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Draft Educational Note

Financial Condition Testing

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Financial Condition Testing

Committee on Risk Management and Capital Requirements

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MEMORANDUM

To: All members in the Life and Property and Casualty Practice Areas

From: Steven W. Easson, Chair
Standards and Guidance Council

Michelle Lindo, Chair
Committee on Risk Management and Capital Requirements

Date: December 5, 2019

Subject: **Draft Educational Note—Financial Condition Testing**

Deadline for comments: **February 28, 2020**

The Canadian Institute of Actuaries (CIA) published its last revised educational note on Dynamic Capital Adequacy Testing (DCAT) in November 2017. This draft educational note has been renamed and updated to reflect revisions to the Standards of Practice (SOP) – Insurance, Section 2500 – Financial Condition Testing (FCT), which was approved by the Actuarial Standards Board (ASB) on September 19, 2019, with an effective date of January 1, 2020.

Background

The objectives of the revisions to Section 2500 Dynamic Capital Adequacy Testing are to:

- Provide a more robust approach to satisfy the federal and provincial insurance acts requirement to report on the expected future financial condition of an insurance entity.
- Allow for a better alignment with Own Risk and Solvency Assessment (ORSA) regulatory requirements as they relate to work needed to report on the expected future financial condition of an insurance entity.

Insurers' specific size, complexity, and other circumstances may have a significant influence on the appropriate level of harmonization between Section 2500 and ORSA. The changes to Section 2500 do not prescribe the level of harmonization, nor does the draft educational note.

Changes to the SOP

Changes to the SOP include:

a) Renaming of Dynamic Capital Adequacy Testing (DCAT) to Financial Condition Testing (FCT);

b) Revised threshold testing of the base scenario to internal target capital ratio(s) as determined by ORSA rather than regulatory supervisory level(s);

c) Testing of "satisfactory financial condition" using both going concern and solvency scenarios;
    - The threshold for "going concern" scenarios is the minimum regulatory target.
    - The threshold for "solvency" scenarios is that the statement value of assets is sufficient to cover the statement value of the liabilities.
d) Three options for the opinion of the actuary:
    - Satisfactory;
    - Satisfactory subject to…;
    - Not satisfactory.
e) Elimination of specifications on the number of years for the review of the recent financial position and forecast period;
f) Removal of the detailed listing of risk categories;
g) Distinction made between ripple effects (which may include management's routine actions) and corrective management actions; and
h) Ability to harmonize with ORSA.

Updates to the draft educational note

The draft educational note provides additional guidance to the actuary on the above topics in the revised SOP. Notable updates include:

a) Recommended minimum percentiles for going concern and solvency scenarios.
b) A decision grid to illustrate the options for the opinion of the appointed actuary.
c) Typical forecast periods are provided, but the choice would be subject to the judgment of the actuary, relevant to the scenario, and consistent with ORSA, if applicable.
d) Retention of risk categories but moved to appendices.
e) Examples of ripple effects and corrective management actions – acknowledging that the classification of a ripple effect or a corrective action would depend on the circumstances of the insurer.
f) Suggestions for possible integration with ORSA in a consolidated report.
g) Recommended that the FCT report contain a minimum of three adverse scenarios (at least one going concern and two solvency scenarios).

Process

In accordance with the CIA's *Policy on Due Process for the Approval of Guidance Material Other than Standards of Practice and Research Documents*, this draft educational note has been prepared by a working group of the Committee on Risk Management and Capital Requirements (CRMCR), and has received approval for exposure to the membership by the Standards and Guidance Council on December 3, 2019.

Responsibility of the actuary

The actuary should be familiar with relevant educational notes. They do not constitute standards of practice and are, therefore, not binding. They are, however, intended to illustrate the application of the Standards of Practice, so there should be no conflict between them. The actuary should note however that a practice that the educational 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. Responsibility for the manner of application of standards of practice in specific circumstances remains that of the members.

Working group

CRMCR would like to acknowledge the contribution of the working group that assisted in the development of this draft educational note: David Kroach (Chair), Nicolas Beaudoin, Marisa Chan, David Gourlay, Marc-André Harvey, Ritchie Hok, Bruce Langstroth, Anh Tu Le, Michelle Lindo, Christian Nadeau-Alary, and Valerio Valenti.

Your feedback

Feedback on all aspects of the proposed changes, as well as suggestions for other changes not presented in this draft educational note, are encouraged.

Interested parties are invited to submit their feedback on this draft educational note by February 28, 2020. Comments should be directed to Michelle Lindo at MLindo@munichre.ca.

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1. Introduction

The primary purpose of this document is to provide guidance and support to actuaries of life and property and casualty (P&C) insurers in performing Financial Condition Testing (FCT) analyses in accordance with the Standards of Practice (SOP) – Insurance, Section 2500.

According to paragraphs 2520.01 to 2520.04 of the SOP:

> The appointed actuary should make an investigation at least once during each financial year of the insurer's recent and current financial position and financial condition, as revealed by financial condition testing for selected scenarios.
>
> The appointed actuary should make a report of each investigation in writing to the insurer's board of directors (or to the appropriate committee of the board such as audit committee, risk committee, etc., if they so delegate) or its chief agent for Canada. The report should identify possible actions, and reasons for those actions, for dealing with any threats to satisfactory financial condition that the investigation reveals. The actuary should also comment on the consistency of the results of the investigation and possible actions with the own risk and solvency assessment (ORSA).
>
> The appointed actuary should ensure that the investigation is current. The investigation should take into consideration recent events and recent financial operating results of the insurer.
>
> The timing and frequency of the appointed actuary's investigations would be sufficient to support timely corrective actions by management and the board of directors or chief agent for Canada.

FCT is one of a number of stress-testing processes that would fit within the insurer's overall risk management process. The FCT process allows management to understand implications the business plan has on capital and provides awareness of the significant risks to which the insurer is exposed. The principal goals of the FCT are to identify possible threats to the financial condition of the insurer and appropriate risk management or corrective actions to address those threats, while considering the ORSA solvency analysis, conclusions, and recommendations. The FCT process should not be viewed as merely a compliance exercise.

Stress testing includes scenario testing and sensitivity testing (refer to the glossary in Office of the Superintendent of Financial Institutions (OSFI) Guideline E-18 – Stress Testing, or to l'Autorité des marchés financiers (AMF) Stress Testing Guideline, for definitions). Stress testing has the following goals:

1. Risk identification and control – stress testing may exist at various levels within an insurer, ranging from risk mitigation policies at a detailed or portfolio level to adjusting the institution's business strategy. It can be used to address institution-wide risks and consider concentrations and interactions between risks in stress environments that might otherwise be overlooked. Knowing the sources of threat will help advise the insurer where it is most vulnerable and should strengthen monitoring systems.
2. Provide a complementary risk perspective to other risk management tools – stress tests would complement risk quantification methodologies that are based on complex, quantitative models using historical data and estimated statistical relationships. Stress-

testing outcomes can provide insights about the validity of statistical models at high confidence intervals such as those used to determine value at risk (VaR).

Stress testing can help the insurer assess possible changes in the economic and financial environment. Stress tests can also help detect vulnerabilities, such as unidentified risk concentrations or potential interactions between types of risk, that could threaten the viability of the institution, which may be concealed when relying purely on statistical risk management tools based on historical data. Stress testing can also be used to assess the impacts of customer behaviour arising from options embedded in products, particularly where the behaviour in extreme events is not well understood.

3. Support capital management – stress testing would form an integral part of an institution's internal capital management where rigorous, forward-looking stress testing can identify severe events, including a series of compounding events or changes in market conditions.
4. Improve liquidity management – stress testing would be a central tool in identifying, measuring, and controlling funding liquidity risks, in particular for assessing the institution's liquidity profile and the adequacy of liquidity buffers in case of both institution-specific and market-wide stress events.

It is essential that the board of directors or chief agent and senior management are involved in the determination of the stress scenarios and understand the key findings of the stress tests to develop and implement risk mitigation strategies. Risk concentration should be considered throughout the stress-testing process.

FCT has the following key elements:

- Development of a base scenario.
- Analysis of the impact of adverse scenarios.
- Identification and analysis of the effectiveness of corrective management actions to mitigate risks.
- A report on the results of the analysis and recommendations to the insurer's management and the board of directors or chief agent.
- An opinion signed by the Appointed Actuary (AA) indicating the financial condition of the insurer.

The subsequent sections of this document cover the following:

- Method – this section provides guidance on the FCT process, forecast period, and approaches to developing the base scenario and adverse scenarios.
- Modelling – this section identifies key elements to be considered in building an FCT model used to project the financial results under the base and selected adverse scenarios.
- Reporting – this section provides guidance on key elements to be considered in reporting the results of FCT, along with an outline of a typical report.
- Appendices – discussion and analysis of life insurer and property and casualty insurer risk categories.

2. Method

Process

The FCT is used for risk identification and control, and assesses threats to an insurer's financial condition while ORSA enhances an insurer's understanding of the interrelationships between its risk profile and capital needs. The ORSA is a more comprehensive process that also addresses other risk management elements such as operational and strategic risks. Both processes share the commonality of relating risk to capital and are complementary, so some level of consistency between the two processes would be expected. The AA would assess the level of consistency necessary in such areas as, but not limited to, the modelling of ripple effects, the selection of adverse scenarios, the forecast periods, and the consistency of messages.

It is fundamental to this process, and to the proper interpretation of results, to understand that the projected capital position under various scenarios may become inadequate during the forecast period. This is not in itself an indication of current or anticipated difficulties. It is the specific degree and timing of capital depletion that indicate the risks to which the insurer is particularly sensitive. This, together with the results under the base scenario, would guide the insurer as to the necessity of revising the business plan or preparing for contingencies.

To perform FCT, it is necessary to understand the regulatory capital minimum(s) and the insurer's internal target capital requirements. If the internal target is established using a different capital benchmark, it would be translated to the equivalent internal target ratio(s) under the current regulatory regime. It is recommended that the AA verify the current regulatory requirements for his or her own insurer's situation and review any applicable guidelines and educational notes. The AA would also understand the risk categories (see Appendices A and B for potential risk categories to be considered) posing the most significant threats to the insurer, including the impact of any ripple effects.

Approach

A typical approach would include the following steps:

- Review of operations in recent years and of the financial position at the end of each of them. The number of years reviewed depends on its relevance to the future financial position.
- Development and modelling of the base scenario. As stated in the SOP, this would normally be consistent with the insurer's business plan.
    - Assess potential risks and identify those that are relevant to the insurer's circumstances. Sensitivity testing may be used to determine the relevant risk categories warranting further analysis.
    - In the event of a new regulatory requirement or change in standards, it may be necessary to perform additional analysis as the sensitivities to certain risk factors may change.
- Selection of adverse scenarios requiring further analysis for relevant risk categories to be applied across all business and product lines:
    - Development and modelling of adverse scenarios likely to significantly impact the

insurer's regulatory capital level and surplus. The scenarios may be single-risk scenarios, or integrated scenarios resulting from a combination of single-risk scenarios. The stress tests would cover a range of scenarios, including non-historical scenarios. Sensitivity testing or stress testing may be used to determine the adverse scenarios.

- Identification and modelling of associated system-wide interactions and feedback effects (ripple effects and macroeconomic effects) caused by a change in assumptions triggered by the scenario.
- Depending on the insurer's circumstances, the board of directors or chief agent and management may also be interested in situations that cross other break points, in which case further stress testing may be beneficial.

- Selection of scenarios for inclusion in the report from those modelled showing the greatest sensitivities. For each scenario that would result in a threat to satisfactory financial condition, identification of possible corrective management actions and presentation of financial condition results with and without such actions. In addition, commentary would be included on the rationale for those actions and the extent to which such actions are necessary and achievable and why they are expected to mitigate and/or eliminate the threats to satisfactory financial condition. Any possible constraints on identified corrective management actions would be taken into account.
- Identification of possible regulatory actions for each scenario that would result in a threat to satisfactory financial condition. For best practices purposes, it would be preferable to also identify possible regulatory actions that may be triggered as a result of falling below any threshold set by the regulator(s).

