB Availability

Current Market Size

According to FTSE Canada, there are 14 RRBs in the FTSE TMX Canada Real Return Bond Index™, with an $84 billion market value as of October 8, 2018. This index is comprised mostly of Federal issues, as summarized on the next page.[15]

Closing figures for : 10/05/2018

	Index Level (TR)	# of Issues	MktVal (Billions)	Effective Term
Real Return Bond Indices				
Real Return Bond	559.0	14	84.2	25.00
Real Return Federal Non-Agency Bond	329.2	8	74.9	25.93

While the RRB market is not as large as the (nominal) bond market, and trading/turnover is likely lower as well (given the "buy-and-hold" nature of RRBs as a long-term hedge), I would not be overly concerned about acquiring RRBs because RRBs should generally be considered a long-term, "buy-and-hold" investment. Any "premium" cost associated with acquiring RRBs initially is relatively small, since it is generally a "one time" cost that could be "amortized" (notionally) over a period that exceeds a decade. In other words, the annualized extra cost of "bidding RRB prices up" is relatively small, yet the "release" of risk capital in other areas to increase returns would more than compensate for any perceived high cost when measured on a total portfolio basis.

15 Source: https://www.ftse.com/products/FTSETMX/home/indices

Future Market Size

I do not have a view on how issuers of RRBs will change the RRB **supply** in the future, nor do I have a view on how demand for RRBs from investors will change. The two relevant considerations, however, relate to:

d) **changes** in MPI's demand for RRBs to achieve its rebalancing objective (e.g., buying more RRBs to keep RRBs at their long-term target weight); and
e) any future new capital to be received by MPI that needs to be invested.

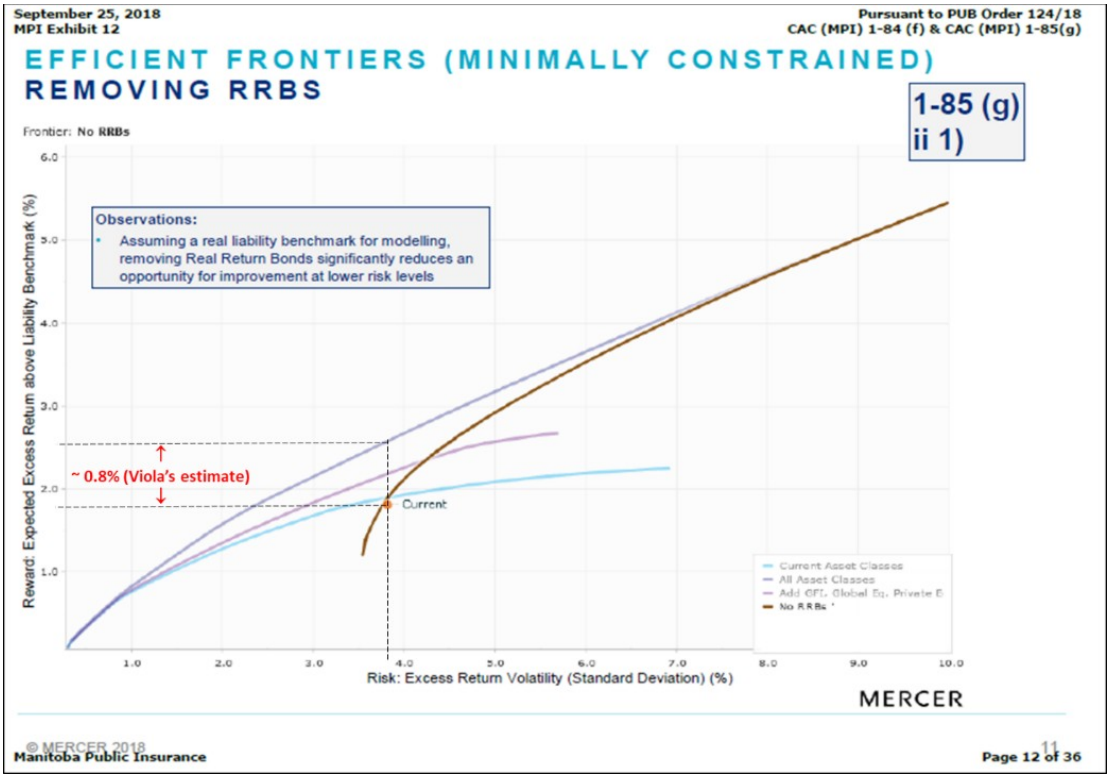
The first item requires a small additional investment if RRBs underperform other assets (to "top up" the RRB weight, based on the **difference** between RRB returns and the return on other assets). The second item is not a large concern, assuming any new capital to be invested is a small proportion of assets under management.

