

# **STRESS TESTING GUIDELINE**

**November 2011**

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## Preamble

The *Autorité des marchés financiers* (“AMF”) establishes guidelines setting out its expectations with respect to the legal requirement of financial institutions to follow sound and prudent management practices. These guidelines therefore cover the execution, interpretation and application of this requirement.

The AMF favours a principles-based approach rather than a specific rules-based approach. As such, the guidelines provide financial institutions with the necessary latitude to determine the requisite strategies, policies and procedures for implementation of such management principles and to apply sound practices based on the nature, size and complexity of their activities.

The AMF considers governance, integrated risk management and compliance (GRC) as the foundation stones for sound and prudent management of financial institutions and, consequently, as the basis for the prudential framework provided by the AMF.

This guideline is part of this approach and sets out the AMF’s expectations regarding sound and prudent stress testing practices.

## Introduction

The financial crisis of 2008-2009 highlighted certain weaknesses in stress testing frameworks, chief among them the fact that stress testing was not adequately incorporated into the integrated risk management and decision-making processes of financial institutions.

International standards pertaining to sound and prudent risk management, set out by bodies such as the Basel Committee on Banking Supervision<sup>1</sup> and the International Association of Insurance Supervisors,<sup>2</sup> encourage institutions to adopt a forward-looking view in the management of their day-to-day activities, strategic planning and capital management. The AMF's expectations regarding stress testing are based on the fundamental principles set out by international bodies.

The AMF believes that an effective stress testing program helps both to improve risk management practices and decision-making and to prepare financial institutions for difficult market conditions. Stress testing should therefore be an integral part of an institution's integrated risk management policy.<sup>3</sup>

In light of this, financial institutions should implement a stress testing program to identify the sources, types and scope of risks to which they are exposed.

The sophistication of the approaches and techniques used in the program will depend on the nature, size, risk profile and complexity of the institution. It is thus the responsibility of each institution to develop a stress testing program tailored to its needs and based on its risk appetite and risk tolerance.

With respect to insurers specifically, the AMF acknowledges that dynamic capital adequacy testing ("DCAT") is one component of stress testing. This guideline does not present stress testing as replacing DCAT, but rather as a complementary tool used, for example, to introduce more severe scenarios and approaches underlying scenario testing.

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<sup>1</sup> Basel Committee on Banking Supervision, International Convergence of Capital Measurement and Capital Standards, June 2006.

Basel Committee on Banking Supervision, Basel III: A global regulatory framework for more resilient banks and banking systems, June 2011.

Basel Committee on Banking Supervision, Bank for International Settlements, Principles for sound stress testing practices and supervision, January 2009.

<sup>2</sup> International Association of Insurance Supervisors, Insurance Core Principles and Methodology, October 2003.

International Association of Insurance Supervisors, Stress Testing by Insurers, Guidance Paper, October 2003.

International Association of Insurance Supervisors, ICP 16, Enterprise Risk Management, standards and guidance material, October 2010.

<sup>3</sup> *Autorité des marchés financiers*, Integrated Risk Management Guideline, April 2009.

It will be the responsibility of each institution to choose the type, scope, time and frequency of its stress testing.

The purpose of this guideline is to set out the AMF's expectations of financial institutions with respect to stress testing. The AMF administers various sector-specific acts<sup>4</sup> authorizing it to provide financial institutions with guidelines pertaining to sound and prudent management practice.

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<sup>4</sup> *An Act respecting insurance*, R.S.Q., c. A-32, sections 325.0.1 and 325.0.2.  
*An Act respecting financial services cooperatives*, R.S.Q., c. C-67.3, section 565.  
*An Act respecting trust companies and savings companies*, R.S.Q., c. S-29.01, section 314.1.

## Scope

This stress testing guideline is intended for insurers of persons (life and health), damage insurers, portfolio management companies controlled by an insurer, mutual insurance associations, financial services cooperatives as well as trust and savings companies governed by:

- *An Act respecting insurance*, R.S.Q., c. A-32
- *An Act respecting financial services cooperatives*, R.S.Q., c. C-67.3
- *An Act respecting trust companies and savings companies*, R.S.Q., c. S-29.01.

This guideline applies to financial institutions operating independently as well as to financial institutions operating as members of a financial group.<sup>5</sup> In the case of financial services cooperatives and mutual insurance associations that are members of a federation, the standards or policies adopted by the federation should be consistent with—and even converge on—the principles of sound and prudent management prescribed by law and detailed in this guideline.

