Office of the Superintendent of Financial Institutions Canada
Bureau du surintendant des institutions financières Canada

Guidance for the Development of a Models-Based Solvency Framework for Canadian Life Insurance Companies

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OSFI BSIF

Canada

Background

The MCCSR Advisory Committee was established to develop proposals for a new solvency assessment framework for Canadian life insurers based on the use of internal models. In the spring of 2008, the Committee requested that OSFI provide guidance in some specific areas to enable the Committee to continue making progress with its work.

At the May 27, 2008 meeting of the MCCSR Advisory Committee, OSFI indicated that it would provide guidance in the following 10 areas:

1. *Model scope:* the risks for which Pillar 1 regulatory capital requirements may be determined using models-based approaches

2. *Standardization:* the degree of model standardization appropriate for each risk

3. *Total Asset Requirement calculation for all risks combined:* the way in which the requirements for individual risks are to be combined to obtain a Total Asset Requirement for all risks

4. *Combination of risks:* the extent to which diversification, correlation and concentration across risks, products, business lines and legal entities are to be incorporated in the calculation of the supervisory and company target capital requirements

5. *Terminal provision:* the valuation basis for the risk that remains at the end of the initial time period

6. *Time horizon:* the length of the time period over which an initial shock is assumed to occur and capital is to provide protection for the identified risks

7. *Risk mitigation:* the extent to which risk mitigation strategies may be recognized in the determination of the regulatory capital requirement

8. *Equivalent risk standard:* the risk metric and confidence level used to determine the Total Asset Requirement

9. *Prerequisites (basic requirements):* the basic requirements that a company seeking to use internal models to determine supervisory target capital must meet before an approval to use internal models would be considered[1]

[1] Throughout this document, "approval" means that OSFI has granted a company permission to use an internal model, subject to specified conditions, to determine the company's capital requirements for regulatory reporting purposes. Companies seeking to use an internal model for regulatory capital purposes will be required to submit a formal application. OSFI's permission to use an internal model should not be interpreted to mean that OSFI has verified the correctness or appropriateness of the company's model or its inputs or outputs, which is the responsibility of the company; it only means that OSFI has reviewed the company's submissions and determined that the company's use of the model in accordance with such submissions should meet the requirements of OSFI's framework for the use of internal models for regulatory capital.

10. *Implementation considerations:* policy governing the industry's transition to an internal models based approach

This document summarizes the guidance that OSFI is able to provide at this time. It also provides some clarifying information on the basic solvency framework, in particular, the anticipated interaction of the new standard and internal models approaches to solvency assessment, and the likely timeframe for implementation of the internal models approach. This guidance and the timeframe for implementation may be reviewed and modified based on new information acquired during the development of the solvency assessment framework. OSFI will provide further guidance as development of the solvency assessment framework proceeds.

A draft version of this document was discussed with the members of the MCCSR Advisory Committee at the September 27, 2008 meeting of the Committee. Based on comments and questions received during and after that meeting, the document has been updated and finalized. Future guidance will be provided in separate documents.

OSFI believes that the guidance provided in this document will enable companies to make informed decisions with respect to their intent to develop and implement internal models for regulatory capital purposes.

Clarifying Information on the Basic Solvency Framework

The new framework for determining regulatory capital requirements for life insurance companies will have two basic components:

- a Standard Approach, which is to be used by all companies to determine the company's minimum capital requirement and by companies without approval to use internal models to determine the company's supervisory target required capital amount, and
- an Internal Models Approach, which is to be used by companies with approval to use internal models to determine the company's supervisory target required capital amount subject to OSFI-defined floors.

Capital and capital ratios will continue to be used in the supervisory process to assess a company's solvency and make decisions on the appropriate level of intervention.

Minimum Capital Requirement and Supervisory Target Capital Requirement
Regulatory capital requirements under both the Standard Approach and the Internal Models Approach will be determined using a Total Asset Requirement method subject to the following limitations with respect to the amount of the liability offset in the determination of the minimum and supervisory target capital requirements and the flexibility of companies to set the supervisory target capital requirement:

<u>Interaction of Asset Requirement and Capital Requirements</u>

- Required capital, whether at the minimum or in the case of companies with approval to use an internal model, the supervisory target levels , will be the amount remaining when

the lesser of the company's IFRS liabilities and a cap specified by OSFI is deducted from the respective asset requirement.