Recent and current financial position

Paragraph 2520.05 of the SOP states the following:

> The investigation would review operations of recent years and the financial position at the end of each of those years.

The review would include the statement of income and source of earnings (if available) for each year and the financial position at the end of each year, including the balance sheet and the results of the applicable regulatory tests of capital adequacy. The AA would analyze recent trends in these statements and investigate the circumstances and key factors contributing to those trends to ensure awareness of the reasons underlying any such recent trends and report on these findings.

Forecast period

Paragraph 2520.15 of the SOP states the following:

> The forecast period for a scenario would be sufficiently long to be aligned with the risk emergence and the recognition of impacts through the accounting and solvency results, and to capture the effect of management actions.

The SOP does not prescribe a minimum length for the forecast period. However, the following would be considered:

- The forecast period would be long enough to incorporate the full effect of an adverse scenario on the financial condition of an insurer, including ripple effects, and long enough to

assess the recovery period of any corrective management actions.

- The length of the forecast period would be aligned with the risk emergence and the recognition of impacts through accounting and solvency (e.g., the horizon over which accounting impacts are recognized may be different than those for capital, such as those related to segregated fund guarantees).
- A typical forecast period for an insurer is three to five fiscal years. It is recommended that the AA use judgment in assessing the forecast period and describe the reasoning in the report.
- Consistency of the forecast period with similar analysis, such as the ORSA.

Materiality standard

The standard of materiality would usually be less rigorous than that used for valuation of the insurer's policy liabilities and, if practical, the AA would discuss it with the insurer's management. In selecting a materiality standard, the AA would also consider:

- The size of the insurer.
- The financial position of the insurer. The standard of materiality would become more rigorous in examining a base scenario where capital adequacy is closer to the target regulatory requirement.
- The nature of the regulatory test. For example, if the test is measuring required capital, the materiality standard might be expressed as a percentage of the required capital.

For more guidance on materiality, refer to subsection 1240 of the Standards of Practice.

Base scenario

According to paragraph 2520.17 of the SOP:

> The base scenario would be a realistic set of assumptions used to forecast the insurer's financial position over the forecast period. Normally, the base scenario would be consistent with the insurer's business plan. The actuary would accept the business plan's assumptions for use in the base scenario unless these assumptions are so inconsistent or unrealistic that the resulting report would be misleading. The actuary would report any material inconsistency between the base scenario and the business plan.

The standard does not necessarily imply that the projected financial results and future financial positions would be identical to the projections prepared at the time the insurer's business plan was approved. Typically, there is a difference between the timing of the starting balance sheet date for the FCT analysis and the timing when the business plan was approved. During this time, events may have occurred that lead to definitive changes in assumptions. As stated above, the projection of the future financial condition would reflect any material change that has occurred during this time. The projected financial results and future financial positions may continue to be consistent with the business plan while still recognizing the following:

- Sales distribution assumptions that differ from those expected in the business plan.
- Recent management decisions not anticipated or discussed in the business plan.

- Changes in the capitalization of the insurer not expected in the business plan.
- The impact on future experience, where appropriate, due to actual recent experience, assumptions, or decisions as described above.

If differences are material, a reconciliation of the base scenario to the business plan would be included in the FCT report. It is expected that significant deviations from assumptions in the insurer's plan approved by the directors, as well as significant deviations in the results for the forecast period, would be documented. Where differences in the base scenario are not due to a recent reforecast of the business plan, the AA would run the business plan as an additional scenario to ascertain the deviations in the results and explain the rationale for the changes. Any differences between the business plan and the base scenario would, typically, also affect all adverse scenarios.

Clear reporting of assumptions made regarding capital injections is essential. There will be some situations where capital injections are a basic part of an insurer's business plan; for example, when the business plan calls for an insurer to grow quickly or is intending a major initiative in a new sphere of operations. In any scenario where capital injections are assumed, it is expected that the AA would comment on the action in the FCT report and is comfortable that such injections are both realistic and reasonable.

Adverse scenarios

According to paragraphs 2520.18 and 2520.19 of the SOP:

> An adverse scenario is developed by stress testing the assumptions used in forecasting the business plan, including the determination of insurance contract liabilities, with regard to risk factors that may trigger potential threats to the insurer's financial condition. The number and types of adverse scenarios may vary among insurers and over time for a particular insurer.
>
> The actuary would consider material, plausible risks or events to the insurer. Reverse stress testing can help assess whether certain risk factors need to be tested, on the grounds that certain risk factors could never deteriorate to the point where they would be a threat to the insurer's financial condition. The actuary can thereby determine whether a material, plausible risk or event exists for the insurer over the forecast period.

An insurer would consider the impact of a range or series of adverse scenarios of varying nature or severity and its ability to meet the specified thresholds indicated for going concern and solvency scenarios. The actuary would consider threats under adverse scenarios that include, but are not limited to, the common risk categories for life and P&C insurers as listed in Appendices A and B in order to develop adverse scenarios to be modelled. The AA would select adverse scenarios from those modelled showing the greatest sensitivity to be examined in further detail, considering associated ripple effects. Any modelled scenario that causes the insurer to fall below, or come close to, the defined threshold during the forecast period would be subject to further examination and reporting. The AA would consider the ORSA, the insurer's stress testing program, any scenario prescribed by the regulator, and whether the circumstances of the insurer result in the need to examine other risk categories.

Adverse scenarios build on the assumptions and actual experience already reflected in the base scenario. This is particularly true if the first part of the projection of the base scenario already reflects some adverse conditions that have been experienced. If the base scenario does not reflect

adverse experience already seen (because this is projected to improve in the future), the adverse scenarios would not be more favourable than the actual experience to date.

If possible, policy liabilities would be revalued or appropriately estimated for each adverse scenario for each year of the projection. Revaluation only at the end of the forecast period may be a suitable compromise if the actuary believes, given the financial position at the end of the forecast period, that the financial condition would be satisfactory throughout the forecast period.

Scenarios would be framed in the context of the key thresholds being tested when consolidating results. In situations where it is unclear as to the severity of the scenario, the AA would use judgment to determine the appropriate grouping and therefore threshold to be tested.

Both deterministic and stochastic models can be used to perform the analysis. For risks where no stochastic models with predictive capabilities are available, the AA would consider the variability in historical results and credibility of data, among other things, in selecting scenarios.

Reverse stress testing may be used as a means to develop adverse scenarios and determine how far risk factor(s) in question have to change in order to drive the insurer below the scenario thresholds and evaluating if that degree of change is plausible and helps insurers better understand the impact of business vulnerabilities. Reverse stress testing begins with the assumption that a specific outcome occurs, in the instance of a solvency scenario where the insurer's surplus becomes negative during the forecast period. A sequence of events in a scenario, whether concurrent or over a period of time, producing the desired outcome are identified, where the events may or may not be more severe than those seen historically. An evaluation is then performed to determine whether that degree of change is plausible in the context of what is being tested. The results of reverse stress testing can also help with strategic business decisions, contingency planning (i.e., corrective management action), and designing risk management arrangements.

It is expected that the AA would report on the considerations for determining the adverse scenarios, including any consideration of reverse stress testing. The stress testing performed as part of the ORSA and any other similar analysis could be considered in the selection of the adverse scenarios, or vice versa. The stress testing performed by the insurer can be harmonized for FCT, ORSA, and any other testing. It is expected that adverse scenarios showing the greatest sensitivities would be discussed in the report in detail.

The regulator might request other FCT analyses be conducted, including additional adverse scenarios and longer forecast periods.

Solvency scenarios

According to paragraph 2520.18.1 of the SOP:

> A solvency scenario is a plausible adverse scenario if it is credible and has a non-trivial probability of occurring. The actuary may use percentile rankings of outcomes to determine whether a solvency scenario is both plausible and adverse.

In a solvency scenario an insurer would be expected to test the occurrence of events that are of such severity that it tests its ability to maintain a positive surplus position even when taking into consideration corrective management actions.

A solvency scenario employs a plausible adverse scenario, recommended at a minimum of the 95th

percentile over the scenario horizon. Although this guideline suggests this minimum, it is recommended that analysis be performed at even higher confidence levels. If the AA is unable to ascertain the percentile severity of the scenario, the AA would be comfortable that the scenario is of sufficient adversity to appropriately test the relationship of the insurer's statement value of assets to its liabilities.

A solvency scenario could align with the level of shocks used in the Own Risk and Solvency Assessment analysis.

Going concern scenarios

According to paragraph 2520.19.1 of the SOP:

> A going concern scenario is an adverse scenario that is more likely to occur and/or less severe than a solvency scenario, and could include risks not considered in solvency scenarios.

In a going concern scenario an insurer is assumed, through its developing capital position, ripple effects, and corrective management actions, to be able to maintain operations and meet its obligations while maintaining regulatory capital in excess of regulatory minimum levels. The scenario would maintain sufficient capital resources, as defined in the OSFI Regulatory Capital and Internal Capital Targets Guideline (A-4) or in the AMF Capital Adequacy Requirements for Life and Health Insurance (CARLI) or Minimum Capital Test (MCT) guidelines, to meet or exceed minimum regulatory levels of capital required to support their risks.

A going concern scenario would utilize an adverse scenario at a lower percentile and lower severity than that used for solvency scenarios over the scenario horizon. Typically testing would be performed using a minimum of the 90th percentile. If the AA is unable to ascertain the percentile severity of the scenario, the AA would be comfortable that the scenario is of sufficient adversity to appropriately test the insurer's regulatory capital ratio(s). Relative to assumptions used in a solvency scenario, a going concern scenario may examine the same type of stressed assumption(s) but alter it in some manner to reduce its severity and/or assume it is more likely to occur. Examples include, but are not limited to, testing a smaller stressed assumption(s) over the same horizon or a more gradual deterioration in the stressed assumption(s).

Management actions

Management responses to stress impacts may be classified as either ripple effects or corrective management actions. As the distinction between the two is critical to the development of the opinion statement, the actuary will need to carefully assess the appropriate categorization of the management actions.

Such actions could include but are not limited to:

- Repricing of insurance products.
- Regular policyholder dividend scale updates.
- Adjustments to non-guaranteed product elements.
- Suspending dividend payments, capital reductions, and transfers to the parent or home office, where applicable.
- Raising additional capital or adopting an approved plan to raise additional capital if and when

needed within a reasonable time frame, or, in the case of a branch, requesting transfer of adequate funds from the parent company.

- Strengthening risk management practices.
- Mitigating the risk causing the capital shortfall.
- An increased level of monitoring and reporting of the insurer's capital position.

The AA would inform management of potential regulatory actions and repercussions and would consider when it may be appropriate to model or calculate the financial impact of such actions. The financial impact of regulatory actions could be significant, and the board of directors or chief agent may be particularly interested in seeing the modelled impact in the analysis. The AA would consider actions that could be taken by the Canadian regulator(s) as well as by regulators in foreign jurisdictions. Such regulatory action and associated management response would consider the local assessment of solvency regardless of the insurer's worldwide solvency position as measured by Canadian regulatory standards. If the impact of potential regulatory action has been modelled in a recent FCT or ORSA analysis, it may not be necessary to model the impact again in a current FCT. This would be reasonable if the AA believes the scenario results have not changed materially and the regulator response and impact would be consistent with the earlier work.

Similarly, the AA would inform management on potential rating agency actions and possible repercussions but would not necessarily model or calculate the financial impact of such actions, unless the AA thought it would be beneficial to include.

It is recognized that actions considered routine by one insurer may not be considered routine by another. Actions that may be classified as routine are those the insurer considered to be a component of standard policies and procedures and remain within the range of accepted actions.

