

## *Draft of Educational Note*

# Sensitivity Analysis to Illustrate the Effect of Adverse Deviations for Pension Plan Actuarial Valuations

Committee on Pension Plan Financial Reporting

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Members should be familiar with educational notes. Educational notes describe but do not recommend practice in illustrative situations. They do not constitute Standards of Practice and are, therefore, not binding. They are, however, intended to illustrate the application (but not necessarily the only application) of the Standards of Practice, so there should be no conflict between them. They are intended to assist actuaries in applying Standards of Practice in respect of specific matters. Responsibility for the manner of application of Standards of Practice in specific circumstances remains that of the members in the pension practice area.

## Memorandum

**To:** All Fellows, Affiliates, Associates and Correspondents of the Canadian Institute of Actuaries

**From:** Michael Banks, Chairperson  
Committee on Pension Plan Financial Reporting  
Jacques Tremblay, Chairperson  
Practice Council

**Date:** April 9, 2009

**Subject:** **Draft Educational Note – Sensitivity Analysis to Illustrate the Effect of Adverse Deviations for Pension Plan Actuarial Valuations**

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This draft educational note is intended to assist actuaries in the development of a sensitivity analysis to illustrate the effects of adverse deviations on funded status of a pension plan.

In accordance with the Institute’s “Policy on Due Process for the Approval of Guidance Material Other than Standards of Practice”, this draft educational note has been prepared by the Committee on Pension Plan Financial Reporting (PPFRC) and has received final approval for distribution by the Practice Council on April 8, 2009.

As outlined in subsection 1220 of the Standards of Practice, “*The actuary should be familiar with relevant educational notes and other designated educational material.*” That subsection explains further that a “practice which the notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation.” As well, “educational notes are intended to illustrate the application (but not necessarily the only application) of the standards, so there should be no conflict between them.”

If you have any questions or comments regarding this draft educational note, please contact Michael Banks at his CIA Online Directory address, [michael.banks@mercerc.com](mailto:michael.banks@mercerc.com).

MB, JT

## **SENSITIVITY ANALYSIS TO ILLUSTRATE THE EFFECT OF ADVERSE DEVIATIONS FOR PENSION PLAN ACTUARIAL VALUATIONS**

A requirement has been added to the Standards of Practice, effective Month XX, 2009, requiring that an external user report for a pension plan's funding valuation include a sensitivity analysis. This draft educational note provides guidance for actuaries on the preparation of such a sensitivity analysis.

The Pension-Specific Standards of Practice (as effective Month XX, 2009,) include the following statements:

3260.01 *An external user report should...include a description of, and the results of, a sensitivity analysis to illustrate the effect of adverse deviations on the funded status of the pension plan at the calculation date or at the next calculation date.*

3260.13 A sensitivity analysis would illustrate the effect of adverse deviations in relation to the valuation most relevant to users. In many cases, this would focus on the security of benefits on plan wind-up and would illustrate the effect on the hypothetical wind-up funded status of changes in interest rates, changes in asset values and, if appropriate, other significant factors that may affect the funded status on wind-up. For plans such as public sector plans, jointly sponsored plans or multi-employer plans, especially if exempted from solvency funding requirements, it may be appropriate to illustrate the effect of adverse deviations on funded status under a going concern valuation.

An external user report for funding purposes normally provides the funded status of a pension plan on a hypothetical wind-up or solvency basis and/or the funded status of the plan on a going concern basis at a single point in time, a date that has already passed. The purpose of a sensitivity analysis is to provide information to the users of an external user report about the potential effect of future events that are different from that which has been assumed and, more specifically, that could adversely affect the funded status of the pension plan at a future date.

Similar considerations may apply in respect of a report on the wind-up of a pension plan. In this regard, the Standards of Practice state

3330.02 *An external user report should...describe the sensitivity of the valuation results to the pension plan's investment policy and to market conditions between the report date and the settlement date.*

### **Types of Valuations**

A sensitivity analysis would illustrate the effect of adverse deviations in relation to the valuation most relevant to users of the external user report. If the valuation report also provides advice on funding, the actuary may also illustrate the effect of adverse deviations on the funding requirements of the plan.