- The cap on liabilities will be defined by OSFI and specified precisely at a later date based on the methods ultimately used to determine asset requirements and liabilities under the standard and internal models approaches.
- The cap will be defined in a way that encourages companies to set liabilities at prudent levels and have appropriate levels of capital.
- To the extent that a company's liabilities exceed the OSFI-specified cap, OSFI will consider how and to what extent to reflect the adjustment for the difference in the calculation of the company's available capital. The amount of any such adjustment, as well possible approaches for addressing this situation, will be determined in the future.

Flexibility of Companies to Set Supervisory Target Capital Requirement

- For a company without approval to use internal models, the supervisory target capital requirement will be a multiple m_S of the company's minimum capital requirement, where $m_S > 1$.
- For a company with approval to use internal models, the supervisory target capital requirement will be the greater of:
  - a multiple m_S^* of the minimum capital requirement, where $m_S^* > 1$ and
  - the amount determined by the company's approved internal model.
- The multiples m_S and m_S^* will be determined at a later date and be such that $m_S^* < m_S$.
- It is expected that the multiples m_S and m_S^* will be uniform for all companies.

Company Target Capital Requirement

- Company target capital requirements will be set by individual companies in consultation with OSFI based on a consideration of the company's inherent risks and the quality of the company's risk control structures.
- The company target capital requirement will always be greater than the supervisory target capital requirement; for most companies, the company target capital requirement will be greater than the supervisory target capital requirement by a material amount.
- Companies with approval to use an internal model will be expected to maintain on an ongoing basis a capital level that is the greater of:
  - the company target capital requirement and
  - the amount required to withstand OSFI-specified shocks (e.g., a 30% decline in the equity market) and still have a capital level that is greater than the supervisory target capital requirement.
- All companies, whether using a standard or internal models approach, are expected to be proactive in the management of capital and conduct their own analysis of the risks being taken to determine the appropriate level of capital at which the company should operate.

Companies should not base operating requirements on regulatory capital requirements alone.

Additional Clarifying Information on the Basic Solvency Framework
It is expected that internal models will be designed and applied on a risk-by-risk basis. Further information on model design is provided throughout the document.

OSFI has high expectations of companies with approval to use an internal model to determine regulatory capital requirements. The senior management and risk officers of such companies are expected to understand and manage the underlying the risk, ensure the ongoing integrity of the model and be proactive in the management of capital.

Likely Timeframes for Implementation of Internal Models

OSFI believes it is important to communicate its expectations with respect to the likely timeframe for implementation of any internal models approach.

Given

- the amount of development work that remains to be done before the framework can be finalized,
- the time required to design, carry out and interpret the results of quantitative impact studies associated with the development of the framework,
- the time required after the framework has been finalized for companies to build the systems and put in place the business processes, infrastructure, controls and independent vetting needed to implement the framework,
- the time required to implement and interpret the results of parallel runs, and
- the need for any internal model being considered to satisfy a "use test",

it is OSFI's expectation that it will be 2014 or later before any company receives approval to use an internal model to determine the regulatory capital requirement for any of the risks identified in this document. However, submission and review of an application to use an internal model for a particular risk could occur prior to this date.

The precise date when OSFI will begin to approve the use of internal models for determining regulatory capital requirements will depend on the availability and completeness of comparative data and results from across the industry, the robustness of the models themselves and other factors as set forth in this document. Should development of the framework for internal models proceed more quickly than currently anticipated, some companies may be able to receive approval prior to 2014 to use an internal model to determine the regulatory capital requirement for selected risks.

A minimum of 4 to 12 quarters of high quality parallel runs per risk will be required of companies seeking to use the internal models approach. The precise number of periods and the

particulars of the parallel runs required will be specified at a later date. Note that the 2014 date quoted allows for the possibility that a company will have satisfied the parallel run requirement prior to 2014.