Ripple effects

A ripple effect is an event or incident that occurs when an adverse scenario triggers a change in one or more interdependent assumptions or risk factors and includes policyholder actions, management's routine actions, and regulatory actions. The following are examples:

- Post-event epidemic mortality following a catastrophic event. A change in mortality unrelated to the catastrophe would not be considered a ripple effect but would be considered under a separate risk category.
- Following a severe catastrophe event, the post-event information would not only affect the claims stemming directly from the catastrophe but also other claims occurring in the area in and surrounding the catastrophe.
- Steady and continued deterioration in mortality versus that assumed in valuation and/or new business pricing assumptions, which would likely result in a routine reprice in new business rates to reflect emerging experience.
- The management action response to deteriorating mortality or morbidity experience on group insurance written on a one-year term-renewable basis, or deteriorating loss ratios in certain lines of P&C insurance, which may take the form of premium rate increases, tightening of underwriting, modification of benefit definitions, etc.

- Adjustments to assumptions used in the base scenario that may no longer be appropriate in the adverse scenario being tested.
- The insurer's expected management routine response to adversity.
- Regulatory actions, both by Canadian and foreign regulator(s), and especially under any adverse scenario where the insurer fails to meet the supervisory target capital requirement.
- Rating agency actions, in scenarios the AA thought it would be beneficial to include due to significant changes in capital or surplus.
- Likelihood of changes in planned capital injections or distributions.

Corrective management actions

Paragraphs 2520.29 and 2520.29.1 state:

> For each of the adverse scenarios that would result in a threat to satisfactory financial condition, the actuary would identify possible corrective management actions that would lessen the likelihood of that threat, or that would mitigate that threat, if it materialized.
>
> Consideration would also be given to the effectiveness of possible corrective management actions in a volatile or stressed environment.

Actions not considered by the insurer in the normal course of business and which require escalation to senior management or the board of directors beyond routine management actions and the normal course of such requests would be classified as corrective management actions.

While corrective management action(s) can be used in both going concern and solvency scenarios, for the solvency scenarios in particular, the AA should consider the insurer's ability to sufficiently control completion of the action in a volatile or stressed environment. The involvement of third parties in the management action could reduce the ability of the insurer to control such actions; however, the presence of existing policies and processes and/or successful completion of such actions in the past could provide the AA with a level of comfort that such actions are within the insurer's control and will provide the expected result. Examples of situations where the AA may consider whether the management of the insurer has sufficient control include:

- The ability to issue debt or preferred shares at a given price or volume.
- The ability to incorporate price adjustments given any action or inaction of its competitors and potential repercussions from policyholders.
- A parent company's ability to inject capital due to increased demands from other business units or a subsidiary's ability to remit amounts to a parent company.
- The ability to develop a hedging program where no capabilities currently exist.

Integrated scenarios

According to paragraph 2520.22 of the SOP:

> The actuary would construct integrated scenarios by combining two or more risks factors whose combination gives rise to an adverse scenario.

An integrated scenario is a type of adverse scenario that results when two or more adverse

scenarios are combined. The integrated scenarios could be a combination of low-probability scenarios, or low-probability scenarios combined with a higher-probability adverse scenario. The adverse scenarios to be combined may be based on correlated or uncorrelated risk factors but the resulting integrated scenario would remain plausible and would consider associated ripple effects. It is recommended that at least one integrated scenario be tested.

3. Modelling

Modelling is normally required to test the capital adequacy of the insurer.

Basic requirements of the model

Typically, the model reproduces key elements from the financial statements, such as:

- Balance sheet
  - Assets (investments, reinsurance recoverables, and other assets)
  - Liabilities (insurance contract liabilities, other liabilities, debt)
  - Retained earnings/surplus
- Income statement
  - Revenues/premium income
  - Policy benefits/claims
  - Expenses
  - Income taxes
  - Preferred share dividends
  - Investment income
- Applicable regulatory measure of capital adequacy
- Source of earnings

The model would be valid on an accounting basis. The AA would verify the validity of the model, specifically that:

Statement of income = cash flows + change in balance sheet items

Financial results would be consistent among the various parts of the model as well as from year to year. This would be true for major items such as invested assets, policy liabilities, and surplus.

The insurer may use more than one model depending on the lines of business and jurisdictions. The modelling capability needs to be sufficiently flexible to enable the AA to assess risks within each risk category.

Model validation

The validity of the model is typically tested with the base scenario. Unless extraordinary changes are occurring in the insurance environment or in the business written by the insurer, it is expected that there would be continuity from the actual financial results of the most recent year to the first projected year and subsequent years such as in the following components:

- Cash and invested assets;
- Policy liabilities;
- Surplus;
- Accounts payable;
- Accounts receivable;
- Deferred income tax amounts; and
- Major cash flow items.

When building a new model, a possible approach to check the validity of the model is to use as input the data prior to the most recent actual year and use the experience of the last year to set the parameters. The result from the model could then be compared to the actual results. If the results between actual and projected are found to be sufficiently close, the model may be acceptable. The AA would determine in advance acceptable differences in assets, liabilities, surplus, premium, investment income and net income.

When updating an existing model, a retrospective check on validity may be made. Each year after the actual results have been determined, differences between actual and base scenario model results would be justified.

The model would also be reasonable for all adverse scenarios. Evaluating the difference between the results of two scenarios is a good way to assess the ability of the model to quantify changes in key results under different sets of assumptions. The AA would verify that the magnitude and direction of change in key elements of the model is consistent with the change in assumptions.

Approach in determining adverse scenarios

The approach used to determine adverse scenarios may be stochastic, deterministic, or a combination of the two.

- Stochastic: certain risks are ideally modelled stochastically, such as those related to capital markets and those where the statistical loss distribution may be inferred and percentiles for results readily determined.
- Deterministic: the adverse scenarios are selected judgmentally by the AA, based on considerations such as variability in historical results or credibility of data.
- Combination: certain risks may be modelled stochastically and the results then used to derive a deterministic scenario that reproduces the desired stochastic results. The deterministic scenario would then be used as the adverse scenario for further analysis.

Examples of risks that are usually modelled stochastically include the following:

- Segregated fund—see the research paper *Use of Stochastic Techniques to Value Actuarial Liabilities under Canadian GAAP* (August 2001).
- Exposure to catastrophe estimated from catastrophe modelling software.

Modelling of ripple effects

The model would allow for the quantification of ripple effects of adverse scenarios. There are two

possible approaches to generate the ripple effects:

- Automatically generated by the model.
- Manually created by the AA by modifying the appropriate assumptions.

For example, for a P&C insurer, the model could be built such that reinsurance rates will automatically increase in the year following a catastrophe – alternatively, the AA may manually modify the relevant parameters. For a life insurer, increases in new money interest rates may provide an incentive for some policyholders to lapse products that do not adjust, or slowly adjust, policy elements to changes in interest rates. The change in lapse rate could be modelled automatically based on changes in interest rates, or the AA could make the adjustment manually.

Organizational considerations

The AA would make an investigation of the insurer's financial condition. Although the modelling may be done by line of business, business unit, or geographical area, in order for the AA to report on the financial condition of the insurer, for regulatory reporting, the model results would be aggregated at the legal entity level.

Some assumptions are normally established at a high level, as they would be applied throughout the model. The following are possible examples:

- Economic parameters – interest rate levels, inflation, capital appreciation, and unemployment levels.
- Demographic parameters – overall trend in mortality or morbidity for a life insurer.

It is expected that the assumptions underlying economic and demographic parameters be consistent within each scenario and between scenarios (unless being specifically tested by the scenario).

It may be helpful to do modelling at the levels where management decisions will be taken (e.g., business units, geographical areas, product lines). For life insurers, it may also be informative to examine changes to the sources of earnings. It is desirable that the model have the ability to focus on a particular line of business, division of the company, fund, or territory. Since it is likely that models constructed for FCT purposes will also be used for corporate planning, the model would be sufficiently flexible to reflect any reasonable changes in insurer operations that management may want to test with additional scenarios.

The objective in designing the structure of the model is to facilitate the projection of the insurer's operations under different scenarios. The insurer will have its own legal structure, and, within that, a management structure around which it will plan and monitor its financial results. In organizing the model, it is necessary to reflect this structure and determine where constraints apply and at which level within the hierarchical structure of the model parameters are best set.

In designing the structure for the model, the size and complexity of the organization will dominate. At a corporate level, capital infusions, shareholder dividend payments, income taxes, required surplus, investment of surplus, and corporate expenses, such as head office lease and overhead costs, would be modelled. In a single-product-line insurer, these may be combined with the product projection.

In the more complex organization, while similar issues arise as in the single-product-line insurer, the need to segment the model arises. This may be driven by size, or certain products may be more

efficiently modelled using different tools or techniques. Alternatively, there may be a desire to analyze specific units separately.

To derive model segments, the AA may consider the following:

- **Management** – this usually reflects the management structure. The business is subdivided into units and cost structures and management reports have been developed around them. Existing plans are assembled and decision-making is centered on these units. These units will combine products and possibly investment units. Subsidiaries and foreign operations would fall into this category.
- **Product** – this is usually the smallest subdivision of business considered. For life insurers, cash flow projections are usually already available, and the model may be built using these as the foundation. For P&C insurers, products with similar characteristics may be grouped together.
- **Investment** – usually investment segments are defined based on asset categories. Investment income allocation follows the investment structure. This method of subdivision would combine a number of similar assets for investment purposes.

It may be desirable to have further breakdowns within a segment to take into consideration different investment strategies or instruments that are exposed to distinctly different risks. These will require at least separate parameters and may need different modelling techniques or valuation methods.

The interrelationship of insurance and investment cash flows feeding the asset model is critical. Cash available needs to be established before investment decisions can be implemented.

For P&C insurers, the modelling of investment may follow the insurer's investment strategy rather than be product specific.

It may be desirable that calculation of taxes and required surplus be done at a divisional level of the model on a stand-alone basis. However, when results are consolidated, these will have to be redone on a consolidated basis. This implies that such data as necessary would be transferred to the corporate model to facilitate these calculations.

4. Reporting

The FCT report enables the AA to communicate the current and expected future financial position of the insurer. Significant investment in time and effort are required to develop the projection and analysis. The outcome of this investment is the report and the discussion, analysis, and management actions captured within. An interpretative report is more useful than a purely quantitative report.

The primary purpose of the report is to communicate the significant risks to which the insurer is exposed and possible actions that could be taken to mitigate those risks. The audience for this report is the board of directors or an appropriate committee of the board (audit committee, risk committee, etc.) if they so delegate, as well as the regulator. In the case of a Canadian branch of a foreign insurer, the audience is the chief agent for Canada.

It is recommended that the FCT report would include a minimum of three scenarios including at least one going concern scenario and two solvency scenarios. It is also recommended that the actuary not concentrate the analysis on only one risk category for all the scenarios.

The actuary would discuss the report with senior management. The AA's challenge is to provide pertinent information in a comprehensible fashion to individuals with different backgrounds and qualifications. The report would be in writing, but an additional oral report that permits questions and discussions is expected. The report would need to consider the timing of other reporting such as ORSA to ensure consistent conclusions.

It may be useful to prepare a supplementary analysis for discussions with management. Any such analysis would contain consistent findings with the report.

The AA may prepare a single report independently on the FCT or, if deemed appropriate, a consolidated report with the ORSA analysis. The level of integration of the FCT and ORSA is a decision for the insurer to make. If the insurer chooses to maintain separate FCT and ORSA reports, the FCT would be consistent with the most recent ORSA report. A consolidated report would include the AA's independent FCT opinion. Development of a consolidated report would consider the insurer's size and its complexity of businesses as well as the impact of significant change in accounting and capital regimes.

