



Research Paper

Patterns of Going Concern Discount Rates

Doug Chandler
Canadian Retirement Research Actuary
Society of Actuaries

March 2019

Document 219029

Ce document est disponible en français.

Caveat and Disclaimer

This study is published by the Canadian Institute of Actuaries (CIA) and the Society of Actuaries (SOA) and contains information from a variety of sources. It may or may not reflect the circumstances of any particular pension plan. The study is for informational purposes only and should not be considered as professional or financial advice. The CIA and SOA do not recommend or endorse any particular use of the information provided in this study. The CIA and SOA make no warranty, express or implied, or representation whatsoever and assume no liability in connection with the use or misuse of this study.

Research reports do not necessarily represent the views of the CIA or SOA. Members should be familiar with research reports. Research reports do not constitute standards of practice and therefore are not binding. Research reports may or may not be in compliance with standards of practice. Responsibility for the manner of application of standards of practice in specific circumstances remains that of the members.

Copyright © 2019 All rights reserved by the Society of Actuaries and the Canadian Institute of Actuaries.

CONTENTS

Section 1: Introduction	3
Section 2: Market Calibration	3
Section 3: 2014 Discount Rates	6
3.1 United States.....	6
3.2 Ontario	7
3.3 British Columbia.....	8
Section 4: Components of Discount Rates	9
Section 5: Asset Mix	11
Section 6: Plan Size	15
Section 7: Asset Smoothing Method	16
Section 8: Funded Level	17
Section 9: Areas for Further Research	18
Appendix A: Data and Methodology	19
A1 Ontario.....	19
A1.1 Selection of Plans	19
A1.2 Plan Size.....	20
A1.3 Fixed Income Allocation	20
A1.4 Asset Valuation Method.....	21
A2 British Columbia.....	21
A3 United States	21
Appendix B: Acknowledgements	22
B1 Modelling Oversight Group	22
About the Canadian Institute of Actuaries	23
About the Society of Actuaries	24

Section 1: Introduction

A funding valuation of a pension plan establishes a target level for pension assets and future contributions that, together with future investment returns, is likely to prove sufficient to pay all of the pension benefits as they fall due. This research examines funding valuation discount rates that reflect the expected return on investments in accordance with the pension plan's investment policy. It does not consider discount rates that are prescribed by regulation or intended to measure the cost of settlement of pension obligations.

The research is based on data from regulatory filings in Ontario, with supplementary information from British Columbia and the United States. Since the information reported in government forms and the restrictions on the selection of discount rates vary between jurisdictions, not all results are comparable and not all analysis is possible for each jurisdiction.

We found that actuaries appear to reflect investment policy in the selection of discount rates, and adjust discount rates to reflect changing market interest rates. Other factors such as plan size also help to explain variations in discount rates.

Section 2: Market Calibration

When measuring a corporate sponsor's liability for a pension plan or estimating the cost of settling vested benefits of a pension plan, actuaries use discount rates that are tightly linked to market bond yields. These measures of pension liability provide valuable information for business owners, regulators, and pension plan members but are problematic when used as funding targets in continuing pension plans. Unless the pension plan follows a "liability-driven investment" policy of purchasing bonds that closely match the timing of projected benefit payments for vested benefits, this sort of measure of liability will not be aligned with going concern funding objectives.^{1, 2}

Nonetheless, current market yields cannot be completely ignored in the selection of a going concern discount rate. Guidance for actuaries working in Canada specifies "For a plan where assets are invested in part in treasury bills or bonds, and are expected to be invested that way indefinitely, the best estimate of the long-term investment return on that class of assets may be reasonably viewed as the market yield on the particular investments or the yield on a market index representative of such investments at the calculation date."³ Actuarial standards in the United States are not as specific on this point.⁴

¹ Chandler D., Settlement Cost Compared to Going Concern Funding Targets – Analysis of Pension Plans Registered in Ontario, February 2018, Canadian Institute of Actuaries and Society of Actuaries. Retrieved from <https://www.cia-ica.ca/docs/default-source/2018/218016e.pdf>.

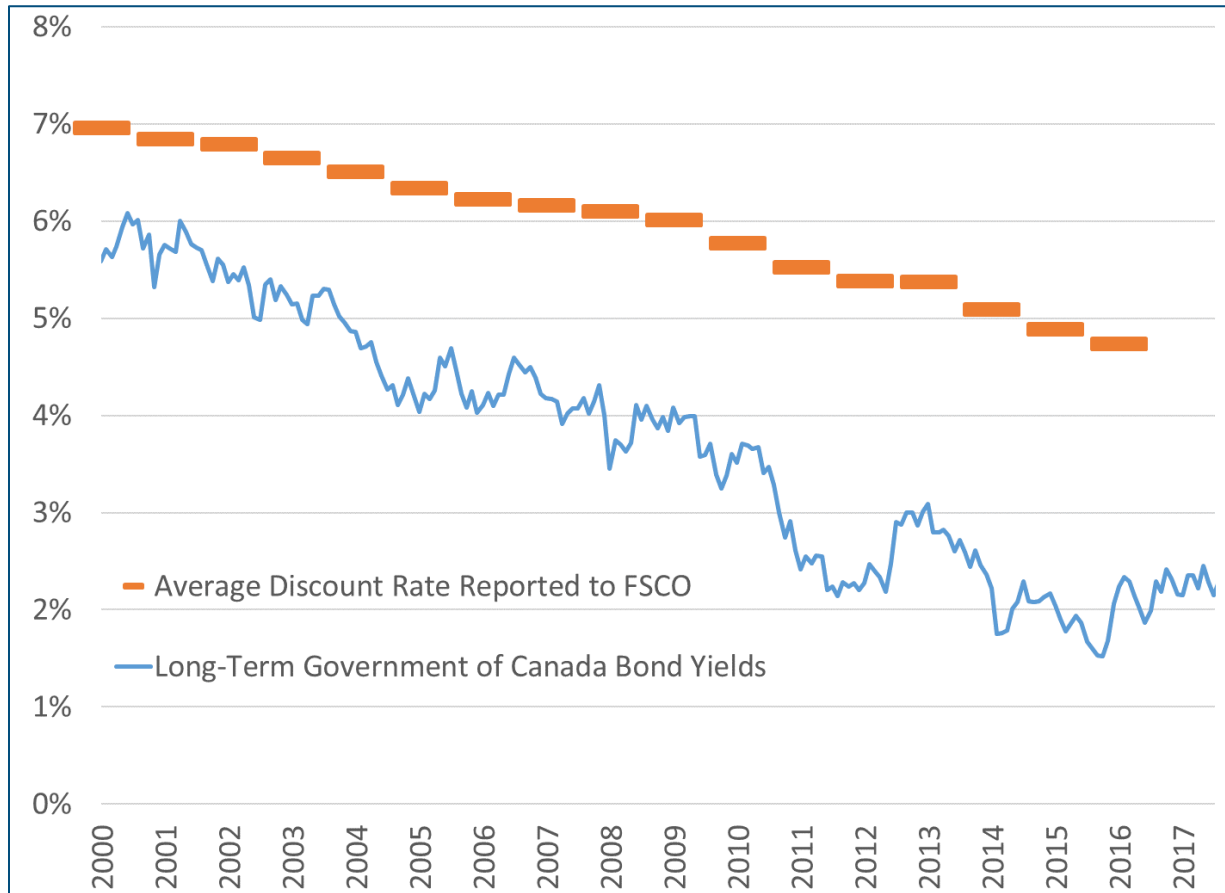
² Ma C., Selecting Discount Rates for Assessing Funded Status of Target Benefit Plans, April 2018, Canadian Institute of Actuaries. Retrieved from <http://www.cia-ica.ca/docs/default-source/2018/218041.pdf>.

