Appendix B – Property and casualty insurers

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 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 actuary 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 experience or frequency and severity of claims. Since catastrophes, large claims, and adverse development are considered in other scenarios, the actuary 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 results, or the combined frequency and severity distribution, be examined. The actuary 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 adverse ripple effects may include the following:

- Insolvency of one or more reinsurers accumulating to a significant portion of the insurer's reinsurance held coverage.
- Increase in the insurance contract liabilities related to current reinsurance contracts held (e.g., swing-rated contracts, variable commission, reinstatements premiums).
- Loss of reinsurance held coverage for remainder of term.
- Increases in reinsurance held rates or non-availability 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 held 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 geographic region/jurisdiction.
- Reviewing the type of products offered, such as writing more subscription policies.
- Selling or reinvesting assets.

2. Liability for incurred claims risk

The estimation of the liability for incurred claims (LIC) is dependent on various assumptions. Actual results may vary significantly from expectations.

Where the underestimation of liabilities for incurred claims 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, new case-law 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.
- **Adverse change in the actual yield curves used for discounting the insurance contract liabilities** compared to what was 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 LIC. 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 actuary may want to fit a distribution to the historical runoff data.

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

Possible adverse ripple effects may include the following:

- Decreases in the reinsurance contracts held assets or increase in the insurance contract liabilities related to current reinsurance contracts held (e.g., swing-rated contracts, variable commission, reinstatements premiums).
- Reduced CSM or increased loss component from onerous groups or from groups that may shift from being non-onerous to being onerous.
- Increase in the loss component 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 geographic location/jurisdiction.

3. Inflation risk

Fulfilment cash flows 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 covered through 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 fulfilment cash flows (LIC and LRC) 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.

  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 a multiple-year time period. 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 (market and credit risk).

- **A significant temporary increase in the cost of labour and materials following a catastrophe or other major event –** in this scenario, the fulfilment cash flow 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, claim settlements 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 yield curves.

Possible adverse ripple effects may include the following:

- A rapid and sustained increase in market interest rates.
- Increase in operating expenses.
- Increase in the insurance contract liabilities related to current reinsurance contracts held (e.g., swing-rated contracts, variable commission, reinstatements premiums).

Possible management actions may include the following:

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

4. Volume and mix of business 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 insurance revenue. Inadequate pricing may also trigger significant changes in the business volume or mix of business and is likely to compound the effect of scenarios triggered by other events. Any significant change in business 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 change in business 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.

Adverse scenarios arising from business volume risk include the following:

Business volume significantly lower than the base scenario

Lower business 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 business 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 adverse ripple effects may include the following:

- An increase in insurance service expense. Examples of potential drivers include a soft market, inadequate pricing, or lost business that is relatively more profitable than the retained business.
- Higher expenses (for example, more advertising costs to counter a very aggressive competitor).
- A shift in portfolio mix. For example, the business lost could have a very different average premium or could be primarily from a specific market segment.
- An increase in reinsurance held costs as a percentage of insurance revenue.
- 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 increases, where possible.
- Changing reinsurance held 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.

Business volume significantly higher than the base scenario

An increase from the planned business 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 business 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:

- Less favourable loss experience 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 PACICC and pool assessments.
- Increased reinsurance held costs.

Possible management actions may include the following:

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

5. Reinsurance held risk

Reinsurance held risk is defined as the risk to a ceding insurer that arises from a reinsurer's failure to meet its obligations, or from a change in market conditions causing an increase in reinsurance held rates, inadequacy of limits, or otherwise inadequate or unaffordable coverage.

Adverse scenarios arising from reinsurance held risk include the following:

- **Reinsurer insolvency** – the impact of a reinsurer insolvency would be reflected by assuming that a portion of the amounts receivable or recoverable from the failed reinsurer would not materialize. 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 actuary would take into account the following considerations:

- Affiliated versus non-affiliated reinsurers – the actuary 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 held – 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 insurance liabilities, including incurred but not reported (IBNR), but less amounts payable to, and security held from, the same reinsurers. The actuary may evaluate the impact of default of some of these reinsurers based on level of participation, financial stability, and rating.

- **An increase in reinsurance held rates or a reduction in reinsurance held 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 held 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 actuary 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 adverse ripple effects may include the following:

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

Possible management actions may include the following:

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

6. Market and credit risk

Changes in economic conditions have the potential to significantly impact an insurer's financial situation. For example, rapid changes in yield curves, 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.
- 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.
- A decrease in the returns and/or value of other major asset categories.