The generic terms “financial institution” and “institution” refer to all financial entities covered by the scope of this guideline.

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<sup>5</sup> For purposes of this guideline, “financial group” refers to any group of legal persons composed of a parent company (financial institution or holding company) and legal persons affiliated therewith.

### **Coming into effect and updating**

This stress testing guideline will come into effect on month XX, 201X.

With respect to the legal requirement of institutions to follow sound and prudent management practices, the AMF expects each institution to develop strategies, policies and procedures based on its nature, size, complexity and risk profile, and to ensure the adoption of the principles underlying this guideline by (two years after coming into effect). Where an institution has already implemented such a framework, the AMF may verify whether the framework enables the institution to satisfy the requirements prescribed by law.

This guideline will be updated according to developments in stress testing and in light of the AMF's observations in the course of its supervision of financial institutions.

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## 1. Stress testing

### A. Concept

Stress testing is a risk management tool used to assess the potential vulnerability of a financial institution to exceptional but plausible events.<sup>6</sup> These events are known for their severity and low probability of occurring, and include extreme or worst-case events.

More specifically, stress testing can be used to assess the potential impact of events or movements of combined factors on the different components of an institution (sectors, portfolios, etc.).

### B. Approaches underlying stress testing

Three main approaches generally underlie the techniques used in performing a stress test.

#### Sensitivity analysis

This approach consists in varying a single risk factor or a limited subset of risk factors. The approach is referred to as *partial equilibrium* since the scope of the shock(s) considered is not reflected in all the factors that would be affected by the shock(s).

The main advantage of this approach is that it can be used to isolate the contribution of a limited set of factors to the institution's risk profile.

For example, an institution might wish to measure the impact of a sudden, short-term drop in interest rates on its profitability, but disregard the cause of the drop and its impact on the economy.

A sensitivity analysis is quick and easy to perform. The results are rapidly available and can be used for numerous and frequent analyses, without however providing a complete picture of the impact of shocks.

#### Scenario analysis

This approach is designed to assess the impact of a simultaneous variation in a complete set of factors in order to reflect an event that could occur in the future. The event underlying the scenario should be clearly defined.

A scenario analysis may be referred to as a *general equilibrium* approach, since it includes the initial shock and all secondary effects on all pertinent factors, which are beyond the institution's control.

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<sup>6</sup> *Stress Testing by Large Financial Institutions: Current Practice and Aggregation Issues*, Committee on the Global Financial System, April 2000.

A scenario analysis of a short-term drop in interest rates would specify the cause of the drop and, unlike a sensitivity analysis, would also include its effects on all other pertinent economic factors for the institution.

The scenarios developed can be hypothetical or historical, i.e. based on past events that are deemed likely to recur. They should incorporate atypical elements, such as the effects of a perfect correlation between types of risk in a stress situation.

The parameters (factors considered, scale of shocks, etc.) may differ from one scenario to another, but must be consistent with one another and relevant to the purpose of each of the analyses.

A scenario analysis provides a more complete picture of the potential impact of shocks, but is also more difficult to perform. The AMF does not expect an institution that is small or has relatively simple operations to carry out this type of analysis on a regular basis.

## **Reverse stress testing**

Reverse stress testing is intended to identify events or economic conditions that could jeopardize the solvency of an institution or cause it other major damage, such as injury to its reputation.

This approach includes an inductive aspect because it involves first identifying types of losses with serious consequences, then determining events that could result in such losses. It can help identify qualitative risks (not based on a probability distribution), such as the impact of losing a major client on solvency.

Reverse stress testing includes the following main advantages:

- encourages the design of integrated scenarios;
- determines the plausibility of scenarios more easily;
- fosters the identification of risk concentrations in and/or among sectors of activity;
- facilitates the identification of certain hidden risks and vulnerabilities;
- helps the institution identify interdependence among various sources of risk and potential inconsistencies in risk mitigation plans;
- fosters integrated risk management.

## 2. General framework

### **Principle 1: Roles and responsibilities of the board of directors and senior management**

The AMF expects stress testing to form an integral part of the institution's integrated risk management and governance.

The AMF believes that a stress testing program should be supported by a governance structure that bolsters the program's effectiveness.

The commitment of the board of directors, senior management, the person in charge of risk management and the person in charge of stress testing is essential to the efficient and effective operation of the stress testing program. The board of directors and senior management should encourage the personnel involved in implementing and operating the stress testing program and in analyzing the results to hold discussions, which can go so far as to challenge the assumptions formulated.