³ Committee on Pension Plan Financial Reporting, Educational Note – Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, December 2010, Canadian Institute of Actuaries, retrieved from <http://www.cia-ica.ca/docs/default-source/2010/210094e.pdf>.

⁴ Selection of Actuarial Assumptions for Measuring Pension Obligations, September 2013, Actuarial Standards Board. Retrieved from <http://www.actuarialstandardsboard.org/asops/selection-economic-assumptions-measuring-pension-obligations/>.

Discount rates used for funding Canadian pension plans have, in fact, decreased as bond yields have declined over recent years, as illustrated in figure 1 below.⁵

Figure 1
Trend in Bond Yields and Discount Rates



This decline in Ontario discount rates is more pronounced than elsewhere. The median going concern discount rate for British Columbia pension plans declined from 5.7% in 2012 to 5.25% in 2014 but no decline is reported for subsequent valuation dates:

“Data from valuations filed with the Superintendent of Pensions between 2013 and 2016 does not show a significant difference in terms of the median going concern discount rates used. The rates fall within a relatively narrow range of between 5.0 and 5.5%. Over 60% of plans filing

⁵ Data on average discount rates for this chart were assembled from the 2004 through 2016 editions of the annual “Report on the Funding of Defined Benefit Pension Plans in Ontario” published by the Financial Services Commission of Ontario. Retrieved from https://www.fSCO.gov.on.ca/en/pensions/actuarial/Pages/risk-based_supervision.aspx. Data on long-term Government of Canada Bond Yields are from CANSIM series V122487 (Government of Canada marketable bonds - average yield - over 10 years), retrieved from https://www.bankofcanada.ca/wp-content/uploads/2010/09/selected_historical_v122487.pdf.

valuations between 2013 and 2016 used going concern discount rates which fall between 5.0 and 5.9%. About 15% of plans used discount rates of 6.0% or higher.”⁶

For U.S. public sector pension plans, the decline has also been comparatively modest:

“Until FY 11, the median investment return assumption used by public pension plans was 8.0 percent. Since 2009, more than 90 percent of plans have reduced their assumed investment return, resulting in a reduction to the median return assumption to just below 7.4 percent.”⁷

Even in Ontario, the decline in discount rates has been more gradual than the decline in bond yields. There are several possible explanations for this pattern.

1. Although actuaries have adjusted their expected returns for bonds, they might not have adjusted their expected returns for equities and other classes of investments in the same way.
2. Except when a pension plan has been frozen or has declining active membership for some other reason, it is often the case that annual contributions for current service exceed annual benefit payments. In this situation, the existing assets of the pension fund can be assumed to remain invested indefinitely. While yields implied by current market prices give a good indication of bond returns expected over the next couple of decades, other considerations must be taken into account in establishing expected returns beyond the maturity of the existing bonds.
3. Actuaries and plan sponsors might rely on historical returns rather than (or as well as) forward-looking return expectations. Historical returns on fixed income investments remained strong until recently because of capital appreciation as yields declined.
4. A significant reason for declining bond yields has been declining inflation. A review of published reports for a selection of large Canadian public sector pension plans would suggest that actuaries for indexed pension plans have adjusted their expectations for inflation but not their expectations for real rates of return (net of inflation).⁸

⁶ Report on Pension Plans Registered in British Columbia, Financial Institutions Commission of British Columbia (FICOM), August 2017. Retrieved from

https://www.fic.gov.bc.ca/index.aspx?p=pension_plans/regulatoryPractices.

⁷ Brainard K. and Brown A., Public Fund Survey, National Association of State Retirement Administrators, November 2017. Retrieved from <https://www.nasra.org/publicfundsurvey>.

⁸ Author’s findings from published annual reports of public sector pension plans, reported in a webcast jointly sponsored by the Canadian Institute of Actuaries and the Society of Actuaries on September 15, 2016.

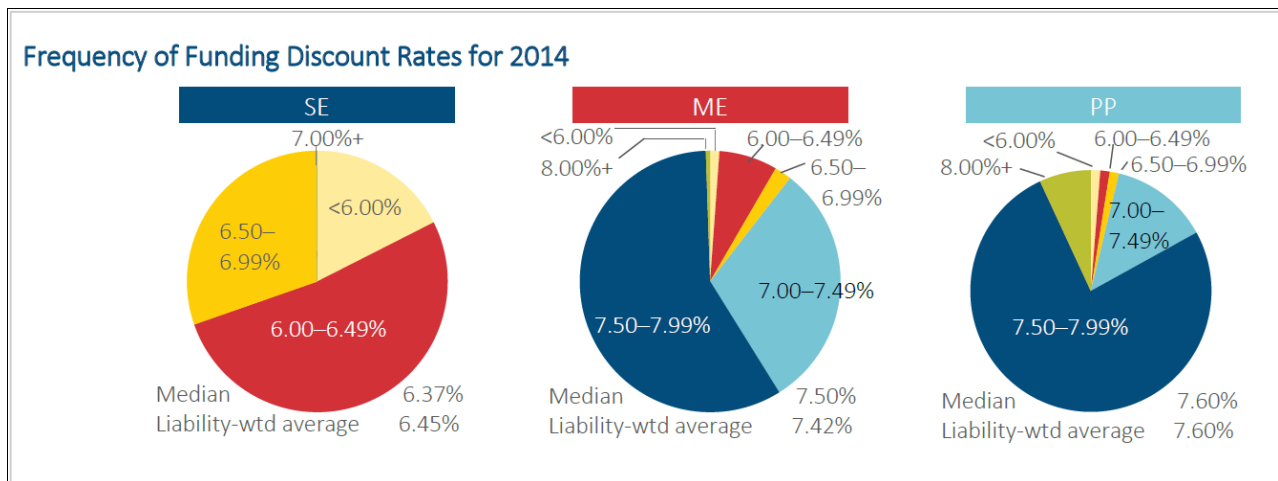
Section 3: 2014 Discount Rates

To overcome differences due to changing market conditions, we restrict the range of valuation dates. We have discount rate statistics for Ontario, British Columbia, and the United States, but the BC data is only for valuations as of January 1, 2014. U.S. data is available for various dates, but the most recent study published by the SOA is for valuation dates in 2014. For comparison, the Ontario data has been limited to valuations with effective dates between December 31, 2013 and January 1, 2015 (inclusive).

3.1 United States

Statistics on U.S. discount rates are taken from a study completed in 2016.⁹ Results are presented separately for single employer (SE) private sector pension plans, multi-employer (ME) pension plans, and public sector (PP) pension plans. SE pension plans are legally required to use a modified market-based discount rate that is not directly comparable to the discount rates based on expected returns that are used by ME and PP pension plans and Canadian plans.

Figure 2
U.S. DISCOUNT RATES



⁹ Schilling L., U.S. Pension Plan Discount Rate Comparison 2009–2014, Society of Actuaries, September 2016. Retrieved from <https://www.soa.org/research-reports/2016/2016-us-pension-plan-discount-rate-comparison/>.