Model Scope and Degree of Standardization

Under Pillar 1 (insurance) there are regulatory capital requirements for:

- market risk,
- credit risk,
- insurance risk,
- policyholder behavior risk,
- expense risk and
- operational risk.

There is no regulatory capital requirement for liquidity risk under Pillar 1 (insurance).

The extent to which an internal model would be permitted and the degree of model standardization expected for the Pillar 1 risks is summarized in the tables on the pages that follow. Precise definitions of the various terms, e.g., real estate risk, will be provided at a later date.

In the context of this document, the term *policyholder behavior risk* means the risk that policyholders behave in a way that:

- is different from assumed or modeled by the company and
- has adverse financial consequences for the company.

Both conditions must be satisfied for there to be policyholder behavior risk. Policyholder behavior that is different from assumed but financially beneficial to the company would not be considered policyholder behavior risk. Likewise, policyholder behavior that has adverse financial consequences but is already assumed by the company when calculating the requirements for the other risks (e.g., market risk, insurance risk, etc) would not be considered policyholder behavior risk.

Note that if a company employed a lapse model that was sensitive to equity market movements, the policyholder behavior risk component of the capital requirement would capture the risk that the company's lapse model is incorrect in a way that could have adverse financial consequences for the company (e.g., realized lapses on a lapse-supported product lower than modeled); if the company's lapse model already captured the behavior that was most financially adverse to the company (i.e., any lapse behavior different from modeled would be financially beneficial to the company) then there would be no additional capital requirement for policyholder behavior risk.

Although there is no regulatory capital requirement for liquidity risk under Pillar 1 (insurance), liquidity risk can be material in some insurance organizations and would be a consideration when setting the company target capital requirement.

Risk Category	Internal Model Permitted	Degree of Model Standardization
Market Risk • Interest rate risk • Credit spread fluctuation risk • Equity risk • Real estate risk • Foreign exchange rate risk • Commodity risk • Monetary inflation risk[2]	Yes	• Companies would be free to use their own internally-developed stochastic economic scenario generators subject to OSFI-specified qualitative and quantitative criteria, which would include requirements on the quality and amount of historical data. • Companies would be required to demonstrate the appropriateness of their internally-developed stochastic scenario generators, even if the generators satisfied the specified qualitative and quantitative criteria. • OSFI reserves the right to prohibit the use of a stochastic economic scenario generator if it believed that the generator was deficient in a material way.

[2] Monetary inflation is a risk that affects expenses and inflation-sensitive liabilities. Because there is some relationship between monetary inflation and the level of nominal interest rates, it is appropriate to consider monetary inflation risk in the same category as interest rate risk. Inflation risk is most pronounced in P&C insurance. However, it also arises in health insurance and can arise in life insurance and annuity business where payments are linked to the consumer price index. Note that claim inflation is often greater than monetary inflation. Claim inflation risk may be considered an insurance risk at a later date.

Risk Category	Internal Model Permitted	Degree of Model Standardization
Credit Risk • Asset credit risk • Counterparty credit risk	Yes	• The approach would be similar to the one used for Basel II AIRB: o The basic model form would be specified o Companies would be free to select parameter inputs (e.g., PD, LGD, EAD, M) subject to OSFI-specified criteria, which would include requirements on the quality and amount of historical data • It is expected that a model very similar, if not identical, to the one used for Basel II will be required, the only likely difference being with respect to maturity duration or time horizon. • OSFI would reserve the right to prohibit the use of a model and/or parameter selection procedure, even one recommended by the industry or the actuarial profession, if it believed that the model and/or parameter selection procedure was deficient in a material way.

Risk Category	Internal Model Permitted	Degree of Model Standardization
Insurance Risk[3] • Mortality/longevity risk • Morbidity risk[4] • Property risk (P&C only) • Liability risk (P&C only)	Yes	• Companies would be permitted to develop and use their own models subject to OSFI-specified o calibration criteria, o requirements on the quality and amount of historical data and/or o parameter assumptions (e.g., with respect to mortality improvement). • OSFI may make available a list of models, but companies would not be obligated to use any of the models on this list. • Companies would be required to demonstrate the appropriateness of any model used, whether or not it is on the OSFI list. • OSFI would reserve the right to prohibit the use of a model that it believed was deficient in a material way.