Considerations supporting integration of FCT and ORSA include but are not limited to:

- ORSA-defined internal target ratios which is a key component in the development of the AA's opinion. Should internal target ratios evolve over the duration of the projection it would be appropriate to assume an internal target ratio that is different than the one provided in ORSA.
- ORSA's usefulness in assessing the going concern nature of adverse scenarios.
- Efficiencies such as:
    - Consistent timing;
    - General reporting needs such as collection of data, analysis, management discussions, production of reports, internal and external party reviews of reports; and
    - Overlapping requirements such as comprehensive stress scenario testing.
- A comprehensive view of both regulatory and own capital requirements that can better inform decision-making and management action.

Integration may encounter challenges that include but are not limited to:

- Oversight for FCT lies with the AA whereas for ORSA it is the board and senior management.
- FCT follows a prescribed regulatory basis while ORSA reflects own models and assumptions. The differences in bases of calculation may make efficient integration of models and processes difficult.
- Areas of the organization responsible for FCT may differ from those coordinating ORSA, increasing the cost of coordination and change management.

The AA would apply judgment to the insurer's circumstances on how to integrate the FCT and ORSA reports to reduce redundancy, ensure metrics are complementary and the report comprehensive. Commonalities may be applicable to both an FCT-only report and a consolidated report with ORSA:

- When there are a number of related legal entities in a group, consideration to the number of

reports is needed. There are circumstances where a single FCT report covering multiple related legal entities may be appropriate. In order for this to be the case, the following conditions would generally be met:

1. There is a common audience (or significant overlap) for all legal entities involved.
2. The regulator(s) that supervise(s) the various legal entities agree(s) that a single consolidated report is acceptable or required.
3. The FCT report includes the consolidated results, but also includes relevant results at the legal entity level.

- The report would include the actuary's FCT opinion overall and for each legal entity. The Standards of Practice and the regulator(s) require a signed opinion on the insurer's financial condition.

Paragraph 2520.09 of the SOP states:

The insurer's financial condition would be satisfactory if throughout the forecast period,

- Under the solvency scenarios, the statement value of the insurer's assets is greater than the statement value of its liabilities;
- Under going concern scenarios, the insurer meets the regulatory minimum capital ratio(s); and
- Under the base scenario, the insurer meets its internal target capital ratio(s) as determined by the ORSA.

The opinion is considered satisfactory even if corrective management actions under control of the insurer, as detailed in the FCT report, are recommended in order to meet any threshold. However, disclosure of the corrective management action(s) needed to maintain satisfactory financial condition of the insurer would be required. A not satisfactory opinion follows if any of FCT thresholds are not met, even with corrective management actions in control of the insurer, or if that corrective management action is not reasonably assured to meet threshold levels.

The AA would consult the capital guidelines and rules of the regulator(s) to assess when and what type of intervention may be initiated if the financial condition of the insurer is not satisfactory.

The report would identify any and all transfers assumed to occur between legal entities, including any risk-sharing agreements between legal entities or between a legal entity and a parent company, dividends to parent companies, capital infusions into legal entities, etc., whether in the base scenario or in the adverse scenarios. If a given legal entity requires a capital infusion in any of the scenarios, the report would include discussion on the likelihood of such infusions actually being made.

The report need not include any commentary on the development and/or validity of the regulatory capital formula used. In most cases it will suffice to disclose the following:

- The applicable federal and/or provincial regulatory formula(s).
- For insurers subject to target capital requirements under multiple jurisdictions, the rationale for using the selected formula.

- The target requirement used in the projections and the rationale.

The report and any discussion materials presented would reflect what is important to the insurer's board of directors or chief agent. The following is an illustrative outline of possible elements of a comprehensive FCT report. Suggestions to integrate with ORSA are also included. A consolidated report would include the guidance from OSFI Guideline E-19 or from AMF Capital Management Guideline.

1. Executive summary

The executive summary provides a high-level overview of the results of the FCT analysis, including the following:

- Summary of the results of the base and selected adverse scenario results.
- Recommendations for management to mitigate or eliminate risk.
- Assessment of the events since the previous FCT report was submitted.
- Commentary on management's action in response to the recommendations in the previous year's FCT report, if appropriate.
- Other significant findings.

If a consolidated report with ORSA is developed, the following would also be included:

- Commentary on consistency of results and possible actions with ORSA.
- Highlights of the ORSA results and internal targets.

2. FCT opinion

The AA would include a signed opinion on the future financial condition of the insurer. The opinion would reflect the particular circumstances of the insurer. The opinion is required in both an FCT-only report and a consolidated report with ORSA. A decision grid is provided below to highlight the decision points for each type of opinion:

Scenario	**Threshold**	**Is the threshold test under the scenario passed?**		
Base	Insurer's regulatory capital ratio(s) >= Internal target ratio(s) as determined by the ORSA	Yes (with or without ripple effects)	Yes (with realistic plan to pass ratio)	No
Going Concern	Insurer's regulatory capital ratio(s) >= Regulatory minimum capital ratio(s)		Yes (with corrective action and actuary is comfortable)	No OR Yes (with corrective action but actuary is not comfortable)
Solvency	Statement value of the insurer's assets > Statement value of its liabilities		Yes (with corrective action under control of insurer and actuary is comfortable)	No OR Yes (with corrective action under control of insurer and actuary is not comfortable)
		↓	↓	↓
Opinion		**Satisfactory Opinion**	**Satisfactory, subject to:**	**Not Satisfactory**

3. Introduction

The introduction provides a forum to inform the user about the purpose and basis for the FCT report, consisting of the following:

- Oversight role of FCT and the purpose and scope of the report.

If a consolidated report with ORSA is developed, the following would also be included:

- Oversight role of ORSA and the purpose and scope of this component of the report.

4. Results

The AA would provide details around the results of the testing performed:

- Discussion and summary of the FCT base and selected adverse scenario results.

If a consolidated report with ORSA is developed, the following would also be included:

- Discussion of the ORSA base and selected adverse scenario results.

5. Capital management and adequacy measurement

The AA would explain the nature of the test used to measure the financial condition of the insurer, including the following:

- Definition of satisfactory financial condition used in FCT.
- Definition of minimum capital ratio requirements.
- Definition of the internal target ratio as determined by ORSA and description of the requirements if they change over the projection period.
- Materiality standard.

6. Background discussion

This section would provide an overview of the insurer and the economic environment during the forecast period, including such things as the following:

- Summary of the nature of the insurer's business, products, and target markets.
- Review of recent and current financial position.
- Discussion of any key events or initiatives affecting the insurer in the recent past and any associated expected future developments.
- Description of economic assumptions.
- Discussion of the current and expected market condition.
- Discussion of prior year's FCT results, recommendations, and corrective management actions, if appropriate.

7. Base scenario

A clear description of the base scenario used in the FCT analysis would include the following:

- Description of the model or process used to project the base scenario.
- Description of main assumptions.
- Description of the internal target(s).
- Discussion of consistency of the base scenario with the insurer's business plan.

- Description of capital plans, especially any capital injections or strategic initiatives.
- Discussion of key financial results, including key income statement and balance sheet items, and capital test results. A desirable approach would be to display the results for each year in the projection.

8. Adverse scenarios

This section would provide detailed descriptions of the selected scenarios posing the greatest risk to the insurer as well as any modelled scenario for which the insurer falls below the defined thresholds. An overview describing the process used to identify the scenarios would be useful. For each adverse scenario, the following items would be included where applicable:

- Description of the risk being tested, key assumptions used, why the risk is significant to the insurer, and how this was determined.
- Comparison to prior year's FCT, and consistency of the selected scenarios with the prior year's results.
- Description of stress-testing results on an FCT basis.
- Description of key financial results and the change from the base scenario.
- Description of management actions that may be taken including reasons for such inclusion.
- Description of any ripple effects reflected in the scenario.
- Description of any changes in the capital injections or distributions from those assumed in the base scenario, and results with and without these capital changes.
- Clear reporting of results with and without the impact of corrective management actions to aid the audience in appreciating the effectiveness, practicality, and adequacy of the risk mitigating strategy.
- Discussion of possible regulatory actions, whether Canadian or from foreign jurisdictions, and repercussions if the scenario results fall below the target capital level, in the absence of any change in the base scenario capital injections, capital distributions, or other corrective management actions.
- Discussion of possible reactions of rating agencies and repercussions, when applicable, if the insurer's capital is severely strained.
- Discussion of changes in the adverse scenarios selected compared to the prior report's selection.
- Discussion on whether additional scenarios other than those reported in ORSA were used and the reasoning behind those additional scenarios.

If a consolidated report with ORSA is developed, the following should also be included:

- Description of ORSA stress-testing results.
- All of the above, as appropriate on an ORSA basis.

9. Conclusions and recommendations

Overall conclusions from the FCT analysis would be presented, including a brief description and

summary of the results of the base and selected adverse scenarios and highlights of the most significant risks to capital adequacy and threats to satisfactory financial condition. Any findings leading to follow-up actions would be discussed. It may also be appropriate, and consistent with best practices, to make one or more recommendations, particularly with respect to corrective management actions that are intended to better manage or mitigate risk exposures.

10. Appendices

The primary purpose of the FCT report is to inform the insurer's board of directors or chief agent, and management of potential threats to future financial conditions and possible actions that may mitigate those threats, so a qualitative report is best to achieve this end.

However, it would be desirable for the AA to include some detailed financial results from the application of the FCT model. Typically, the model creates key elements and pages from the financial statements and copies of such exhibits for the base scenario and each of the selected adverse scenarios for the forecast period allow users to review the FCT results in more detail.

In a consolidated report with ORSA, the appendix would contain the methods and assumptions of own risk capital assessed. It could also include an overview of an insurer's enterprise risk management framework.

Appendix A – Discussion and analysis of life insurer risk categories

This appendix outlines major risk categories that would be considered for life insurers and possible adverse trends. Each risk category section provides guidance about ripple effects, with possible corrective management actions listed where relevant.

The actuary would assess various risk categories and identify those that are relevant to their circumstances, including, but not limited to:

- Mortality;
- Morbidity;
- Persistency and lapse;
- Market (includes interest rate, equity, real estate, and currency);
- Inflation;
- Credit;
- Reinsurance;
- New business;
- Expenses;
- Government and political issues;
- Off-balance-sheet items; and
- Related companies.

Recent industry and insurer historical experience and the outlook for the future could be considered in determining a range of possible future experience. The Appointed Actuary may want to look at historical data such as CIA or other economic statistical data as a guide to help determine the possible deterioration of the risk.

The AA may also consider systemic risk as a cause of some of the other risks. As an example, the failure or downgrading of one or more significant insurers in the market could result in marketing and/or reputational risk for the other insurers. The AA may also consider liquidity and operational risks, likely as ripple effects associated with other adverse scenarios.

Liquidity is the availability of funds, or assurance that funds will be available, to honour cash outflow commitments (both on- and off-balance sheet) as they fall due. Liquidity risk is the inability to meet financial commitments as they fall due, through ongoing cash flow or asset sales at fair market value. Under some adverse scenarios, cash flow results may fall outside the targets set in a liquidity risk management policy, in which case examining ripple effects and possible management responses may be beneficial.

The AA may wish to consider operational risks, although the quantitative measurement of operational risk is still in its infancy and investigations may be more qualitative in nature. Systems and internal control procedures that may function well under normal day-to-day operations may begin to break down under adverse scenarios developed as part of FCT or ORSA. As well, business continuity plans may not consider scenarios that are as adverse as those developed as part of the

FCT analysis. Other sources of information that may be useful in examining operational risk might be rating agencies (e.g., new product risk) and the Society of Actuaries.

If a life insurer writes P&C business and the P&C business represents a material risk for the insurer, the AA would consider all risks covered in the P&C section of this draft educational note. If the P&C risk is not considered material by the AA, the AA would provide an explanation as to why it is not considered material. This is especially the case for some chartered life insurance companies operating in Québec.