Table 1
REPORTED 2014 VALUES FOR FUNDING PURPOSES – UNITED STATES

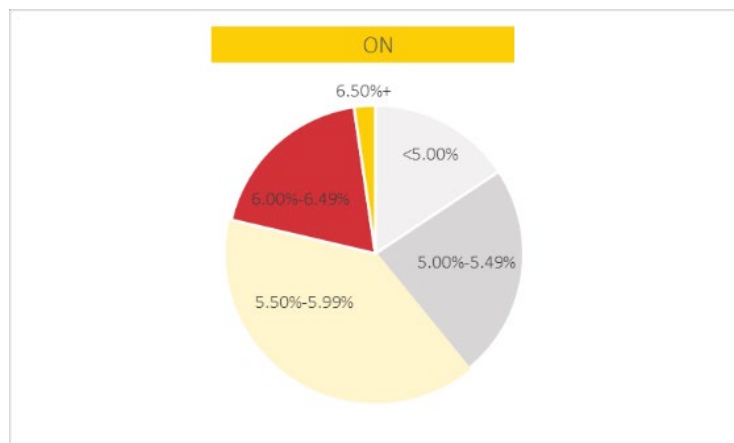
	SE	ME	PP
Liability-weighted average discount rate ¹⁰	6.38%	7.44%	7.64%
Liability-weighted average funded ratio ¹¹	110%	77%	72%
Approximate values (rounded):			
Total liabilities (billions)	\$1,900	\$500	\$4,100
Total unfunded liabilities (billions)	\$53	\$130	\$1,200
Number of participants (millions)	31	10	26
Number of plans	37,000	1,200	160

3.2 Ontario

Private sector and public sector pension plans are not identified separately in Ontario data. However, most Ontario defined benefit pension plan members in the public sector belong to “jointly sponsored pension plans” (JSPP). These arrangements are similar to multi-employer pension plans (MEPP), except that reductions in accrued benefits are not permitted prior to plan wind-up. Deficits must be addressed through increases in employer and employee contributions.

Single employer pension plans are funded on both a going concern basis and a solvency basis. In recent years, solvency has been the primary determinant of contributions, shifting the scrutiny of sponsors and regulators away from going concern discount rates.

Figure 3
ONTARIO DISCOUNT RATES



¹⁰ For this analysis, “discount rate” refers to the interest rate used to compute the present value of future benefit payments.

¹¹ In addition to varying discount rates, the liabilities and assets used for funding reflect varying actuarial methods across categories as well as within some categories.

Table 2

REPORTED 2014 VALUES FOR FUNDING PURPOSES – ONTARIO

	Single Employer	Multi-Employer	Jointly Sponsored	All Plans
Liability-weighted average discount rate	5.45%	6.02%	5.43%	5.47%
Liability-weighted average funded ratio	104%	99%	92%	96%
Total liabilities (C\$ billions)	153	26	345	525
Total of unfunded liabilities (C\$ billions)	7	2	43	52
Number of participants (millions)	0.99	0.90	1.28	3.17
Number of plans	1,092	64	9	1,165

The differences in regulatory regimes and risk-sharing deals do not appear to have led to significant differences in Ontario discount rates.

3.3 British Columbia

The number of pension plans registered in British Columbia is much smaller than in Ontario or the U.S., limiting our ability to draw inferences about subgroups of pension plans. Figure 4 below shows discount rates for the aggregate of all British Columbia (BC) pension plan valuations with valuation dates of January 1, 2014 (or December 31, 2013).

Figure 4

BRITISH COLUMBIA DISCOUNT RATES

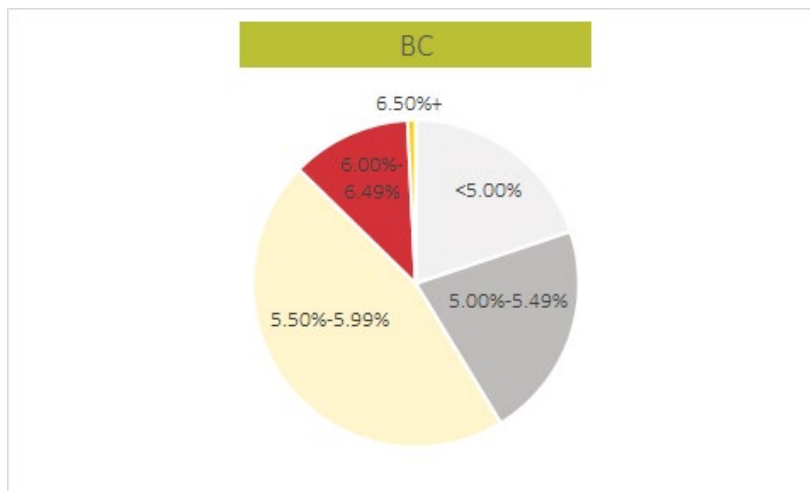


Table 3**REPORTED 2014 VALUES FOR FUNDING PURPOSES – BRITISH COLUMBIA**

	BC Aggregate
Liability-weighted average discount rate	5.51%
Liability-weighted average funded ratio	105%
Total liabilities (C\$ billions)	11
Total unfunded liabilities (C\$ billions)	–
Number of participants (millions)	0.18
Number of plans	126

The statistics above include single-employer and multi-employer pension plans but not public sector pension plans, as those plans had different valuation dates. The main public sector pension plans had a discount rate of 6.5% at the most recent valuation date prior to December 31, 2013.¹²

BC discount rates are similar to those in Ontario. Discount rates for both Canadian jurisdictions are typically lower than U.S. discount rates. A small part of the difference between Canadian and U.S. rates that reflect expected future investment returns (i.e., disregarding U.S. single employer pension plan rates) can be attributed to differences in market conditions. At the end of 2013, Canadian 10-year treasury bond yields were lower than their U.S. equivalents by about 0.25%.¹³

Section 4: Components of Discount Rates

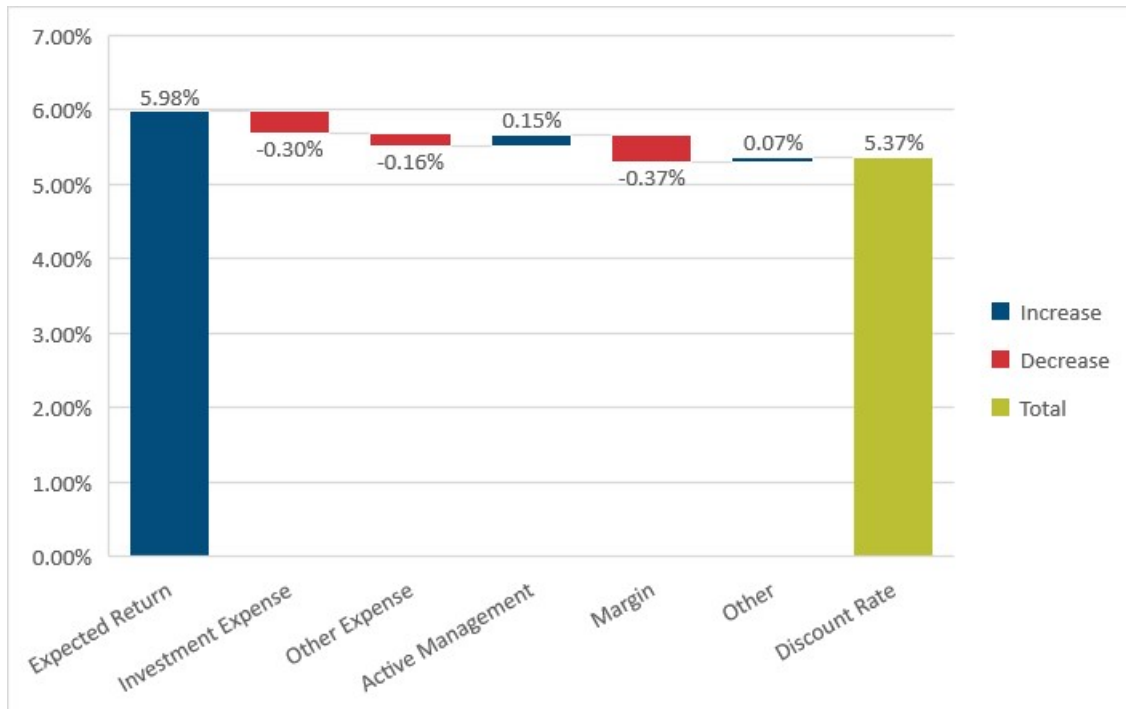
In determining discount rates, the expected cost of managing investments is deducted from the expected return on invested assets. The Canadian actuarial guidance for determining best estimate discount rates cited above specifies “the actuary may assume, if appropriate based on the circumstances of a particular plan, that any additional active management fees are fully offset by additional value added returns”. That is, they may set an expected return assumption that reflects passive management in accordance with the pension fund asset mix policy, with no adjustment for the costs or benefits of active investment management. Depending on the circumstances, there may also be adjustments to the discount rate for administration expenses and adverse deviations. While actuaries in all jurisdictions provide a rationale for their valuation assumptions in their report, this often does not include an explicit breakdown of the components of the discount rate. The British Columbia Actuarial Information Summary requires this breakdown but the Actuarial Information Summary prescribed in Ontario and elsewhere

¹² Access valuation reports on public sector pension plans administered by the BC Pension Corporation from https://www.pensionsbc.ca/portal/page/portal/pen_corp_home/home/.