b) RRB Concerns

I do not have concerns about the inclusion of RRBs on the impact of returns from the Basic or Pension portfolios when viewed on a **total portfolio basis** and after adjusting for the risk reduction that RRBs have on the portfolios, other things equal. As noted in my evidence and response to PUB (CAC) 1-5, RRBs improve **total portfolio** returns at all levels of risk according to Mercer. In other words, an efficient frontier that includes RRBs is higher than one that excludes them.

0.8% Return Reduction in Basic Portfolio

The 0.8% adverse impact of removing RRBs from the **Basic** Portfolio is inferred from Mercer's analysis in MPI Exhibit 12, page 12 of 36 (below).



At "current" risks levels (vertically at x = Risk = 3.8%) Mercer's efficient frontier suggests that the expected excess return above the Liability Benchmark drops by ~ 0.8% when RRBs are removed, from a visual inspection of the graph.

PUB (CAC) 1-8

Document:	The Capital Maintenance Provision Proposal by Manitoba Public Insurance	**Page No.:**	3
PUB Approved Issue No.:	20. Capital Maintenance Provision		
Topic:	CMP and Accepted Actuarial Practice		
Sub-Topic:			

Preamble to IR (If Any):

"The CMP does not align with Accepted Actuarial Practice in Canada."

Question:

a) What does it mean to be aligned with Accepted Actuarial Practice vs. being in compliance with Accepted Actuarial Practice?

b) If the assertion being made is that a CMP is not in compliance with Accepted Actuarial Practice in Canada, please file specific authorities from the Standards of Practice of the Canadian Institute of Actuaries to support this assertion.

Rationale for Question:

To understand the assertions made with respect to the CMP and Accepted Actuarial Practice in Canada.

RESPONSE:

a) From http://www.yourdictionary.com/align one of the definitions of align is "to bring into agreement, close cooperation, etc." To the best of the writer's knowledge the Actuarial Standards of Practice does not contain a section on how a company should maintain target capital. Therefore, the CMP does not align with the Actuarial Standards of Practice.

b) Please see the response to a). The Actuarial Standards of Practice do not contain a section on maintaining capital so the CMP would not technically be non-compliant.

PUB (CAC) 1-9

Document:	The Capital Maintenance Provision Proposal by Manitoba Public Insurance	**Page No.:**	5
PUB Approved Issue No.:	20. Capital Maintenance Provision		
Topic:	CMP and Capital Preservation		
Sub-Topic:			

Preamble to IR (If Any):

"The RSR range will go up in dollar terms as the size of the Corporation increases. This negates the need for a CMP."

Question:

a) Is it Dr. Simpson's and Ms. Sherry's assertion that the CMP is redundant when one considers the target range for Basic total equity is to be determined annually from the DCAT? Please explain.
b) In the absence of a CMP, if Basic's capital position is expected to naturally decline during the forecast period, is that outcome in the public interest and acceptable for rate setting purposes?

Rationale for Question:

To better understand Dr. Simpson's and Ms. Sherry's evidence re: the need for a CMP.

RESPONSE:

a) Yes. MPI's DCAT is performed yearly, the RSR range can be determined yearly based on the DCAT results, the actuarial rate indication is completed yearly, and the rate required based on the actuarial rate indication and whether the Corporation's capital is within the RSR range determined can be applied for yearly. Given this, there is no need for a CMP as the rate required can be sought annually based on the Corporation's situation at the time of filing.

b) It is not against public interest if Basic's capital position falls over the time period between GRAs because the capital position will be reviewed when the RSR target range is set on an annual basis. If the capital position of the Corporation is below the minimum of the range a filing asking for an RSR rebuild provision would be possible.

CAC Manitoba adds that it expects to explore the hypothesis that "Basic's capital position is expected to naturally decline during the forecast period" during the General Rate Application.