Finally, the *Dynamic Financial Condition Analysis Handbook* of the Society of Actuaries is a good supplemental reference for risk areas and adverse scenarios that may be relevant for a given insurer, beyond those covered here.

1. Mortality risk

Annuity and insurance contracts tend to react very differently to adverse scenarios, so the testing of mortality for those lines of business would be done separately.

For insurance business, adverse mortality may arise from a variety of causes, including:

- An absolute increase in mortality rates, likely for a specific period of years and arising from an epidemic or other catastrophe.
- A steady and continued deterioration in mortality, arising from anti-selective lapse experience as new and more competitive products are offered, and also due to a weakening in underwriting standards.
- A steady and continued deterioration in mortality versus that assumed in valuation and/or new business pricing assumptions, which may include mortality improvement assumptions that are not fully realized.
- A misestimation of expected experience due to a lack of credible experience data.
- For death-supported insurance policies (i.e., policies where a decrease in mortality rates increases policy liabilities), a steady and continued decrease in mortality rates, arising from changes in medical treatments and/or changes in policyholder lifestyles, at a different rate than assumed.

For annuity business, adverse mortality may arise from a variety of causes, including:

- A steady and continued decrease in mortality rates, arising from improvement in medical treatments and/or changes in annuitant lifestyles, at a faster pace than that assumed.
- A misestimation of expected experience due to a lack of complete experience data.

The AA would consider whether such adverse mortality will be temporary or permanent in nature. Where appropriate, the impact would be reflected through a recalculation of policy liabilities.

The AA would consider possible ripple effects such as changes in sales levels and/or persistency following any pricing or benefit adjustments.

Possible management actions could include the following:

- For adjustable products, changing premiums and/or benefits (delay before management actions, partial adjustment for the adverse mortality experience).

- Adjusting the price of new business.
- Seeking reinsurance solutions.

2. Morbidity risk

Adverse morbidity includes the following:

- Increases in incidence rates for disability, medical, dental, critical illness, and other coverage; and
- Decreases in the rate of claim termination.

These may arise from a variety of causes, some of which include the following:

- A prolonged high-unemployment recessionary environment leading to both sharply increased incidence rates and low claim termination rates for disability.
- An increase in incidence rates without increasing death rates (for example, in the case of non-life-threatening epidemic or accident rates) or increased rates of diagnosis of critical illness as a result of sensitive diagnostic technologies.
- Improved treatment for diseases that decrease associated death rates.
- Court rulings that limit the insurer's ability to adjudicate claims.
- Retrenchment of government social security programs.
- Escalation in dental and medical costs.
- Misestimation of expected experience due to a lack of credible experience data.

The AA would consider possible ripple effects, such as the following:

- Constraints to rate increases as the industry reacts slowly in implementing renewal rate increases.
- Rate guarantees that limit or delay required rate increases.
- Increases in anti-selective lapses that dampen or nullify the effect of rate increases.
- Adverse publicity/reputation damage arising from claim or underwriting practices, leading to decreased sales of new business.

Possible management actions could include items such as the following:

- Increasing rates; and
- More active claims management.

3. Persistency and lapse risk

Generally, persistency risk exists when cash value does not equal the policy liability. When cash value is higher, the risk is that lapses will exceed those assumed. When the policy liability is higher, the risk is that lapses will be less than those assumed. In examining the persistency and lapse risks, it is prudent to assume that both these adversities may happen concurrently. Generally, the appropriate level of lapses would be assessed for each product line.

Causes of adverse persistency and lapse include the following:

- Premium changes, including amount and payment pattern.
- Dividend scale changes.
- Changes in distribution system.
- A new product introduced to the market by a competitor.
- Changes in underwriting and/or qualification criteria for preferred/select classes.
- Changes in premium rates in the market.
- A lack of confidence in the insurer that may be caused by a sudden downgrade by external rating agencies, combined with extensive publicity.
- A misestimation of expected experience due to a lack of credible experience data.

Ripple effects for persistency and lapse risk could include the following:

- Worsened mortality or morbidity, which may be caused by anti-selection.
- Mismatch of asset and liability cash flows.
- Increased unit expenses.
- Worsened liquidity risk (for example, a "run on the bank" situation).
- Reduction in insurer's new business while, at the same time, the insurer could not proportionately reduce its expenses.
- Inability to borrow or renew any external capital or debt.
- Changes in the expected mix of business.

4. Market and credit risk

In consideration of market and credit risks, the AA may want to review available historical data. Adverse scenarios may arise from a variety of sources, including the following:

- Changes in future rates of interest.
- Increases in losses from defaults on debt securities.
- Poor returns and/or declines in value of equities or real estate.
- Counterparty defaults on derivatives.
- Loss or significant decline of value for other major asset categories.
- Concentration risks, including geography (e.g., impact of natural disasters), asset class, industrial sector, subsidiaries, individuals.
- Poor returns and/or declines in the value of a subsidiary.
- Fluctuations in currency values.
- Market value deterioration in segregated fund assets.

The AA would test the impact of potential adverse scenarios on liabilities and surplus across all lines of business in aggregate.

When there is a mismatch between the cash flow pattern of assets and liabilities, there will be a need to reinvest positive cash flows, and to borrow or liquidate assets to fund negative cash flows. Future rates of interest can vary substantially and can adversely affect surplus. As a result, the value of derivatives will also be impacted. Where they are used as hedges, they will help mitigate adverse impacts.

In assessing the impact of changes in interest rates, the AA would consider both the current mismatch position as well as any possible mismatch in the future. This will depend on the maximum position allowed by the insurer's investment policy and the most aggressive position that has been taken in the past by the insurer.

Parallel and non-parallel shifts in the yield curve, both on a sudden and a gradual basis, would be considered. Stochastic modelling as well as deterministic scenarios could be considered. The AA could also examine additional deterministic scenarios or more extreme tail results under stochastic modelling than are already reflected in the development of adverse scenarios.

Changes in future interest rates will affect not only future rates of reinvestment and market values, but also the pattern of the cash flows. For example, this can occur with asset-backed securities, callable bonds, and on policies with cash surrender values.

Future interest rates may also affect the spread that can be achieved on both new business and the fixed interest rate business where rate resets are being made.

Sustained low levels of interest rates could also affect the insurer's ability to support minimum long-term guarantees embedded in both insurance and annuity products.

Future interest rate levels will also affect the amount and mix of new business for guaranteed fund and segregated fund products. Interest rate levels will also affect the number of surrenders, transfers between funds, and shifts between portfolio average and new money products. The movement and financial exposure will depend on surrender charges and market value adjustments embedded in these products. Particular consideration would be given to assessing the effect of a "run-on-the-bank" scenario.

For participating insurance, universal life, and adjustable premium business, considerations would include the following:

- The impact on the proportion of fixed income assets backing participating business and the duration of those assets, and that of key competitors.
- Dividend actions of competitors.
- The ability and willingness of management to maintain or change dividend scales.
- Reviewing premiums and charges of universal life products.
- Related policyholder actions such as surrender levels and potential litigation.
- The impact on the level of new sales.

For segregated funds, drops in market value may affect the payment of benefits (or the likelihood of future payment of benefits) relating to the existence of guarantees of minimum segregated fund performance. Considerations would include the following:

- The extent of minimum performance guarantees provided on death or maturity.

- The extent of hedging operations or reinsurance to mitigate the risk.
- The existence of product features such as resets that will affect the risk.
- The existence of volatile funds, fund-switching privileges, guarantees on a "per policy" basis, or high management expense ratios (MERs).

The AA may consider an integrated scenario in which a combination of the following events occurs:

- A drop in the market value of debt securities resulting from an increase in the yield curve.
- A decline in equities caused by a significant drop in the S&P/TSX index or any other significant stocks index.
- A significant decline in the value of real estate.
- A significant decline in the value of the largest subsidiary.

The AA would consider how to reflect the effect of such events in determining policy liabilities and also consider expected pricing actions. The ripple effects could vary depending on whether the results are insurer-specific or industry-wide. The following are possible ripple effects:

- Exposed risk positions as a result of counterparty default.
- A ratings downgrade of the insurer that leads to decreased sales and increased surrenders.
- Liquidity issues or forced asset liquidation risk issues caused by large sustained credit-related losses either through defaults or severe asset downgrades.
- Counterparty defaults on derivatives.
- Decreased policy owner dividends that could lead to higher surrenders.
- Increased disability claims frequency and severity due to deterioration of economic conditions.

Possible management actions may include the following:

- A shift in the investment strategy;
- Dynamic hedging programs; and
- A review of premium rates.

5. Inflation risk

Inflation can pose a significant risk to an insurer in many ways: a sustained increase in disability, pension or other benefits that are linked to the Consumer Price Index or similar price indices; a sudden increase in drugs and health care costs covered by health insurance policies; and an increase in absolute expenses and in-unit operating costs. Inflation rates and market interest rates tend to be correlated. A high-inflation scenario would normally be assumed to accompany a high-interest scenario, but consideration would be made to a scenario where this does not occur.

The AA would consider possible ripple effects, such as the following:

- A decrease in real rates of return.
- A rapid and sustained increase in market interest rates.

- Constraints to rate increases as the industry reacts slowly in implementing renewal rate increases.
- Rate guarantees that limit or delay required rate increases.
- Decrease in the rates of disability claim termination when inflation is higher than wage increases or when inflation occurs during a recession or a period of rising unemployment.

Possible management actions may include the following:

- Implementing rate increases, where possible;
- Reviewing the extent of the coverage and cost containment features;
- Reviewing the asset mix to increase real rates of return; and
- Reviewing policies, procedures, and staffing to control costs.

6. Reinsurance risk

Reinsurance risk arises from a reinsurer's failure to meet its obligations, or from a change in market conditions causing an increase in rates, inadequate limits, or otherwise inadequate or unaffordable coverage. In this context, the term reinsurer is intended to include both reinsurers, if the entity is a primary insurer, and retrocessionaires, if the entity is itself a reinsurer.

Reinsurance terms on individual life cessions may be guaranteed for the life of the underlying policy. The primary risks for a ceding entity are outlined below.

- **Insolvency of a reinsurer –** the ceding entity's exposure in the case where its principal reinsurer(s) become(s) insolvent would reflect an assumed realization percentage of assets to liabilities of the failed reinsurer, and any different treatment of various types of amounts owing from the reinsurer to the direct writer. The impact of a reinsurer's insolvency may be mitigated by the following provisions:
  - The right of offset of amounts owing under all treaties between the companies.
  - The preferential position insurers will have relative to other creditors.
  - The right of recapture in the event of the reinsurer's failure.
  - Access to amounts on deposit or assets in trust (or other similar arrangements) with the insurer, or letters of credit in respect of an unregistered reinsurer.

  It would normally be appropriate to assume that the business previously ceded to the insolvent reinsurer could be successfully reinsured elsewhere, but possibly on less favourable terms. However, there may be certain unique features regarding the business involved that would make securing such replacement difficult.
- **Increases in reinsurance rates –** where a reinsurer takes market-wide action impacting all of its insurers operating in similar markets, such action would not necessarily pose competitive issues, as these insurers would all face an increase in reinsurance rates, possibly requiring repricing in a large segment of the marketplace. However, market-wide increases in rates may further adversely impact a particular insurer if it is operating with lower capital margins. In addition, where a reinsurer's action is targeted to one specific insurer because of poor experience, necessary repricing could affect the level of sales.

- **Reduction in reinsurance capacity available for the financing of new business –** this could result in an increase in reinsurance costs and/or constraints on the amount of new business growth of the insurer.
- **Disputes over policy conditions –** the AA could consider a dispute over reinsurance policy conditions which results in a principal reinsurer denying coverage for a significant class of business or category of claims; for example, terrorism exclusions.