¹³ The Bank of Canada reports a yield of 2.77% for the 10-year benchmark Government of Canada bond (CANSIM series V39055) at December 31, 2013. The U.S. Department of the Treasury reports a yield of 3.04% for a 10-year Treasury bond at December 31, 2013.

does not.¹⁴ Figure 5 below shows the average breakdown for January 1, 2014 valuations of pension plans registered in British Columbia.

Figure 5
AVERAGE COMPONENTS OF BRITISH COLUMBIA DISCOUNT RATES



Although Ontario Actuarial Information Summary forms do not provide a breakdown of the components of the discount rate comparable to the BC breakdown, they do provide an indication of the type of expense allowance. About half of Ontario pension valuations in the data were prepared with an explicit addition to normal costs to cover administration expenses, while most other plans make an implicit reduction in the discount rate. The plans with an explicit addition to the normal costs have discount rates 0.2% higher than the others. This is consistent with the 0.16% average administration expense allowance for British Columbia plans.

Almost all Ontario pension valuations were prepared with an implicit reduction to the discount rate for investment expenses. It is our understanding that margins for adverse deviations and other factors are also usually reflected through adjustments to the discount rate.

With recent changes¹⁵ in regulations and actuarial standards concerning provisions for adverse deviations (PfADs), Canadian actuaries may choose to remove the margin for adverse

¹⁴ The current Actuarial Information (AIS) user guide can be found on the BC Financial Industry Commission website at <https://fic-e-file.gov.bc.ca/ais/pdf/AIS-UserGuide-NewAct.pdf>. The AIS form and instructions used in Ontario can be found at <https://www.canada.ca/content/dam/cra-arc/formspubs/pbg/t1200/t1200-fill-17e.pdf>.

¹⁵ Canadian actuarial standards for reporting on the funding of pension plans were amended in 2010 to specify the selection of best-estimate going concern by the actuary. The objectives of funding and the inclusion of a provision for adverse deviations are specified by the terms of engagement or applicable law. Prior to that, pension-specific actuarial standards specified that the objectives of pension funding in accordance with accepted practice included

deviations from the discount rate and disclose the entire provision for adverse deviations separately in the going concern valuation balance sheet and normal cost.

Section 5: Asset Mix

Each pension plan has an investment policy, reflecting the circumstances and risk tolerance of the plan and the funding entities. Pension investments can include government and corporate bonds, public market equities, real estate, and a variety of other securities and real assets. Within each broad category, investment managers may be given mandates for active trading or specialization. While some of the details of pension funds' target and actual investments are included in the Ontario Investment Information Summary and other government filings, these forms do not encapsulate all the details, strategies, and constraints that would be reflected in an actuary's determination of the expected rate of return on assets or the riskiness that would influence a margin for adverse deviations.

The changes to funding regulations adopted in Ontario in 2018 specify a minimum provision for adverse deviations based on each pension plan's target allocation to fixed income assets. For this purpose, fixed income assets include the following:

- 100% of bonds, debentures, guaranteed investment certificates, term deposits, insurance contracts, cash (when identified as a separate asset class), and short-term investments;
- 0% of publicly and privately traded stocks and employer-issued securities; and
- 50% of real estate (including real estate debentures and mortgages), resource properties, venture capital, and other types of investments.

This definition of fixed income assets has been used for analysis of the relationship between asset mix and discount rates, to the extent data was available.

Most Ontario pension plans employ pooled funds. The majority of smaller plans use pooled funds for all or almost all of their investments, while larger pension plans tend to use pooled funds for smaller portions of their assets. The regulations specify that pooled funds are to be allocated to fixed income or non-fixed income assets according to their underlying holdings. Balanced pooled funds are treated as 50% fixed income assets except that plans are excluded from this part of the analysis if the allocation to balanced funds exceeds 40%.

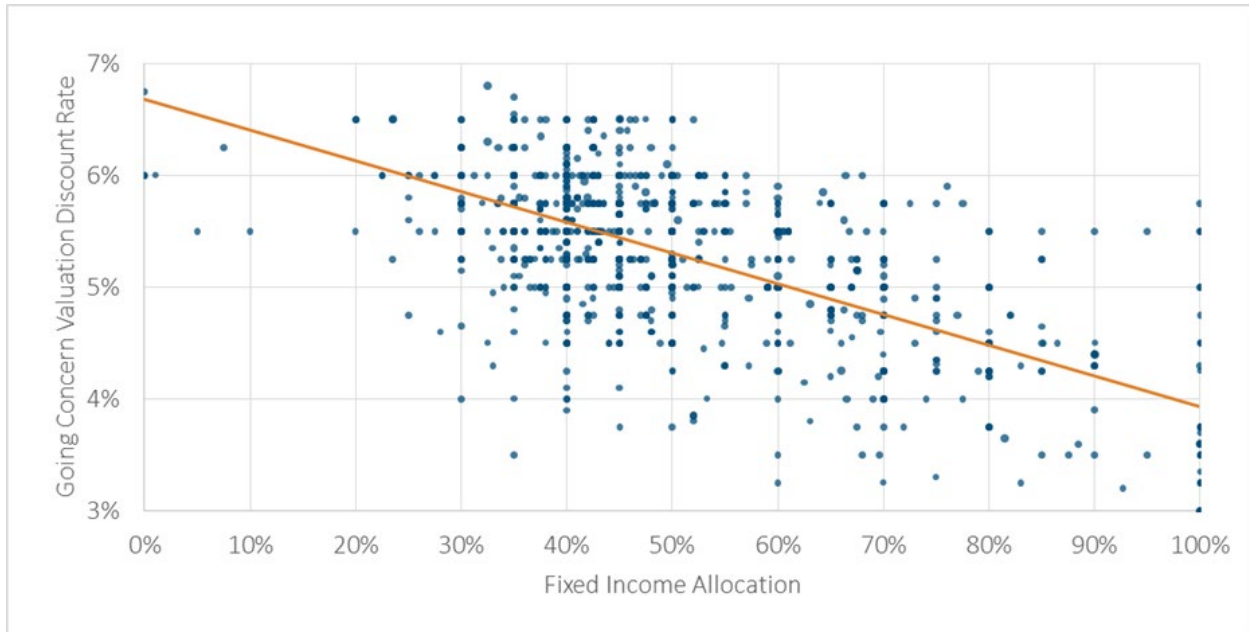
Some Ontario pension funds use derivatives or borrowing to achieve investment objectives that cannot be implemented through direct investments. These are relatively uncommon, and not

security of benefits and so (in accordance with general standards) called for a margin in assumptions selected by the actuary. If there was no provision for adverse deviations (in a pre-2010 report), actuaries were required to report the reason. The change in standards in 2010 did not immediately lead to the removal of margins from assumptions or the explicit reporting of best estimates and provisions for adverse deviations. Changes to minimum funding regulations in Québec (in 2016) and Ontario (in 2018) specify minimum provisions for adverse deviations, based on a plan's target asset mix and other considerations. Alberta, British Columbia, and New Brunswick introduced explicit minimum provisions for adverse deviations for target benefit plans and multi-employer plans in 2014.

well described in regulatory filings. Where mention is made of derivatives, the fair value is included with real estate and other types of investments.