The actuary 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 actuary may want to refer to the CIA's *Report on Canadian Economic Statistics*. For example, the actuary may base an assumption on the largest one-year decline in equities, or the largest three-year average increase in yield curve. The actuary should be mindful of the fact that the future economic environment is correlated with the current economic situation when selecting its assumptions.

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

Possible adverse 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.
- Change in the yield curve used for calculating insurance contract 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.
- Reducing costs through layoffs, consolidation of branch offices, or other similar actions.

7. Expense risk

Scenarios arising due to expense 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, or for lines of business where the main driver of the cost comes from expenses other than claims costs (e.g., surety or title insurance).

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 or litigation. Insurers practicing 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. The actuary would also consider impacts related to directly attributable or non-directly attributable expenses, and their implications on the financial statements.

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 emerge 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 early adopters of such technology. 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, litigation impacts, ratings downgrades, lower sales, and higher cancellations or non-renewals.
- **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.
  - Higher cancellations and non-renewals.

8. Government and political 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 P&C insurers.
- Political instability that leads to confiscation of assets, closure for new business, exchange controls, etc., particularly in foreign jurisdictions.
- Geopolitical conflict leading to supply chain disruptions and inflationary pressure.

Possible adverse ripple effects may include the following:

- Higher than expected fulfilment cash flows.
- 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 held coverage.
- Increase in the insurance contract liabilities related to current reinsurance contracts held (e.g., swing-rated contracts, variable commission, reinstatements premiums).
- Increased reinsurance held rates or non-availability 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 geographic location/jurisdiction or line of business.
- Creating or expanding a separate company or distribution channel.
- Reviewing the target mix by line of business or geographic location/jurisdiction.
- Reviewing reinsurance held coverage, type, or contract terms at next renewal.

9. 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 actuary 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 P&C 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 adverse 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 held strategy.
- Repositioning of derivative tools.
- Reducing costs through layoffs, consolidation of branch offices, or other similar actions.

10. 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 adverse 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.
- Regulator action to protect local policyholders.

Possible management actions may include the following:

- Finding alternative sources of funds for operational support.
- Implementing rate increases, where possible.
- Reviewing reinsurance held coverage purchased to mitigate capital strain.
- Reviewing the target mix by line of business or geographic location/jurisdiction.
- Reviewing type of products offered.
- Selling or reinvesting assets.

11. Climate-related risks

Climate-related risk could be considered a risk category of its own or may form the basis for an integrated scenario reflecting the other risk categories.

Climate-related risks are not limited to risks arising from localized climate events such as wildfires and floods. They also include larger-scale impacts related to climate change adaptation. In general, this risk category consists of physical and transition risk, as outlined below:

- Physical risk, which arises from an increase in frequency and severity of climate events, that could disrupt critical operations, threaten the value of investments, and/or increase insurance risks.
- Transition risk, which is driven by a shift towards a lower carbon footprint economy, could stem from current or future government policies, changes in investor or consumer sentiment, technological advancements, or climate-related litigation.

The actuary would consider the occurrence of a combination of these risk factors. Given that the timing and impact of climate change is uncertain, the actuary would apply judgement in forecasting climate change impacts and determining the forecast period for a climate-related risk scenario. Considerations would include the potential timing and magnitude of physical versus transition risk, and the need to incorporate the vast majority of the scenario impacts on the financial condition of an insurer.

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

- Increased frequency of catastrophe events.
- Increased severity of catastrophe events.
- Affordability and availability of reinsurance which may imply an increase in the retention for the primary insurer and/or increase in reinsurance premiums.
- Disruption in the supply chain from climate-related events resulting in increased severity for non-catastrophe related claims.
- Changes in regulation impacting future claims severity (e.g., rebuilding with eco-friendly materials, costs to rebuild in a non-hazard prone area).
- Changes to insured products (e.g., new electric vehicles).
- Increase in credit, market, and liquidity risks due to increased costs of climate change adaptation.
- Increases in operational risk due to damage to infrastructure.
- Increases in general expenses to support climate-change mitigation actions.
- Increase in reputation risk.

Possible management actions may include the following:

- Reviewing reinsurance held coverage purchased to mitigate capital strain.
- Finding alternative sources of reinsurance.
- Implementing rate increases, where possible. Reviewing the target mix by line of business or geographic location/jurisdiction (e.g., reviewing concentration risk).
- Reviewing type of products offered.
- Selling or reinvesting assets.

12. Technology and cyber risk

Refer to Technology and cyber risk in Appendix A. Risks associated with cyber insurance products offered by P&C insurance companies could either be considered as part of the technology and cyber risk category, or the other insurance risk related categories (e.g., frequency and severity and liability for incurred claims).