7. New business risk

One of the uncertainties facing an insurer is the volume of new business it will be able to write in the future. Volumes significantly different from those assumed can result in a capital position quite different from that expected. It may be equally important to examine both higher-than-expected and lower-than-expected levels of new business production. Even in the case where total business volumes have been estimated accurately, new business risk may still be present if the mix of business sold is different from that expected.

There are several events that could lead to a significant reduction in premium volume written by an insurer, including the following:

- A financial rating downgrade of the insurer or an affiliated company (particularly the parent), or some other event (including cyber or operational risks) similarly damaging to the insurer's reputation.
- Entry of a new and strong competitor into an area where competition was previously weak, and/or increased competitiveness in the market due to higher use of advertising by competitors.
- Loss of a key distributor or even an entire distribution channel previously responsible for the production of a significant portion of an insurer's business.
- Loss of a key client, such as a large group client representing a significant portion of an insurer's group portfolio.

The most significant impact of lower-than-expected sales would be that the insurer is not able to cover its expenses, particularly when there is a large element of overhead and fixed expenses associated with marketing, underwriting, policy issue, and sales functions.

Ripple effects could include the following:

- Higher lapse rates on existing business.
- Poorer claims experience on the remaining business.
- Poorer coverage of maintenance expenses (resulting from both lower current sales as well as higher lapses on existing business).
- Ripple effects on associated lines of business to the affected line of business (for example, distribution channels primarily involved in one line of business may contribute to significant future sales in another line).

Possible management actions could include items such as the following:

- Reviewing bonuses paid to agents and brokers.

- Diversification into more than one line of business.
- Control over non-variable expense levels.
- Maintaining contingency action plans to be implemented in case one of these events occurs.

When the insurer has written a greater amount of new business sales than expected, this could lead to severe capital strain for the insurer. Events that could lead to a significant increase in premium volumes written by an insurer include the following:

- Unexpected success in a new product area or in beating previously stronger competition.
- Exit of a competitor from a product or market.
- Rate increase implemented by other companies leading to a fire sale for products still in the market at lower rates.
- Tightening of product features by other companies in the market.
- Change in reinsurance arrangements leading to a higher-than-expected retention on new business.

Ripple effects could include the following:

- Problems with management control over policy issue, underwriting, field expenses, financial reporting, etc., due to rapid growth (leading to future problems in claims and expenses as competition eventually catches up and volume levels return to normal).
- Future expected lapses, mortality, or morbidity could be different if sales are driven by old-generation products.

Possible management actions would include the following:

- Putting capital-raising plans in place with a parent company or with external sources.
- Contingency plans to be able to handle the increased volumes of business.
- Reviewing rates and underwriting guidance.
- Reviewing the use of reinsurance to mitigate the need for additional capital.
- Withdrawing a product or a line of business.

Normally, the base scenario would incorporate the new business projections of the insurer's business plan and associated expense levels. Alternate scenarios would be heavily dependent on the specific insurer, varying in particular with the kind of market the insurer serves and the distribution channel employed to reach it. However, any alternate scenario would reflect not only the change in new business levels, but also the impact on expense coverage and any other possible ripple effects.

8. Expense risk

Expense assumptions are unique in that management has a greater level of influence here than on other assumptions. Even insurers who, historically, have aggressively managed expenses to budgeted targets may face major expense issues in some situations such as an unexpected variation in new business growth, litigation, or other developments. Insurers practising strict management of budgets to meet expense levels included in pricing may have different results from insurers that

manage budgets to other measures. The extent to which the insurer has demonstrated effective actions towards managing expenses in the past would be a consideration in how closely to relate expense levels under adverse scenarios to expenses in the base scenario.

Adverse expense scenarios and related ripple effects to which an insurer's financial condition may be sensitive include the following:

- **Inflation** – a severe inflationary environment may cause a rapid increase in absolute expenses and in unit costs. It is also possible to have future expense increases due to internal factors unrelated to future interest rates and inflation rates.
- **Technological obsolescence** – new technologies may develop that deliver significant cost, delivery, or service benefits for those who can achieve economies of scale. For companies that do not make use of new technologies, expenses may rise relative to the competition. Such a scenario would also include the sales and termination impacts of technological obsolescence.
- **Court-awarded damages/data security or recovery** – potential high costs can result from court-awarded damages to plaintiffs relating to such matters as market conduct or the costs related to data security and recovery due to a cyberattack or breach. Resulting ripple effects include damaged industry reputation, ratings downgrades, lower sales, and higher terminations.
- **Industry or guarantee fund assessments** – further industry failures can precipitate higher assessments to companies in the industry. Ripple effects from such failures can include damaged industry reputation, flight to quality, lower sales, and higher terminations.
- **Company structure** – holding-company expenses may be allocated to subsidiary companies based on historical or projected relative profits. This could lead to a major change in the level of expenses allocated to the insurer based on the performance of one of the other companies in the enterprise. Within a single insurer, methods of allocating overhead expenses to different business units may produce changing expense levels over time. In an enterprise that has several insurance companies or business units that provide services to one another, the impact of cross-billing would be considered.
- **Mergers and acquisitions, or assumptions of new business** – reductions in unit expenses after a merger, acquisition, or assumption of a new block of business may be delayed or lower than projected in the base scenario. Possible ripple effects could include:
    - Changes in product pricing;
    - Low sales; and
    - Higher lapses.

9. Government and political issues risk

When the government makes changes to its policies or regulations, the implementation of such changes usually takes a considerable amount of time. This gives an insurer time to analyze the impact and take appropriate actions, if necessary. However, some changes can occur in a very short period and cannot be foreseen. There may also be cases where changes are effective retroactively without any grandfathering provisions. In such cases, the adverse scenario may be modelled in the

first year if the scenario is plausible in that time period.

The AA would likely focus on changes that are being discussed or proposed by government entities. However, in some situations it may be beneficial to consider other changes, particularly for certain lines of business that have a greater sensitivity to political intervention, and if those lines of business are material to the insurer.

Examples of adverse events:

- An increase in premium tax rates.
- An increase in taxation rates for corporations (income tax or capital gains tax).
- A prolongation of temporary taxes.
- New restrictions on registered retirement savings plans or registered retirement income funds that would have a direct impact on the level of new business for those products.
- Entry of other financial institutions into the life insurance industry (e.g., due to revisions to the Bank Act) that affect the amount of new business and lower profit margins due to increased competition.
- Possible new restrictions on the investment practices of life insurance companies (e.g., a restriction on the use of derivative products for speculation or hedging).
- The introduction of a new or modified public health care policy, which could decrease new sales or in-force business (e.g., the introduction of pharmacare).
- A change in regulatory solvency standards that increase the capital requirements.
- A reduction in the government's need to borrow funds, which could affect the volume of government bonds available to the market.
- Political instability, which could lead to confiscation of assets, closure for new business, exchange controls, etc., particularly in foreign jurisdictions.
- Impact of cost shifting between public and private sectors or changes in coverage under public insurance plans.
- A change in law or regulation directly affecting an important product line (e.g., a change in tax law affecting the position of the policyholder, a change in capital or reserving requirements putting a particular type of product at a competitive disadvantage relative to products provided by other financial institutions or even other insurance providers, a restriction of information that may be used in underwriting).
- A change in legislation that restricts the use of some distribution channels.
- Benefits, premiums, or rate adjustments subject to regulation.

For a specific scenario, possible ripple effects may include the following:

- Increased litigation costs;
- Forced liquidation of assets due to cash flow strains;
- Increased regulatory monitoring;

- Increases in the policy liability; and
- Increases in reinsurance rates and/or non-availability of reinsurance of new business.

10. Off-balance-sheet items risk

There are numerous off-balance-sheet items that may place an insurer at risk. Often these items arise from new or evolving industry practices that, in future years, do get recognized on the balance sheet by the Chartered Professional Accountants of Canada (CPA Canada), the CIA, or regulators. The AA needs to be aware of emerging risks that may be relevant to the insurer during the forecast period and assess their potential threat to the insurer's solvency.

Discussed below are examples of common off-balance-sheet items and their related risks that may be relevant to the insurer:

- **Derivative instruments** – the risks associated with derivatives include market risk, default risk, management risk, and legal risk:
  - Market risk includes marketability risk and basis risk. Marketability risk is the risk of not being able to cancel or unwind one's contract when desired or at a favourable price. Basis risk is the risk that the derivative's price behaviour does not act as expected, undoing the intended hedging benefits. The price behaviour of the instruments can change adversely when market conditions change. Market risk is best evaluated on a security basis and on a portfolio basis since some risks may not net against each other.
  - Default (or credit) risk is the risk that a loss will be incurred due to a default in making the full payments when due, in accordance with the terms of the contract.
  - Management risk is the potential for incurring material, unexpected losses on derivatives due to inadequate management supervision and understanding, systems, controls, procedures, accounting, and reporting.
  - Legal risk is the risk that the derivative agreement is not binding as intended.
- **Contingent liabilities or losses** – there are a variety of contingent liabilities to which an insurer may be exposed, such as tax, litigation, etc. The AA would consider the financial impact of adverse outcomes.
- **Letters of credit and pledged assets** – the insurer may be exposed to the risk that a lending institution defaults on payment under, for example, a letter of credit, or there is a call on assets pledged.
- **Capital maintenance agreements** – an insurer could be exposed to capital maintenance agreements it must honour for its subsidiaries (e.g., if an insurer has to guarantee a certain capital level in a subsidiary).
- **Employee and senior management benefits and liabilities not listed on the balance sheet (e.g., pension plans, stock option plans)** – this carries the risk of increasing costs.

11. Related companies risk

The related companies risk is the risk that the life insurance company may run into financial difficulties as a result of its subsidiaries' or any other related entity's financial difficulties. The related companies risk may also arise from a decision made by the controlling company that may be

unfavourable to the affiliate. For an insurer, being a part of a financial organization can be a potential source of strength, but it can also pose risks, particularly as a result of contagion. This risk could be integrated easily into other risk categories as a ripple effect and/or corrective management action or be considered as a separate scenario.

Factors to be considered include, but are not limited to, the following:

- The impact on the insurer if financial support is no longer guaranteed by the parent, or the insurer is unable to access additional capital or is obliged to continue to repatriate funds.
- The effect on the insurer of an impaired parent or affiliate within the group (e.g., the impact on funding sources available, such as lines of credit, intra-group funding, or access to external capital).
- The effect on the insurer of the inability to sell or close in a timely manner a subsidiary that is in financial difficulty (e.g., where the subsidiary shares the same brand, systems, and other infrastructure as the insurer).
- The implicit support of group companies through the reallocation of group overheads towards the insurance entity.
- The pressure on the insurer to support other group members financially (e.g., capitalizing subs to meet their local supervisory target capital requirement).
- The pressure on the insurer to comply with group requirements rather than the firm's own strategy (e.g., with respect to investment mix).
- The effect on the insurer of a high degree of dependence on group resources (e.g., through intra-group outsourcing) to support the insurer's critical operations.
- The effect on the insurer of a downgrade in the rating of the group or of other reputational issues.

Appendix B – Discussion and analysis of property and casualty insurer risk categories

This appendix outlines the major risk categories that would be considered by P&C insurers, and possible adverse trends. Each risk category section provides guidance about ripple effects, with possible management actions listed where relevant. The actuary would assess various risk categories and identify those that are relevant to their circumstances, including but not limited to the following:

- Claims frequency and severity;
- Policy liabilities;
- Inflation;
- Premiums;
- Reinsurance;
- Investment;
- Government and political issues;
- Off-balance-sheet items; and
- Related companies.

Two risk categories not included above are expense risk and operational risk. Scenarios arising due to expenses risk are not common for most P&C insurers but may be significant for an insurer that is just starting up or winding down operations. Operational risk is an evolving area and the AA may be obliged to consider scenarios such as a major shutdown of operations or loss of a key individual in the organization.