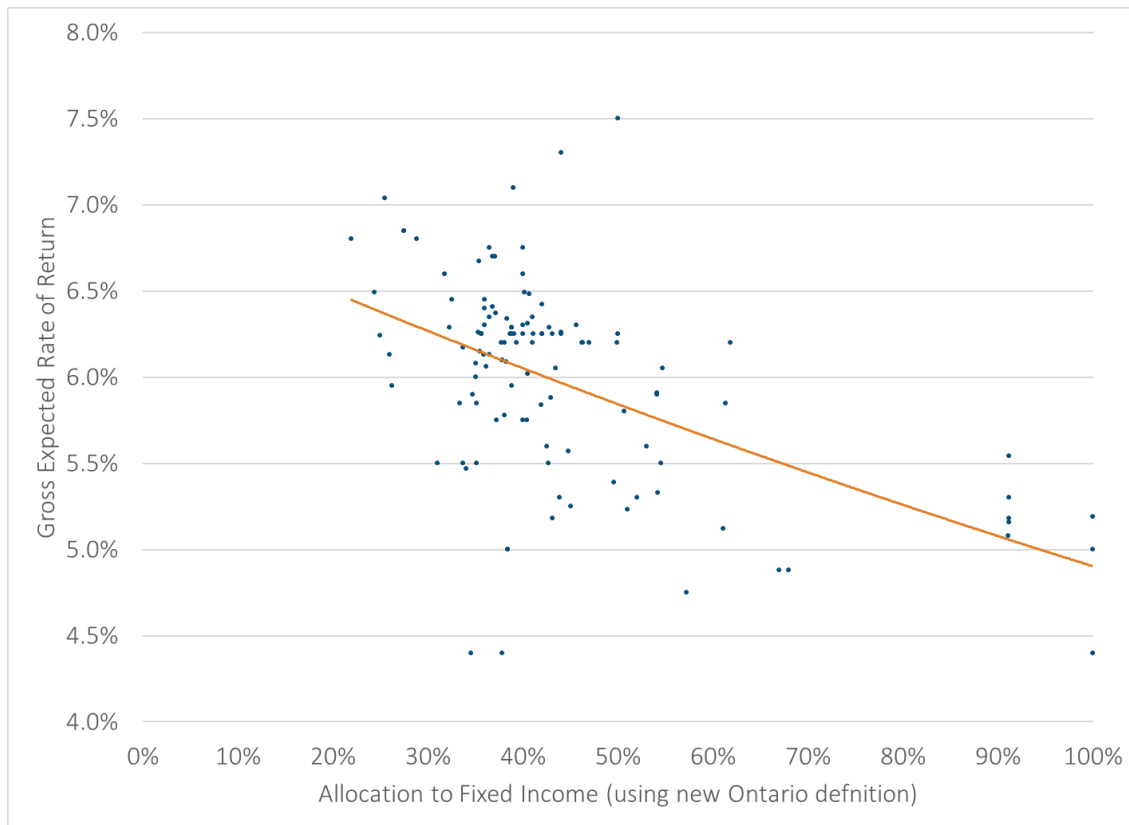
The scattergram in figure 6 below shows the relationship between going concern funding valuation discount rates and the allocation to fixed income assets for 1,131 Ontario pension plans with valuation dates between the end of 2013 and the beginning of 2015. The trend line shows the overall pattern.

Figure 6
ONTARIO DISCOUNT RATES AND ASSET MIX



The scattergram in figure 7 below shows the pattern for 126 British Columbia pension plans with valuation dates at the end of 2013. In this case, the expected return on assets component of the discount rate is used, before adjustments for fees and margins.

Figure 7
 BC EXPECTED RATES OF RETURN AND ASSET MIX



The Canadian guidance on the selection of going concern discount rates cited above suggests a building-block approach, with an equity premium over long-term Government of Canada bonds based on historical averages.¹⁶ Recent changes to provincial funding frameworks cited above follow a similar approach. In particular, the 2018 Ontario regulations define a benchmark discount rate and require a larger provision for adverse deviations when the going concern discount rate for a particular plan exceeds the benchmark. The benchmark discount rate is defined as

$$0.5\% + i_L + 1.5\% \times F + 5\% \times (1 - F)$$

where i_L is the benchmark yield on long-term Government of Canada bonds and F is the fraction of the plan's assets invested in fixed income securities.¹⁷

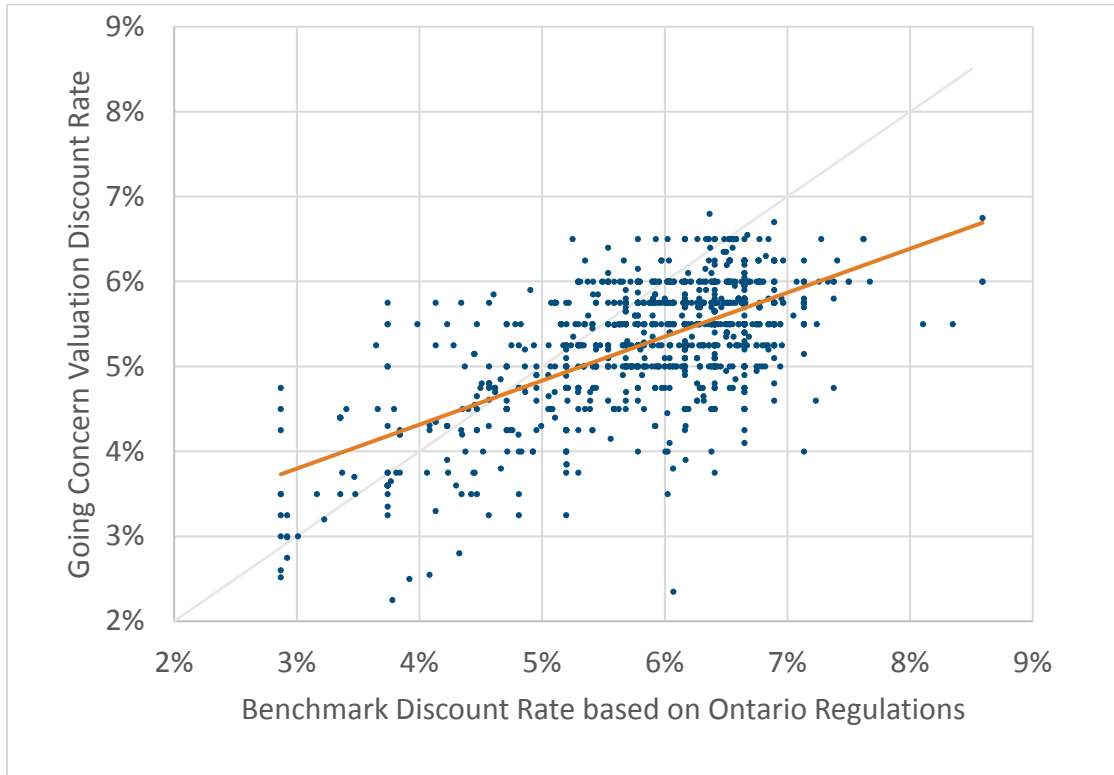
The scattergram in figure 8 below compares actual Ontario going concern discount rates to the new Ontario benchmark discount rate. All valuation dates in the data provided are included since variations in market conditions are reflected in the benchmark. When comparing discount rates to the benchmark, keep in mind that the benchmark discount rates were conceived for

¹⁶ See pages 4–5, Committee on Pension Plan Financial Reporting, Educational Note – Determination of Best Estimate Discount Rates for Going Concern Funding Valuations, December 2010, Canadian Institute of Actuaries, retrieved from <http://www.cia-ica.ca/docs/default-source/2010/210094e.pdf>.