[3] "Claim inflation" is a risk that may be included in this category at a later date.
[4] Morbidity covers accident, sickness, disability income, health & dental, etc

Risk Category	Internal Model Permitted	Degree of Model Standardization
Policyholder Behavior Risk • Persistency/ lapse/surrender risk • Risk related to election of benefit options (resets, ratchets, fund switches, etc)	Yes	• Companies would be permitted to develop and use their own models subject to OSFI-specified o calibration criteria, o requirements on the quality and amount of historical data and/or o parameter assumptions (e.g., with respect to lapse). • Models must take into account the unique features and risk characteristics of individual products (e.g., for some products, premature lapses may be adverse; for others, fewer-than-anticipated lapses may be adverse). • OSFI may make available a list of models, but companies would not be obligated to use any of the models on this list. • Companies would be required to demonstrate the appropriateness of any model used, whether or not it is on the OSFI list. • OSFI would reserve the right to prohibit the use of a model that it believed was deficient in a material way. *Note that if market and insurance risk models assumed optimal policyholder behavior (i.e., captured the true value of the embedded options and assumed that policyholders behaved in their best interest) then there would be no need for a separate requirement for policyholder behavior risk.*

Risk Category	Internal Model Permitted	Degree of Model Standardization
Expense Risk	Yes	• OSFI has not yet decided how much flexibility companies will be given in this area. • The requirement for expense risk depends on the valuation basis of the terminal provision: Expense risks are different if the business is run-off as opposed to transferred, etc.
Operational Risk • Business risk • Strategic risk • Reputation risk • Model risk	Not yet	n/a

Total Asset Requirement Calculation for All Risks Combined

The total asset requirement for all risks combined should be determined by:

- calculating a total asset requirement for market risk in which "best estimate" assumptions and/or relationships for credit, insurance, policyholder behavior, expense and operational variables are used, and then
- adding to this result in sequence separate capital requirements for credit risk, insurance risk, policyholder behavior risk, expense risk and operational risk.

A detailed description of the necessary steps follows:

1. Generate a set of stochastic scenarios for the modeled market risk variables (e.g., interest rates, credit spreads, equity returns, etc) using the approved stochastic economic scenario generator.
2. For each such scenario generated, determine the corresponding asset and liability cash flows for the product and/or liability, using "best estimate" assumptions for credit, insurance, policyholder behavior, expense and operational variables. In this context, "best estimate" includes deterministic functions of market risk variables.
3. From the scenario-specific asset and liability cash flows so determined, calculate scenario-specific asset requirements. The result is a distribution of asset requirements for market risk.
4. From this distribution of asset requirements, determine the total asset requirement for market risk using the specified risk measure and confidence level.
5. Determine stand-alone capital requirements for each of the following risks:
    a. credit risk
    b. insurance risk
    c. policyholder behavior risk
    d. expense risk
    e. operational risk.
6. Calculate the sum of the stand-alone capital requirements from 5a, 5b, 5c, 5d and 5e and add this sum to the amount determined in 4.
7. The result is the Total Asset Requirement for all risks covered under Pillar 1.

Combination of Risks

It is expected that regulatory capital requirements under the new solvency framework will be determined on a consolidated basis as is the case with the existing MCCSR. So the issue with respect to the combination of risks is the extent to which the calculation of the supervisory target capital requirement may incorporate diversification, correlation and concentration within and across risk categories. In this context, "risk category" means one of market risk, credit risk, insurance risk, policyholder behavior risk, expense risk or operational risk.