The discussions should include the program objectives, scenario development and the decisions based on the interpretation of the results. A particular effort should be made, when the size of the institution so permits, to seek the participation of personnel who are experts in a pertinent field but not directly involved in the program.

#### **Roles and responsibilities of the board of directors**

The board of directors has the ultimate responsibility for the stress testing program. It should, in particular:

- see to the implementation of a program applicable on an institution-wide basis;
- approve the program, its management and monitoring procedures, as well as any amendment that may be made thereto;
- be informed, through regular reports, of the main findings of the stress tests and the implications thereof on the institution's risk profile;
- approve risk mitigation strategies.

## Roles and responsibilities of senior management

The roles and responsibilities of senior management and the person in charge of risk management with regard to the institution's stress testing program are primarily as follows:

- to ensure that the institution has a stress testing program as one of its risk management and prevention tools;
- to implement, manage and ensure the monitoring of the stress testing program;
- to take part in determining test scenarios that are exhaustive, comprehensible and applicable to the institution;
- to incorporate stress test results into the institution's risk tolerance review process, definition of acceptable risk and assessment of long-term strategic options;
- to review risk mitigation strategies;
- to document the stress testing program and each of its components (scenarios, methodologies, etc.).

## Principle 2: Stress testing program

The AMF expects the institution to implement a stress testing program, based on a range of perspectives and techniques, fostering integrated risk management.

Stress tests are not standardized tests, since programs must be tailored to the size, nature, risk profile and complexity of each financial institution. However, the program implemented, regardless of its scope and level of sophistication, must form an integral part of the institution's integrated risk management.

## Stress testing program

A stress testing program is made up of all the procedures and processes in which stress tests are developed, assessed and factored into the decision-making process.

The program should include:

- the techniques and mechanics for applying individual tests;
- the portfolios and business activities targeted by the tests;
- all the scenarios developed;

- the models used in the operation of scenarios;
- the reports explaining the results to decision-making bodies.

The scope and complexity of the efforts made by institutions must be commensurate with the size and sophistication of their activities.

An effective stress testing program is able to measure the impact of the breakdown of qualitative or quantitative assumptions underlying a management practice or model. The program should cover all risk assessment models and all sectors of the institution's activities.

Stress testing should initially disregard the risk mitigation measures available to the institution to deal with stresses, and should focus on the overall consequences of anticipated shocks in order to support the development of risk mitigation and business continuity plans. Risk mitigation measures can be included in a second phase so as to provide a picture of the residual effects of the shocks.

In practical terms, a program is used to test different shocks and scenarios that could have an impact on the institution's business continuity or solvency.

### **Stress testing program and dynamic capital adequacy testing**

As previously mentioned, in the case of insurers, DCAT is one component of stress testing. The rules established by the Canadian Institute of Actuaries (CIA) in its educational note<sup>7</sup> concerning DCAT cover the majority of issues presented in this guideline.

Insurers are therefore encouraged to use their DCAT-related methods and results to meet the AMF's expectations with respect to stress testing, by systematically complementing them with an analysis of *extreme* rather than simply *unfavourable* scenarios and, when necessary, by using reverse stress testing to detect qualitative risks, i.e. risks not based on probability distributions.

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<sup>7</sup> Committee on Risk Management and Capital Requirements. Canadian Institute of Actuaries. *Educational Note, Dynamic Capital Adequacy Testing*, November 2007

## **Role of stress testing in integrated risk management**

The stress testing program should contribute to integrated risk management and, to do so, should:

- **support risk identification and control**
  - address all the institution's risks;
  - incorporate institution-wide risk management activities;
  - contribute to a re-assessment of the institution's risk profile and facilitate monitoring;
  - enable the board of directors and senior management to ensure that the institution's exposure is commensurate with its risk appetite;
  - be based primarily on exceptional market environments;
  - consider risk concentrations and interactions, since assumptions valid in normal times may fail in times of crisis;
  - assess the institution's potential exposure in a crisis and foster the development of risk mitigation strategies;
  - facilitate internal communication; scenario-based analyses could help provide a more tangible view of exposures and the action to be taken to mitigate them.
- **provide a complementary perspective to other risk management tools**
  - detect certain vulnerabilities not identified by tools based solely on historical data;
  - complement analyses provided by the management tools in place;
  - examine the risk characteristics of new products, portfolios or risk management strategies when historical data are limited or do not cover crisis periods.
- **guide decision makers in times of economic change**
  - provide a complete picture when reversals occur in the economic cycle, major changes take place in factors beyond the institution's control, or the recent environment differs significantly from that anticipated for the immediate future;