¹⁷ See Section 11.2(7) of the Revised Regulations of Ontario, Regulation 909 under the Pension Benefits Act (Revised Statutes of Ontario 1990 c. P.8.). Retrieved from <https://www.ontario.ca/laws/regulation/900909#BK4>.

use in conjunction with an explicit provision for adverse deviations that appears on the going concern valuation balance sheet separately from the best estimate funding target, whereas historical valuation discount rates would typically include an implicit margin for adverse deviations.

Figure 8
COMPARISON OF ONTARIO DISCOUNT RATES TO BENCHMARK DISCOUNT RATES



Benchmark discount rates vary from less than 3% (for plans with 100% allocation to fixed income and valuation dates towards the end of the study period) to more than 8% (for plans with 0% allocation to fixed income and older valuation dates). The diagonal grey line shows the point where the historical going concern discount rates would have matched the new benchmark. The orange trend line shows the average pattern.

The variation in actual discount rates among pension plans is not as broad as the variation in benchmark discount rates. The standard deviation is smaller and the range of values is narrower. This pattern is consistent with research¹⁸ and new regulations indicating smaller margins for adverse deviations when there is a strong fixed income allocation. The reasons noted in section 2 for the gradual pace of decline in pension funding discount rates would also help explain the pattern.

¹⁸ Chandler D., Provisions for Adverse Deviations in Going Concern Actuarial Valuations, Society of Actuaries, March 2017. Retrieved from <http://www.cia-ica.ca/docs/default-source/2017/217035e.pdf>.

Section 6: Plan Size

As you can see in figures 9 and 10 below, there is a pattern of higher discount rates for larger pension plans.

Figure 9

AVERAGE ONTARIO DISCOUNT RATES BY SIZE OF LIABILITIES (IN CANADIAN DOLLARS)

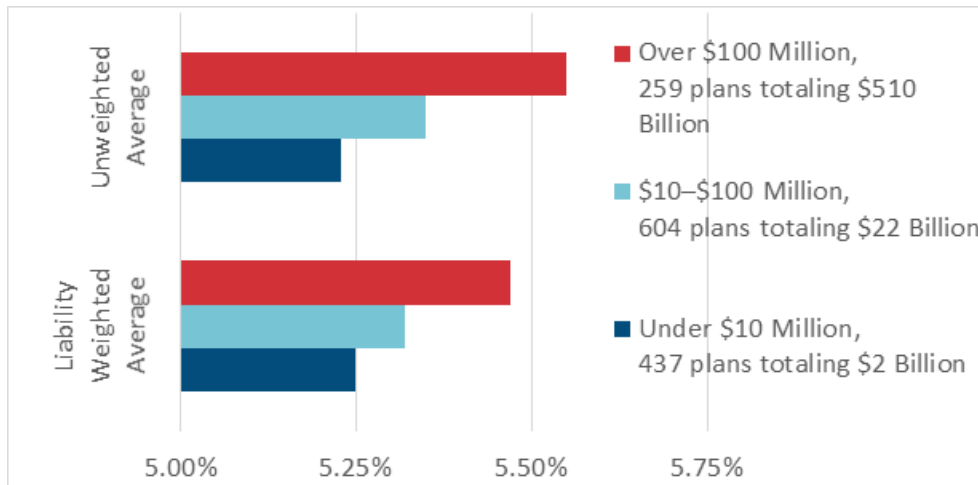
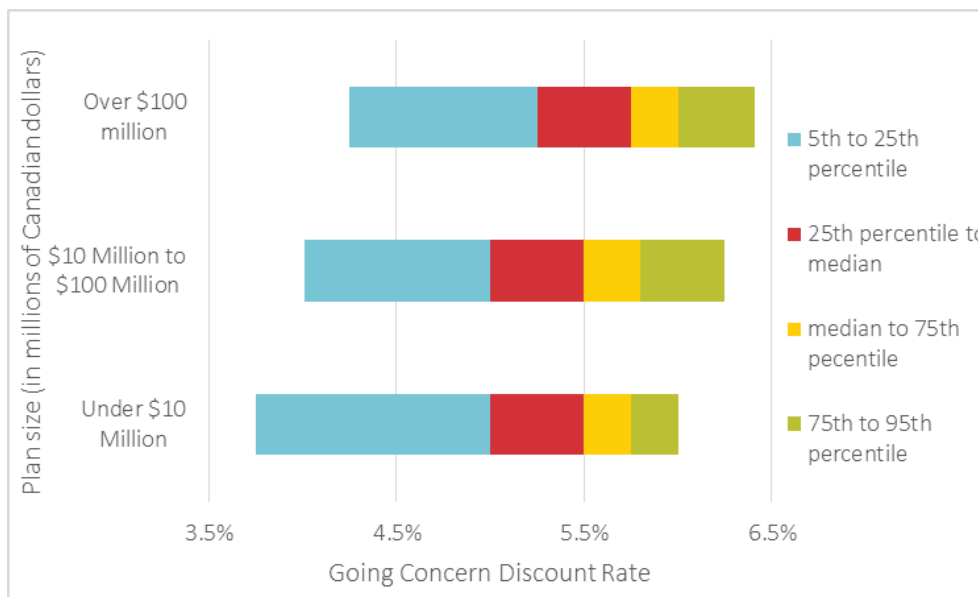


Figure 10

DISTRIBUTION OF ONTARIO DISCOUNT RATES BY SIZE OF LIABILITIES



The variation in discount rates by plan size may be partly attributable to variations in asset mix. Overall, the average fixed income allocation (for Ontario plans and using the 2018 Ontario definition of fixed income allocation) was 48%. Small, medium, and large plans (by size of liabilities, as in figures 9 and 10) had average fixed income allocations of 47%, 49%, and 50% respectively. The difference between 47% and 50% translates into a difference in the benchmark discount rates of 0.10%.

The variations in discount rates may also be partly attributable to differences in expense allowances, with smaller allowances for larger plans. This is evident in the British Columbia averages in table 4 below.

Table 4**AVERAGES OF COMPONENTS OF BRITISH COLUMBIA DISCOUNT RATES**

Going Concern Liabilities	Under \$10 Million	\$10 Million to \$100 Million	Over \$100 Million	All Sizes
Number of Plans	36	59	29	124
Expected Return	5.89%	6.01%	6.00%	5.98%
Investment Expense	-0.43%	-0.28%	-0.19%	-0.30%
Other Expense	-0.29%	-0.13%	-0.07%	-0.16%
Active Management	0.22%	0.14%	0.08%	0.15%
Margin	-0.36%	-0.39%	-0.35%	-0.37%
Other Adjustments	0.12%	0.08%	0.05%	0.07%
Discount Rate	5.15%	5.43%	5.52%	5.37%

The observed variations in average size of the active management premium are not what one would expect. Achieving consistent added value through active management requires a significant governance budget and the kinds of investment opportunities that are available only to very large pension funds.

Section 7: Asset Smoothing Method

Ontario pension funding regulations permit pension plan sponsors to delay recognition of investment gains and losses through an adjustment to the fair market value. When assets recorded on the valuation balance sheet are higher than market value, future returns on the adjusted value will be correspondingly lower. On average, the smoothed value of assets was about 5% lower than the market value, presumably because of favourable market returns during 2010 through 2013. As shown in table 5 below, the average discount rate for plans with a smoothing adjustment is slightly higher than the average discount rates for plans that determine going concern contributions using the market value of assets without adjustment. The difference is consistent with the 5% gap between smoothed and market values.