For each relevant risk category, the AA would assess the plausible adverse scenarios that are likely to significantly affect surplus or that may cause the insurer to fall below the threshold during the forecast period.

The AA may also consider systemic risk. As an example, the failure or downgrade of one or more significant insurers in the market could result in marketing and/or reputational risk for the other insurers. The AA may also consider liquidity risk, likely as ripple effects associated with other adverse scenarios.

Depending on the insurer's circumstances, the board of directors or chief agent and management may also be interested in various levels of not satisfactory condition, in which case further stress testing may be beneficial.

Once the relevant scenarios are tested, the AA would then select plausible adverse scenarios from those modelled showing the greatest surplus sensitivity for inclusion in the FCT report. Similarly, for any plausible modelled scenario that may trigger rating agency actions, the AA would discuss those with management.

If the P&C insurer manages life business and that life business represents a material risk for the insurer, the AA would consider all the risk categories covered in the life appendix of this draft educational note. If the AA does not consider the life risk important, an explanation would be

provided indicating why it is not considered material.

1. Claim frequency and severity risk

An insurer's financial condition may be sensitive to increases in claim costs (including loss adjustment expenses). Future claims costs and loss ratios can differ significantly from the base scenario due to the following:

- **Single catastrophic event –** consider natural disasters (e.g., earthquakes, windstorms, floods, and hail), human-made events (e.g., terrorism), or any other single event affecting multiple policyholders that could have a material impact.
- **Single large claim –** consider the effect if policies/accounts with the largest probable maximum loss or maximum exposed policy limits (if more appropriate) have a full loss event.
- **Multiple catastrophic events –** consider two or more events affecting multiple policyholders where the joint probability of the events is approximately equal to the probability of a single catastrophic event.
- **Multiple large claims –** select a size of claim that would be considered large by the insurer, generally smaller than the insurer's net retention. Using historical claims trended to current levels and adjusted for the insurer's current exposure, the AA would estimate the frequency and severity distribution of these claims. The cumulative distribution may be estimated using assumed distributions or simulation techniques. The cumulative distribution would be constructed for net and gross claims.
- **Other frequency and severity –** model the loss ratio or frequency and severity of claims. Since catastrophes, large claims, and adverse development are considered in other scenarios, the AA could remove unusual claims from the data prior to their analysis. It is generally recommended that the variability of the normal accident year or underwriting year loss ratio, or the combined frequency and severity distribution, be examined. The AA may assume a distribution of claims and determine the appropriate adverse scenario.
- **Social inflation –** Social inflation refers to the claims inflation resulting from changes in the likelihood of claimants bringing suit, the size of awards, the standards of liability, or the attitudes of claimants towards settlement of their claims. A significant sustained increase in the rate of social inflation would tend to lead to increases in the ultimate number or severity of unpaid liability claims and increases in the number or severity of future liability claims (both those related to the runoff of the unearned premium and those related to future new and renewal business). It would not normally be linked to a change in market interest rates.

Possible ripple effects may include the following:

- Insolvency of one or more reinsurers accounting for a significant portion of the insurer's reinsurance coverage.
- Increases in the policy liabilities related to current reinsurance contracts that are swing-rated, have variable commission, or require reinstatements.
- Loss of reinsurance coverage for remainder of term.
- Increases in reinsurance rates or non-availability of reinsurance at the next renewal.

- Post-event inflation (i.e., a significant temporary increase in the cost of labour and materials) following a catastrophe resulting in increases to the ultimate cost of unpaid claims as well as future claims.
- Post-event inflation in regions not directly affected by the catastrophic event.
- Forced sale or liquidation of assets.
- Increased Property and Casualty Insurance Compensation Corporation (PACICC) assessments resulting from failure of other insurers.
- Rating agency downgrade.

Possible management actions may include the following:

- Reviewing reinsurance coverage, type, or contract terms at renewal.
- Implementing rate increases, where possible.
- Restricting writing in hazard-prone areas.
- Reviewing the target mix by line of business or jurisdiction.
- Reviewing the type of products offered, such as writing more subscription policies.
- Selling or reinvesting assets.

2. Policy liabilities risk

Policy liabilities are estimates of future amounts required to pay for claim liabilities and premium liabilities. For long-tail lines, estimates of the cost of future claims may depend upon the estimates of the unpaid claim liabilities. As such, underestimating the policy liabilities may have a concomitant effect on the estimates of future claims.

Where the underestimation of policy liabilities results from the occurrence of a catastrophe, this scenario would normally be covered under claim frequency and severity risk. Where the underestimation results from legislative change(s), this scenario would normally be covered under government and political issues risk.

Examples of adverse scenarios to which an insurer's financial condition may be sensitive include the following:

- **Selection of inadequate loss development factors,** especially for new products or lines subject to legislative changes for which long-term development patterns are not available.
- **Class actions and other mass torts,** effective retroactively.
- **Change in mix of business** where a shift to longer-tailed lines of business may result in adverse development if selected loss development patterns do not reflect the shift.
- **Claims paid faster than assumed** in the base scenario, especially if large claims are paid earlier.
- **Actual rate of return on investments supporting the liabilities significantly lower than assumed** in the base scenario.

Possible methods to determine the adverse scenario include the following:

- Modelling the loss development factors with a statistical distribution and estimating the unpaid claims with factors at the desired adverse scenario percentile.
- Analyzing the insurer's history of actual-to-expected development of unpaid claims. This would generally be done for all lines of business combined, although an analysis by lines of business may be appropriate for an insurer where the mix of business has changed significantly over the years. It may be appropriate to use industry data for a new insurer, or if the insurer has a significant volume in new lines of business. In estimating the adverse scenario, the AA may want to fit a distribution to the historical runoff data.

Stress testing may be useful to determine the magnitude of an understatement of unpaid claim liabilities or of an unanticipated large payment that would result in not satisfactory financial condition for the company.

Possible ripple effects may include the following:

- The effect on actuarial present value for scenarios affecting undiscounted policy liabilities.
- Increases in the policy liabilities related to current and past reinsurance contracts that are swing-rated, have variable commission, or require reinstatements.
- Increases in ultimate claim costs and claim expenses in connection with the runoff of the unearned premium for scenarios affecting claims liabilities.
- Increases in ultimate claim costs and claim expenses in connection with future new and renewal business.
- Forced sale or liquidation of assets.
- Rating agency downgrade.

Possible management actions may include the following:

- Settling claims faster by minimizing litigation or fast-tracking claims handling.
- Reviewing reserving and claim settlement guidelines.
- Implementing rate increases, where possible.
- Reviewing the target mix by line of business or jurisdiction.

3. Inflation risk

Claim costs and claim adjustment expenses are quite sensitive to inflation. Inflation in the insurance environment will generally be positively correlated with the general rate of inflation, as measured by the Consumer Price Index (CPI). There will, however, be changes in costs that will affect the insurance environment differently than the overall economy.

Claim costs may be affected by price increases extraneous to the insurance business. This excludes the effect of social inflation that is considered in risk category 1 (claim frequency and severity risk). Changes in inflation may be due to the following:

- **A significant, rapid, and sustained increase in the general rate of inflation –** in this scenario, inflation will lead to increases in the ultimate cost of settling claims (incurred and unpaid as well as future claims) as well as various related expenses. It would normally, but not always,

be linked to a rapid and sustained increase in market interest rates.

A scenario considering sustained inflation will tend to be based on a significant increase in trend over inflation projected in the base scenario. Ideally, the increase would be applied over the entire projection period. This would tend to be accompanied by an increase in market interest rate.

A possible method to determine an adequate level of increase in the inflation trend would be to look at historical changes in the CPI over three-year periods of time. The length of time considered would ideally be long enough to capture a large range of situations that can be applied to the projection period. The level of change in market interest rate would be based on the reasoning described in risk category 6 (investment risk).

- **A significant temporary increase in the cost of labour and materials following a catastrophe or other major event –** in this scenario, the ultimate cost of settling claims would increase following a catastrophe or other major industry event that did not directly affect the insurer. This scenario differs from the ripple effect for catastrophic event(s) in risk category 1 (claim frequency and severity risk) because the increased cost affects claims that were not the result of the event.
- **A severe recession in the economy –** in this scenario, economic conditions may lead to increases in the ultimate number of and cost of settling claims and loss adjustment expenses, for both current and future claims. This may be linked to a sustained increase in general inflation, unemployment level, or market interest rates.

Possible ripple effects may include the following:

- A rapid and sustained increase in market interest rates.
- Increase in operating expenses.
- Increase in reinsurance rates on current swing-rated contracts and on future contracts.

Possible management actions may include the following:

- Reviewing reinsurance coverage, type, or contract terms at renewal;
- Implementing rate increases, where possible;
- Reviewing the target mix by line of business or jurisdiction;
- Reviewing the type of products offered;
- Selling or reinvesting assets; and
- Adjusting the insurance to value or cost calculator.

4. Premium risk

An insurer's financial condition may be affected by differences between actual business volume, type, or mix, and the respective assumptions in the business plan.

There are several categories of events that could have considerable impact on the volume, type, mix, and profitability of business written by an insurer. Some of these events are related to the underwriting and marketing environment and can result in unexpected reductions or increases in

premium volume. Inadequate pricing may also trigger significant changes in the premium volume or mix of business and is likely to compound the effect of scenarios triggered by other events. Any significant change in premium volume resulting from government or political actions would be considered under risk category 7 (government and political issues risk).

Stress testing may be useful to determine the magnitude of premium volume that would result in a not satisfactory financial condition for the insurer. Consideration would be given to the assumptions in the base scenario, and vulnerability of the insurer to the selected event given its size, marketing plan, and strategies.

Premium volume significantly lower than the base scenario

The reduction from the planned premium volume can be the result of lost business, reduced or inadequate rate level for some market segments, and/or uncompetitive pricing in some market segments.

Some events resulting in a significant reduction in premium volume include the following:

- Entry of a new and strong competitor into a market.
- Increased competitiveness in a market.
- Loss of a key distributor or even an entire distribution channel.
- Loss of a key client.
- Action by any influential entity (consumers, distributors, rating agencies, etc.) that affects the insurer's reputation or growth negatively.
- Inability to implement planned premium rate increases.
- Non-competitive premium rates.

Possible ripple effects may include the following:

- An increase in loss ratio due to a soft market, inadequate pricing, or lost business that is relatively more profitable than the retained business.
- An increase in the fixed expense ratio.
- An increase for certain types of expenses (for example, more advertising costs to counter a very aggressive competitor).
- A shift in portfolio mix since the lost business could have a very different average premium or could be primarily from a specific market segment.
- An increase in reinsurance costs as a percentage of subject premium.
- Forced sale or liquidation of assets.

Possible management actions may include the following:

- Reducing personnel or slowing down hiring.
- Identifying other distributors for the insurer's product(s).
- Implementing rate changes, where possible.

- Changing reinsurance coverage, type, or contract terms at next renewal.
- Underwriting actions in markets subject to increased competition.
- Changing the target mix of business of future lines of business.
- Adjusting the investment portfolio to mitigate cash flow strains.

Premium volume significantly higher than the base scenario

An increase from the planned premium volume can be the result of unexpected new business or inadequate (i.e., too competitive) rate level for some market segments.

Some events resulting in a significant increase in premium volume include the following:

- Withdrawal or failure of major competitors from a market.
- Appointment of a key distributor.
- Unexpected new business from a large client.
- Any action by any influential entity (consumers, distributors, rating agencies, etc.) that affects the insurer's reputation or growth favourably.
- Unexpected success in a new product area, or against previously stronger competition.
- Premium rates set too low compared to the competition.