It is important to endorse the principle of diversification, correlation and concentration in a solvency framework because risk diversification and mitigation are key components of sound risk management. However, the experience of 2008 and 2009 suggests that during periods of market stress, risks that may have appeared to be uncorrelated or weakly correlated turn out to be strongly correlated. As capital is intended to provide protection during periods of market and company stress, companies should be conservative when making assumptions about diversification and correlation within or between risk categories. Diversification, correlation and concentration within risk categories may be reflected in the calculation of the supervisory target capital requirement, provided it is justified. Diversification across different risk categories may not be reflected at this time, until evidence confirms that diversification will hold in a stress situation; i.e., the appropriateness of correlation in the tail is demonstrated and a solid parallel run period has been completed before considering allowing diversification benefits.

The experience of 2008 and 2009 has also suggested that the movement of capital among different legal entities can become more difficult during periods of market stress. Although it is expected that regulatory capital requirements under the new solvency framework will be determined on a consolidated basis as under the existing MCCSR, companies seeking to use internal models to determine the supervisory target capital requirement should design their models in a way that takes into account the impact that restrictions on the movement of capital among different legal entities during periods of stress could have on the company's Canadian operations viewed on a stand-alone basis.

Terminal Provision

Terminal provision calculations arise explicitly in the determination of the total asset requirement for market risk and implicitly in the determination of the stand-alone capital requirements for the other risks. The terminal provision will be a function of the experience during the initial time period, i.e., it is scenario-specific. For example, the terminal provision for a scenario in which equity markets increase 10% during the initial time period will generally be quite different from the terminal provision for a scenario in which they decrease 10%.

The terminal provision should be determined in a way that:

- is as objective (i.e., non-company-specific) as possible and
- reflects the actions that an independent third party could reasonably be expected to take to reduce and/or mitigate risk at the end of the initial time period.

The terminal provision for market risk should be determined under the following assumptions:

- A standard investment strategy is followed by all companies after the initial time period.
- The standard strategy is to mitigate market and credit risk at the end of the initial time period to the extent possible by selling and purchasing assets and/or entering into hedge contracts to obtain a cash-flow-matched portfolio, and/or transferring liabilities to a third party provided there is an objective way to value the transferred liabilities.

- The scenarios used to determine the terminal provision are subject to standard calibration criteria with, for example, limits on mean reversion and requirements on yield curve inversion.

The discount rate to be used for the terminal provision will be determined at a later date.

For risks other than market or credit risk and in situations where insurance risk is present in the liability cash flows, a decision on whether to use

- company experience with no deterioration over time,
- company experience with some deterioration over time,
- industry experience with some deterioration over time, or
- a mixture of company and industry experience, with or without deterioration over time, with the weight given to company experience decreasing over time must be made.

To this end, OSFI suggests that the industry conduct some preliminary studies to ascertain the quantitative impacts of the various alternatives. The treatment of margins will be determined at a later date based on the results of these and other studies.

OSFI will provide further guidance on the valuation basis for the terminal provision after seeing the results of these studies.

Time Horizon

The total asset requirements should be determined on the basis of a one-year time horizon subject to the use of appropriate modeling philosophies and calibration criteria.

Risk Mitigation

Consistent with the December 2008 advisory "Recognition of Hedge Contracts in the Determination of the Segregated Fund Guarantee Capital Requirement for Life Insurance Companies":

- a company may recognize contracts that it has entered into as of the valuation date, but may not recognize contracts that have not yet been entered into; and
- the only management action that may be recognized in the calculation of the supervisory target capital requirement is:
  - the exercise of options that the company holds as of the valuation date and
  - the implementation of a standard investment strategy at the end of the initial time period.[5]

[5] The concept of standard investment strategy is defined in the discussion of the terminal provision.

In this context:

- "contracts" includes reinsurance contracts and other contracts entered into for the purpose of risk mitigation and
- "exercise of options" includes:
    - the filing of claims under reinsurance contracts that are in force as of the valuation date and
    - the exercise of privileges under contracts entered into for the purpose of risk mitigation that are in force as of the valuation date.

Equivalent Risk Standard

The total asset requirements should be determined using the conditional tail expectation risk measure. The confidence level at which this risk measure is to be applied will be determined at a later date following the results of quantitative impact studies and will be set in a way that ensures the resulting capital and asset levels are appropriate overall as well as for individual risks and products.