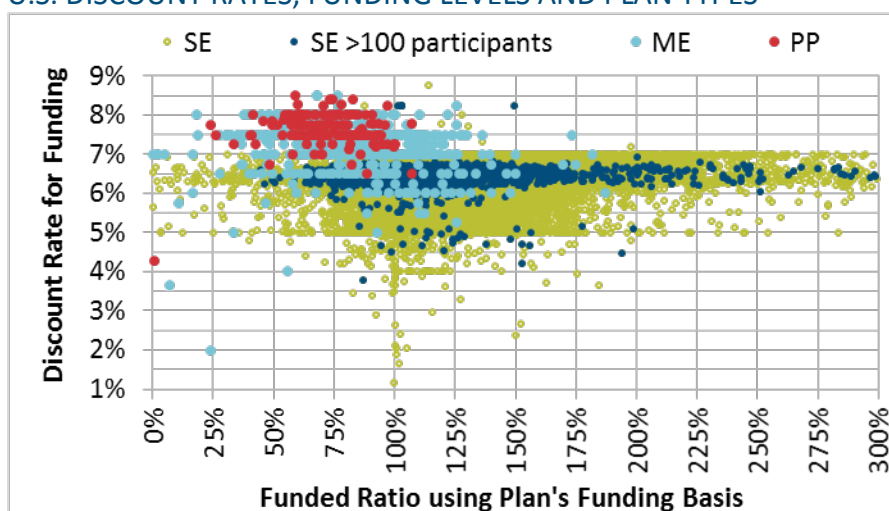
Table 5
AVERAGES OF ONTARIO DISCOUNT RATES BY ASSET SMOOTHING METHOD

	Market Value of Assets	Smoothed Assets
Average Discount Rate	5.42%	5.48%
Liabilities (C\$ billions)	101	432
Number of Plans	944	350

Section 8: Funded Level

There is some evidence that higher discount rates may be associated with poorer funding levels in U.S. pension plans, as shown in figure 11 below.¹⁹ We cannot conclude that higher discount rates lead to underfunding or that underfunding leads to inflated discount rates—there are other important factors driving the funding levels of U.S. pension plans. Nonetheless, it is worth considering whether a similar pattern exists in Canada.

Figure 11
U.S. DISCOUNT RATES, FUNDING LEVELS AND PLAN TYPES



Prior to the 2018 changes to Ontario funding regulations,²⁰ a pension plan with a large solvency deficiency would have required large special contributions to amortize that deficiency. The level of going concern contributions was less important than solvency funding in overall contribution requirements. Thus, unlike the U.S. situation, going concern discount rates might not have been an important determinant of pension plan contributions. Like the U.S. situation, a higher discount rate is associated with a higher funded ratio for going concern funding purposes.

For an Ontario pension plan, the “solvency ratio” is the ratio of the market value of assets to the solvency liabilities (i.e., wind-up cost excluding indexing). This is a measure of the level of funding that is independent of the going concern discount rate. To identify plans with

¹⁹ Reproduced from the U.S. Pension Plan Discount Rate Comparison 2009–2014, op. cit.

²⁰ Ontario Regulation 250/18 was filed on April 20, 2018. Details of the reforms to Ontario funding rules can be found at <https://www.ontariocanada.com/registry/view.do?postingId=25526&language=en>.

contributions that are dominated by solvency special payments rather than going concern funding, the Ontario plans are split into two groups:

- “Solvency dominant” plans with a solvency ratio of less than 95% (i.e., solvency special payments are required) and a solvency ratio less than the going concern funded ratio; and
- “Going concern dominant” plans with a solvency ratio that is either higher than 95% or higher than the going concern funded ratio.

This split is shown in table 6 below. It would appear plans with solvency concerns have slightly higher going concern discount rates than better funded plans. A small part of the difference in discount rates can be explained by slightly lower allocations to fixed income amongst plans with solvency concerns.

Table 6

AVERAGES OF ONTARIO 2014 DISCOUNT RATES BY FUNDING LEVEL

	Solvency Dominant	Going Concern Dominant
Liability-weighted average discount rate	5.92%	5.14%
Unweighted average discount rate	5.46%	5.22%
Liability-weighted average going concern funded ratio	97.6%	94.4%
Unweighted average going concern funded ratio	106.0%	125.1%
Aggregate going concern liabilities (C\$ billions)	220	304
Number of plans	623	542

As in the U.S., higher discount rates are associated with poorer funding but we cannot conclude that there is a causal relationship between the two metrics.

Section 9: Areas for Further Research

It will be interesting to extend this analysis to other jurisdictions and to examine how the patterns of discount rates change once Ontario valuations are filed under the new 2018 funding regulations. Are margins fully removed from discount rates? Are the new PfADs larger or smaller than those margins?

It would also be interesting to examine how same-plan discount rates change from one valuation to the next in the absence of regulatory changes. This would offer a better indication of how actuaries respond to changing market interest rates and other investment market events.

More detailed analysis of asset class allocations could shed light on the prevalence of liability-driven investing and different investment choices for different sizes and types of pension plans.

Appendix A: Data and Methodology

A1 Ontario

Ontario pension plan data was provided by the Financial Services Commission of Ontario (FSCO) in March 2016. It included the most recent Actuarial Information Summary and Investment Information Summary for all plans with an active Ontario registration. Valuation reports and forms are submitted by actuaries electronically, within nine months after the valuation date. Reports are required once every year or once every three years, depending on the funding status, and after a plan amendment. Thus, most of the valuation dates were between 2012 and early 2015. A few reports on wound-up or inactive pension plans were older.

A1.1 Selection of Plans

The data encompassed single employer defined benefit plans, plans that provide both defined benefits and defined contributions (defined contribution balances are normally excluded from the summary data), multi-employer defined benefit plans, and jointly sponsored plans. All the records provided were included, except as described below:

- FSCO maintains a codified plan type (single employer, jointly sponsored, or multiemployer) and benefit type (defined benefit, defined contribution, or plans that provide some combination of defined benefit and defined contribution under a single registration). These codes are automatically populated and cannot be changed except through a plan amendment. Defined contribution pension plans (which have actuarial reports only in unusual circumstances) and a small number of “other” pension plans were excluded.
- Canadian pension plans that are primarily for executives or business owner-operators are required to limit funding to amounts determined using actuarial assumptions prescribed in the Income Tax Regulations. Frequently, these assumptions are used in place of independently determined going concern assumptions. The prescribed discount rate is 7.5%, although this relatively high discount rate (by current standards) is offset by a relatively high inflation assumption. These “designated plans” and any other plans with only one member (“individual pension plans”) were excluded from our analysis.
- The Actuarial Information Summary form supports select and ultimate (step-rate) discount rates and different discount rates for active members and retired members, although this feature is rarely used. Most valuations are based on a single level discount rate applicable to all members. Plans with step-rate going concern discount rates were excluded. For plans with different level discount rates for active members and pensioners, the discount rate was taken to be a liability-weighted average of the two rates.
- Plans with missing or invalid discount rate data were excluded.
- Plans without both an Actuarial Information Summary and an Investment Information Summary in the data were excluded.
- Valuations are prepared when a pension plan is first established, regularly every one or three years thereafter, on an interim basis in support of a plan amendment, or on termination or partial termination of a pension plan. The going concern discount rate for

an interim report is normally unchanged from the discount rate established as of the most recent regular valuation. Wind-up valuations might not need to reflect a full review of going concern valuation assumptions. Where the specified purpose was other than a regular valuation, the plan was excluded.

- FSCO maintains a plan status, and these codes are included in the data provided. Only active plans were included. Frozen and wound-up plans were excluded, since the going concern discount rate would not necessarily reflect a long-term expected return on the investments of the pension fund.