Possible ripple effects may include the following:

- A higher loss ratio on new business due to inadequate pricing.
- A shift in portfolio mix since the new business could have a much different average premium or could be primarily from a specific market segment.
- Higher expenses (hiring of employees, increased overtime, etc.) in the short term as well as in the long term.
- Increased PACIC and pool assessments.
- Increased reinsurance costs.

Possible management actions may include the following:

- Implementing rate changes, where possible.
- Underwriting actions (e.g., restrictions on new business, withdrawal) in unprofitable markets.
- Reviewing the distribution channels.
- Reducing certain types of expenses (for example, advertising costs).
- Using reinsurance to mitigate capital strain.

5. Reinsurance risk

An insurer's financial condition may be adversely affected by a reinsurer's failure to meet its obligations to the insurer, or from a change in market conditions causing an increase in reinsurance rates, inadequate reinsurance limits, or otherwise inadequate or unaffordable reinsurance

coverage. In this context, the term reinsurer is intended to include both reinsurers, if the entity is a primary insurer, or retrocessionaires, if the entity is itself a reinsurer.

Adverse scenarios arising from reinsurance risk include the following:

- **Reinsurer insolvency** – the impact of reinsurer insolvency would reflect an assumed "recoverable percentage" of assets to liabilities of the failed reinsurer, and any different treatment of various types of amounts owing from the reinsurer to the ceding entity. The impact may be mitigated by right of offset to amounts owing under all treaties between the two entities, by the preferred position insurers will have relative to other creditors of a failed reinsurer, by the special termination clause in the event of failure, and by any amounts on deposit or in trust with the insurer, or letters of credit in respect of an unlicensed reinsurer. It would normally be appropriate under this scenario to assume that the business currently ceded to the failing reinsurer could be successfully reinsured elsewhere (possibly on less favourable terms), unless there is something unique about the business involved that would make securing such replacement reinsurance difficult.

  Reinsurer insolvency can be due to the circumstances of a specific reinsurer (such as undervaluation of older liabilities), or it could be systemic to the industry due to a major global event or series of global events (e.g., terrorist attack, natural disaster, etc.).

  In developing this scenario, the AA would take into account the following considerations:

  - Affiliated versus non-affiliated reinsurers – the AA may be better able to assess the likelihood of insolvency if a reinsurance arrangement consists of an inter-company pooling agreement or reinsurance with an affiliated company, as opposed to external reinsurance.
  - Rating of reinsurers – reinsurers with weaker rating from rating agencies could be more likely to fail than reinsurers with stronger rating.
  - Registered versus non-registered reinsurers – although non-registered reinsurers may have deposits in Canada covering known liabilities, access to funds to cover unknown liabilities may be more difficult to secure.
  - Concentration of reinsurance – this involves the failure of a reinsurer with a significant share of the ceded liabilities.

  Stress testing may be useful to determine a plausible scenario. The exposure to the reinsurers would be calculated in terms of unpaid claims, including incurred but not reported (IBNR), but less amounts payable to, and security held from, the same reinsurers. The AA may evaluate the impact of default of some of these reinsurers based on level of participation, financial stability, and rating.

- **An increase in reinsurance rates or a reduction in reinsurance commission** – this scenario considers situations where reinsurance action is systemic in nature, due to the overall insurance environment. This is in contrast with ripple effects considered in risk categories 1, 2, and 4, where the reinsurer action is taken in response to situations unique to the insurer, such as poor experience.

- **Reduction in capacity** – this scenario contemplates a reduction in the availability of

reinsurance over the forecast period.

- **Disputes over policy conditions** – the effect on an entity of disputes with reinsurers may be similar to the effect of reinsurer insolvency. To differentiate between these scenarios, however, the AA would consider a dispute that results in a principal reinsurer denying coverage for a significant class of business or category of claims, such as a terrorism occurrence.

Possible ripple effects may include the following:

- Increase in reinsurance rates arising from the need to obtain replacement reinsurance coverage.
- Reduced availability of reinsurance.

Possible management actions may include the following:

- Changing the reinsurance structure.
- Diversifying participants on the reinsurance program.
- Retaining a greater proportion of business to decrease the reinsurance cost.
- Changing reinsurers.
- Reducing primary policy limits.

6. Investment risk

Changes in economic conditions have the potential to significantly impact an insurer's financial situation. For example, rapid changes in interest rates, exchange rates, and economic growth rates can affect the insurer's financial condition by leading to concomitant changes in the following:

- The market value of debt and equity securities;
- The default rates on debt securities;
- The match between cash flows from assets and liabilities; and
- The creditworthiness of derivative counterparties.

Adverse scenarios in respect of deterioration of asset values may come from a variety of sources, including the following:

- A significant change in the yield curve;
- An increase in the default rate on debt securities;
- A decrease in the returns and/or value of equities;
- A decrease in the returns and/or value of real estate;
- A decrease in the returns and/or value of subsidiary;
- A significant change in foreign exchange rates; and
- A decrease in the returns and/or value of other major asset categories.

The AA may consider integrated scenarios involving a combination of these events. For example, in the event of a severe market shock, the creditworthiness of derivative counterparties may go down

at the same time the exposure in the re-margining agreement goes up. A period of market turbulence or a shock to market liquidity would be among the scenarios considered.

In selecting appropriate assumptions to determine the adverse scenario, the AA may want to refer to the CIA's *Report on Canadian Economic Statistics*. For example, the AA may base an assumption on the largest one-year decline in equities, or the largest three-year average increase in interest rate. It is important, however, to keep in mind the starting position of the current economic environment.

Alternatively, the AA may use a stochastic model for economic changes, if one is available.

Possible ripple effects may include the following:

- Forced sale or liquidation of assets;
- Significant positive or negative cash flows impacting the insurer's liquidity position;
- Negative change on derivative positions;
- Default by counterparty on derivatives;
- Rating agency downgrade;
- A liquidity crisis caused by large, sustained default losses;
- Increase in the frequency or severity of claims due to the deteriorating economic conditions; and
- Change in discount rate used for calculating actuarial present value of policy liabilities.

Possible management actions may include the following:

- Selling or reinvesting assets;
- Changing the investment strategy;
- Repositioning derivative tools;
- Reducing the amount of business underwritten;
- Implementing rate increases, where possible; and
- Reducing costs through layoffs, consolidation of branch offices, or other similar actions.

7. Government and political issues risk

The implementation of a government's policies or regulations usually takes a long time. This normally allows an insurer time to analyze the impact(s) and take the appropriate actions. Time for analysis and action may not be available where implementation of changes occurs quickly, is not foreseen, or is made retroactively effective. In these cases, the adverse scenario may be modelled in the first partial year modelled if the scenario is plausible in that time period.

Adverse scenarios to which an insurer's financial condition may be sensitive include the following:

- A rate freeze or rollback of rates by a government body or regulator on lines of business and jurisdictions in which rates are subject to regulatory approval.
- A change to regulations regarding use of rating variables that may impact the adequacy of

rates and availability of insurance on lines of business and jurisdictions in which rates are subject to regulatory approval.

- A change to legislation that prescribes levels of insurance coverage, such as automobile accident benefits.
- An increase in taxation rates or rules for corporations, such as income tax, capital gains tax deductions, or offshore income.
- Nationalization or privatization of a line of business in a jurisdiction.
- A change to legislation that creates or restricts distribution channels.
- A change in regulatory solvency standards that could increase the capital requirements for property and casualty insurers.
- Political instability that leads to confiscation of assets, closure for new business, exchange controls, etc., particularly in foreign jurisdictions.

Possible ripple effects may include the following:

- Deterioration of loss ratio;
- Increased litigation costs;
- Reduced availability of insurance to the public;
- Increased volume of industry pools resulting in increased assessments;
- Increased regulatory monitoring or filing of rates;
- Forced sale or liquidation of assets;
- Problems with reinsurance coverage;
- Increased policy liabilities related to current reinsurance contracts that are swing-rated, have variable commission, or require reinstatements; and
- Increased reinsurance rates or non-availability of reinsurance at the next renewal.

Possible management actions may include the following:

- Reducing the volume of business written by restricting sales or broker force, freezing new business, or withdrawing from the jurisdiction or line of business;
- Creating or expanding a separate company or distribution channel;
- Reviewing the target mix by line of business or jurisdiction; and
- Reviewing reinsurance coverage, type, or contract terms at next renewal.

8. Off-balance-sheet items risk

There are numerous off-balance-sheet items that may adversely affect an insurer's financial condition. Often these off-balance-sheet items arise from new or evolving industry practices that, in subsequent years, do get recognized on the balance sheet by the CPA Canada, the CIA, or regulators. Therefore, the AA needs to develop awareness of any emerging risk that may be relevant to the insurer during the forecast period and assess its potential threat to the insurer's financial condition.

Possible scenarios of off-balance-sheet items and their related risks include the following:

- **Structured settlement –** when a property and casualty insurer purchases an annuity to satisfy a structured settlement, it is exposed to the credit risk associated with the insolvency of the insurer selling the annuity.
- **Contingent liabilities or losses –** there are a variety of contingent liabilities to which an insurer may be exposed, such as tax, litigation, etc.
- **Letters of credit and pledged assets –** the insurer may be exposed to the risk that a lending institution defaults on payment under, for example, a letter of credit, or a call on assets pledged.
- **Capital maintenance agreements –** an insurer could be exposed to capital maintenance agreements it must honour for its subsidiaries.
- **Derivative instruments –** the risks associated with derivatives are discussed in more detail below:
    - Market risk includes liquidity risk and basis risk. Liquidity risk is the risk of not being able to cancel or unwind one's contract when desired or at a favourable price. Basis risk is the risk that the derivative's price behaviour does not act as expected, undoing the intended hedging benefits. The price behaviour of the instruments can change adversely when market conditions change. Market risk is best evaluated on a security basis and on a portfolio basis since some risks may not net against each other.
    - Default (or credit) risk is the risk that a loss will be incurred due to default in making the full payments, when due, in accordance with the terms of the contract.
    - Management risk is the potential for incurring material, unexpected losses on derivatives due to inadequate management supervision and understanding, systems, controls, procedures, accounting, and reporting.
    - Legal risk is the risk that the derivative agreement is not binding as intended.
- **Pension underfunding –** the insurer could be exposed to the potential impact of unfunded liabilities.

Possible ripple effects may include the following:

- Forced sale or liquidation of assets.
- Significant positive or negative cash flows, affecting the insurer's liquidity position.

Possible management actions may include the following:

- Selling or reinvesting assets;
- Changing the reinsurance strategy;
- Repositioning of derivative tools; and
- Reducing costs through layoffs, consolidation of branch offices, or other similar actions.

9. Related companies risk

It is possible that adverse scenarios in a related company may have a concomitant impact on the

insurer's financial condition. The choice of adverse scenarios for this risk will tend to be based on actual company organizational structures. Related company risk may also be considered in creating integrated scenarios with other risk categories.

In this context, an insurer's financial condition may be sensitive to the following:

- **A reduction in reliance on the parent company for financial support –** typically, such a situation would arise when a group's financial resources are needed to support a financially impaired parent or affiliate company.
- **An increase in the provision of financial support to the parent –** in this situation, funds the company expected to have for its own purposes are now needed to support other entities in the group.
- **A high level of dependency on group operational resources –** this situation would consider disruptions in services (computer systems, actuarial, etc.) provided by related companies.
- **A rating agency downgrade reflecting difficult financial conditions at the group level.**

Possible ripple effects may include the following:

- Management focus on group rather than company priorities, potentially delaying remedial action;
- A need to provide for service disruptions; and
- Regulator action to protect local policyholders.

Possible management actions may include the following:

- Finding alternative sources of funds for operational support;
- Adjusting premium volumes and mix of business;
- Reviewing reinsurance coverage purchased to mitigate capital strain;
- Reviewing the target mix by line of business or jurisdiction;
- Reviewing type of products offered; and
- Selling or reinvesting assets.