Prerequisites (Basic Requirements)

In recognition of improved risk management resulting in part from the use of an internal model, OSFI is prepared to base its capital requirements on the results of an internal model approved for such purpose. Companies seeking approval should normally be in good financial condition at the time of application. OSFI would therefore expect companies seeking to use internal models to determine the supervisory target capital requirement to meet the following pre-requisites before an application will be considered:

Technology

Companies must have:

- robust and dedicated computing systems with the ability to support complex and frequent calculations and required audit functions,
- state-of-the-art hardware and software, and
- robust back-up and recovery systems for models used in production.

Resources

Companies must have:

- highly qualified staff with sufficient background and experience in stochastic modeling,
- sufficient resources to develop, implement and maintain models, software and systems, and
- back-up resources to ensure capital models are run on a timely basis with integrity.

Management

There must be:

- board and senior management approval of models,
- appropriate risk management practices and delegation,
- well-defined roles and responsibilities, and
- robust reporting and documentation.

In addition, senior management and risk officers of the company must demonstrate that they:

- understand and are managing the underlying risk,
- are responsible for ensuring the ongoing integrity of the model, and
- are being proactive in the management of capital.

Controls

Companies must have a strong risk management culture and there must be:

- independent review and oversight, both internal and external,
- independence of capital management, risk management and audit functions, and
- control systems to ensure the integrity of data, calculations and output.

Financial

At the time of application, the company's composite risk rating should be consistent with a company, whose financial condition is better than satisfactory; for example,

- the company's available capital should be:
    - greater than the supervisory target capital for a company without approval to use internal models by an amount to be determined and
    - greater than the company's internal target in the DCAT projection base scenario;
- the company's financial condition in the DCAT stress scenarios should be satisfactory.

Additional requirements

The company must have:

- sufficient volume of business and
- robust contingency plans.

Such contingency plans should take into consideration the possibly of various adverse events in additional to the ones captured by the company's model and outline the steps that could be taken to protect the company's capital from becoming impaired in such circumstances.

The company's models must satisfy a "use test", the nature of which is to be defined in the future.

Additional pre-requisites may be set at a later date.

Implementation Considerations

The policy governing the industry's transition to an internal models approach is summarized in the table that follows.

Specific Issue	Policy
Whether or not the large companies will be expected to use the internal models approach	The large companies will be encouraged, but not required, to use internal models.
Whether the large companies will be expected to use internal models at the same time or individually as ready	Internal models will be considered on a company-by-company and risk-by-risk basis, subject to restrictions.
Whether companies will be expected to design their systems to be able to measure risks and determine capital by legal entity and measure correlation and diversification among risks	Companies seeking to use the internal models approach will be expected to design their systems to be able to measure risks and determine capital by legal entity and measure correlation and diversification among risks.
The extent to which companies will be expected to upgrade their information systems, e.g., to be fully integrated or be able to provide output to OSFI without manual intervention	Companies seeking to use the internal models approach will be expected to work toward making their systems fully integrated.
The number of periods of high-quality "parallel runs" required before approval to use an internal model would be considered	A minimum of 4 to 12 quarters of high quality parallel runs per risk will be required of companies seeking to use the internal models approach. The precise number of periods and the particulars of the parallel runs required will be specified later.
The length of the transition period from "initial approval" to "full implementation" and the capital floors that would be in place during the transition period	The length of the transition period will vary from company to company depending on how quickly internal models are implemented and will be at least 2 years for each risk. The transition period is in addition to the required number of periods of high-quality parallel runs. Maximum annual reductions in supervisory target capital and/or asset requirements will be specified later.

Specific Issue	Policy
Whether or not companies with approval to use an internal model will continue to be subject to capital floors after the transition period is complete	For the foreseeable future, every company's minimum capital requirement will be determined by the standard approach and floors on the supervisory target will remain in place.
Expectations of companies with approval to use an internal model after approval has been granted and the transition period is complete	Companies with approval to use the internal models approach to determine capital requirements will be expected to meet the conditions and requirements for approval on an ongoing basis. A complete list of expectations will be provided later.