In many cases a significant concern of users is the security of benefits in the event of plan wind-up. The sensitivity of such security may be illustrated by reporting the effect, on a hypothetical wind-up basis, of changes in interest rates, changes in asset values and, if appropriate, other significant factors that may affect the funded status on wind-up. In

cases where plan funding is materially affected by the results of a solvency valuation, adverse variability in the hypothetical wind-up funded status may be very relevant to the possibility of future contribution increases.

For plans such as public sector plans, jointly-sponsored plans or multi-employer plans, especially if exempted from solvency funding requirements, where the possibility of wind-up may reasonably be considered remote and/or funding is predominantly based on the results of a going concern valuation, it would be appropriate to illustrate the effect of adverse deviations on funded status on a going concern basis. In these circumstances adverse variability in the going concern funded status may be relevant to the possibility of future contribution increases or future benefit decreases.

For plans where the contribution rates are fixed and the benefit levels can be reduced as a result of a funding shortfall, the illustration may include an analysis of the reduction in benefits or increase in contribution rates that might be needed under the adverse deviation scenario(s) considered.

### **Basic Sensitivity Analysis**

A most basic sensitivity analysis, would include

- the effect on the funded status at the calculation date and the incremental cost to the next calculation date using discount rates 1% lower than those used for reporting, and

- the effect on the funded status at the calculation date if the value of assets was 10% lower than reported.

### **Refinement for Fixed Income Investments**

The sensitivity analysis may be enhanced by allowing for the effect of a reduction in interest rates on the market value of fixed income investments on a basis consistent with the assumed reduction in discount rates. Asset value volatility could then be illustrated by assuming the value of non-fixed income investments to be 10% lower than that assumed.

### **Other Significant Factors**

The funded status of a pension plan may be adversely affected by other significant factors and the actuary may consider whether, and how, to illustrate the effect of such adverse experience. Some examples include illustrating the effect on the funded status and/or funding of

- a plan where pensions are indexed with inflation, an inflation assumption that is 1% higher than that used for reporting the funded status of the plan,

- a plan where benefits are based on final average earnings, a salary escalation assumption that is 1% higher than assumed at the calculation date,

- a plan where contributions are negotiated and benefit levels can be reduced, an assumption that expected hours worked are 10% less than assumed at the calculation date, and

- the effect of using a more conservative mortality table.

**Projected Funded Status (Deterministic)**

A more advanced sensitivity analysis could examine the projected funded status at the next calculation date under alternative scenarios, such as

the discount rate remaining unchanged, or falling by 1%,  
fixed income investment valuations being consistent with the alternative discount rate assumptions, and  
non-fixed income assets either earning a best estimate expected return or losing 10% relative to the best estimate expected return assumption.

The projected funded status could allow for contributions at the rate recommended in the report or alternative projections could be provided based on a range of contributions recommended in the report.

**Projected Funded Status (Stochastic)**

Another approach to enhance the sensitivity analysis is to examine the projected funded status at the next calculation date on a stochastic basis. Such an analysis could show the projected funded status on a best estimate basis (assuming interest rates are unchanged) and the probability of worse alternative projected funded status levels.

For example, consider a plan that is 100% funded at the calculation date and is projected, on a best estimate basis, to be 100% funded on the hypothetical wind-up basis at the next calculation date. The actuary might then report the probability that the plan will be at least 90% or at least 80% funded at the next calculation date.

This type of analysis could use the statistics provided in the Research Paper, *Determination of Appropriate Provisions for Adverse Deviations in Hypothetical Wind-up and Solvency Valuations* or could be based on plan specific models.

**Other Considerations**

The descriptions above are not intended to preclude other approaches that the actuary might consider to be relevant in a particular case. In some cases, additional scenarios that reflect the effect of alternative investment policies may be helpful.

The focus above is on the effect of adverse experience as described in paragraph 3260.01 of the Standards of Practice. However, the actuary may also consider illustrating the effects of favourable experience. For example, in some cases, it may be worthwhile to illustrate the potential for large surpluses to arise.

Given the degree of uncertainty being addressed, the focus would be on providing reasonable order of magnitude effects of adverse experience. Reasonable approximations may often be appropriate.

In determining the extent of a sensitivity analysis, the actuary may consider the cost of preparation in relation to the size of the plan and the materiality of the information that could be provided.