Of the total of 2,664 Actuarial Information Summary records provided,

- 701 were excluded because the plan status was other than “active”;
- 236 were excluded because of invalid or step-rate discount rates;
- 425 designated plans for executives or owner-operators were excluded;
- 2 were excluded solely for other reasons; and
- 1,300 were included in the analysis.

The total market value of assets of the included plans was \$503 billion. For comparison, FSCO analysis of valuations with effective dates between July 1, 2012 and June 30, 2015 included 1,283 plans with assets totaling \$178 billion and excluded seven large public sector plans with assets of \$325 billion.²¹

A1.2 Plan Size

The going concern funding objective is described in the Ontario Actuarial Information Summary as a “going concern liability”, even though this amount is a target level for invested assets rather than a measure of the settlement or economic value of the plan’s liabilities. Plan size is defined using the total of reported going concern liability for active members, retired members, and other participants. That is, it excludes optional ancillary benefits and other reserves. This definition is used to group plans by size and to determine liability-weighted average discount rates.

A1.3 Fixed Income Allocation

As noted in the body of the report, asset mix is determined using the definition of fixed income investments adopted in the 2018 Ontario funding regulations. Information on a pension plan’s target and actual asset mix is included in the Investment Information Summary.

The target asset categories in the online form are selected from a drop-down list, but the older historical forms allow plan administrators to enter asset categories in free form. For each category, the plan administrator reports the target, minimum, and maximum allocation. This information was parsed and the categories were grouped for further analysis.

The target asset allocation was not used if the allocation to balanced funds and other asset classes whose character could not be determined by parsing the description exceeded 40%.

²¹ Financial Services Commission of Ontario, 2015 Report on the Funding of Defined Benefit Pension Plans in Ontario: Overview and Selected Findings 2012–2015, April 2016. Retrieved from <http://www.fSCO.gov.on.ca/en/pensions/actuarial/Documents/2015DBFundingReport.pdf>.

Where available, actual asset allocations were used instead. The actual asset allocations reported in the Investment Income Summary follow the Ontario regulation for preparation of pension fund financial statements (which is also the basis for the 2018 funding regulations). Target asset mixes were used for 1,239 plans with a total market value of \$332 billion and actual asset mixes were used for 16 plans with a total market value of \$180 billion. Neither type of asset mix data was available for the remaining 45 plans. Table A1 below shows the target asset class groupings, the number of plans with non-zero allocations to each asset class, the unweighted average allocation for plans with a non-zero allocation, and the weighted (aggregate) allocation for all plans combined.

Table A1 – Ontario Target Asset Mix Categories

	Number of Plans	Average Allocation	Weighted Average Allocation
Asset Classes Counted as 100% Fixed Income			
Cash and term deposits	494	4.5%	1.1%
Bonds and fixed income funds	1,227	45.7%	34.9%
Asset Classes Counted as 0% Fixed Income			
Public Equities	1,200	51.0%	42.6%
Asset Classes Counted as 50% Fixed Income			
Real Estate	192	7.3%	4.5%
Mortgages	24	11.8%	0.1%
Private Equities	25	16.2%	11.7%
Balanced Funds	1	20.0%	0.0%
Indeterminate and Other Classes	186	12.5%	5.1%
All Asset Classes	1,239		100.0%

A1.4 Asset Valuation Method

The Actuarial Information Summary offers five choices for the asset valuation method (market, smoothed market, book, book and market combination, or other). Only six plans of the 1,300 included in the analysis used a method other than market or smoothed market value.

A2 British Columbia

British Columbia pension plan data was provided by the Financial Commission of British Columbia (FICOM) in April 2015. It included data from actuarial valuations filed with the Superintendent of Pensions with an effective date of December 31, 2013. In a few instances, the data was not entered according to the Actuarial Information Summary instructions, but the correct interpretation was obvious. Where the intent was clear and the result was reasonable, the data was adjusted. Of the 126 plans included in the original data,

- All were included in average discount rate calculations;
- Five were excluded from the analysis of discount rates by asset mix; and
- Two were excluded from the analysis of components of the discount rate.

A3 United States

A description of data sources is included in the September 2016 report.

Appendix B: Acknowledgements

The author extends thanks to the individuals who volunteered their time and expertise to support the preparation of this paper, including the individuals recognized below. This paper does not necessarily reflect their views, nor the views of their employers. Any errors are the author's, not theirs.

Ontario pension plan data used in this paper was provided by the Financial Services Commission of Ontario (FSCO). The author is grateful for the assistance of Lindy Charles, Teck Go, Lester Wong, and Joaquin Zermeno in the assembly of the necessary data. No FSCO staff were involved in preparing the conclusions, analysis, or predictions included in this paper.

British Columbia data used in this paper was provided by the Financial Institutions Commission of the Province of British Columbia (FICOM). The author is grateful for the assistance of Abraham Koomson and Michael Peters in the assembly of the necessary data. No FICOM staff were involved in preparing the conclusions, analysis, or predictions included in this paper.

George Ma, FSA, FCIA, PhD generously volunteered his time and expertise to review and comment on this paper throughout its preparation. The author, the Canadian Institute of Actuaries, and the Society of Actuaries value his feedback tremendously and thank him for his service.

Michael Austin, FSA, FCIA generously volunteered his time to review a technical aspect of the interpretation of Ontario filings and to provide comments on the paper.

Lisa Schilling, FSA, U.S. Retirement Research Actuary at the Society of Actuaries, reviewed and provided comments on the paper.

Patrick Wiese, ASA, Lead Modelling Researcher at the Society of Actuaries, conducted data assembly and technical review.

B1 Modelling Oversight Group

The Canadian data-driven in-house retirement modelling oversight group is a collaboration of the Canadian Institute of Actuaries and the Society of Actuaries. It provides insight into the retirement industry's data-driven actuarial research needs and guidance over priorities. The author, the the Canadian Institute of Actuaries, and the Society of Actuaries thank them for their ongoing volunteer service.

Faisal Siddiqi, FCIA, FSA

Chun-Ming (George) Ma, FCIA, FSA, PhD

Malcolm Hamilton, FCIA, FSA, MSc

Bonnie-Jeanne MacDonald, ACIA, FSA, PhD

Bruce Jones, FCIA, FSA, PhD

Michel St-Germain, FCIA, FSA, MS

About the Canadian Institute of Actuaries

The Canadian Institute of Actuaries (CIA) is the national, bilingual organization and voice of the actuarial profession in Canada. Its members are dedicated to providing actuarial services and advice of the highest quality. The Institute puts the public interest ahead of the needs of the profession and those of its members.

Vision

Financial security for Canadians.

Mission

As the trusted bilingual voice of the Canadian actuarial profession, we advance actuarial science and its application for the well-being of society.

Values

Values shape our attitudes and influence our professional conduct. Our values are:

Community

We put the public interest ahead of our own. Our processes are transparent and volunteerism is at the heart of our activities.

Integrity

We are honest and accountable professionals; we uphold strict ethical principles. We use our expertise, rigorous standards, and objectivity to deliver actuarial services and advice of the highest quality.

Advancement

We are committed to demonstrating the value of effective risk management. We use innovation to advance actuarial science and its applications.

Canadian Institute of Actuaries

360 Albert Street, Suite 1740

Ottawa, Ontario K1R 7X7

www.cia-ica.ca

About the Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world dedicated to serving 30,000 actuarial members and the public in the United States, Canada, and worldwide. In line with the SOA vision statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations, and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers, and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement, and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and non-actuaries from a range of industry sectors and organizations. A rigorous peer review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision-makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modelling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

Society of Actuaries

475 N. Martingale Road, Suite 600

Schaumburg, Illinois 60173

www.SOA.org