- assess the robustness of the models in place and their ability to operate effectively in an economic or financial environment different from that in which they were developed;
  - since it is based on an analysis of extreme values, provide for an assessment of tail risk and measure the potential impact of a breakdown in assumptions regarding volatility and correlations in crisis periods;
  - temper the expectations of institutions during periods of stability or sustained growth.
- **support capital and liquidity management**
    - form an integral part of the institution's capital adequacy assessment process;
    - feed into and complement dynamic capital adequacy testing (DCAT) in the case of insurers;
    - identify market events or conditions that could jeopardize the institution's solvency;
    - support the measurement, monitoring and control of liquidity risk as well as the adequacy of liquidity levels<sup>8</sup> in the event of institution-specific or industry-wide stress events;
    - measure the insurer's ability to assume an extensive outlay in the event of an increase in claims or an unexpected decrease in premium collections;
    - play a role in communicating with the AMF during the regulatory and economic capital adequacy testing process.

## Use of models

The program should incorporate the different risk measurement models used throughout the institution; new specific models should be added, if need be.

The use of each model must:

- take the model's area of applicability into account;
- comply with all of the basic assumptions.

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<sup>8</sup> Autorité des marchés financiers, Liquidity Risk Management Guideline, April 2009.

The parameterization of a model depends directly on the environment in which the model was estimated. For example, a model based on a sample drawn from a period of strong economic growth may not be suitable for a study of a crisis scenario marked by a widespread economic downturn.

The robustness of the parameterization and the theoretical basis for the models included in the program should therefore be carefully examined in order to define their limits of use. The limitations of the models as well as the assumptions associated with stress testing must be documented and disclosed to both the board of directors and senior management.

### **Principle 3: Program framework**

The AMF expects institutions to implement a flexible, robust framework and to document the procedures governing its stress testing program.

The procedures should include:

- the frequency of stress testing;
- details on the methodology adopted;
- the purpose and scope of the stress testing;
- a definition of the scenarios, underlying assumptions, techniques and fundamental elements of each stress test;
- the role of expert judgment, i.e. with respect to the aspects selected by the institution in establishing the assumptions and interpreting the results;
- an assessment of consistency between the stress test results, nature of the scenarios selected (scope and severity) the underlying assumptions;
- the actions to be taken when stress test results indicate the need to mitigate risks, as well as an evaluation of the feasibility and impact of such actions.

A stress testing program, depending on the nature and size of the institution, may require a large amount of data about the institution, its counterparts, and the economic and financial environment in which it operates. In the case of a small institution, the amount of information required for the program could be relatively limited.

The institution should ensure that it allocates the necessary resources (personnel, software, infrastructure and data) to carry out stress tests representative of its size and the nature of its activities. The personnel should be sufficiently flexible and skilled to adapt to changing financial and economic environments, and thus be able to perform pertinent, extreme, integrated stress tests tailored to the needs of the institution.

**Principle 4: Assessment and updating of stress testing program**

The AMF expects the institution to maintain and update its stress testing program and to assess it regularly and independently.

The stress testing program should be assessed regularly, from a quantitative and qualitative point of view, to ensure that it is effective and efficient. Internal control functions should play a key role in the process. In the case of smaller-scale institutions, the external audit could fill the role.

Benchmarking and backtesting should be considered the main quantitative assessment tools for the methods used in the program.

The ability of econometric and statistical models to operate adequately in stress situations should also be assessed. Testers must ensure that the assumptions underlying the model are not violated during testing and that the parameterization for economic changes is robust.

The qualitative assessment of the stress testing program should cover:

- the level of integration of the stress testing program in day-to-day risk management;
- the authorization process for changes to the program;
- the integrity of information management systems and the availability of data;
- the consistency and relevance of sources of data;
- the accuracy, reliability and exhaustiveness of the data used;
- the severity, scope and relevance of the scenarios;
- the ability of the program to meet the objectives set;
- the adequacy of the documentation of the processes.

Any significant change to the procedures associated with the stress testing program following an assessment should be approved by the board of directors.

### 3. Methodology and scenario selection

The methodologies and scenarios used in the stress testing program must be stringently selected. The quality of the results derived from the program depends entirely on the ability of the units in charge to implement a complete, effective program based on the sound practices set out in the following principles.

#### Principle 5: Scope of program and integration of results

The AMF expects the stress testing program to cover an adequate range of risks and business areas. The institution should be able to adequately integrate its various stress testing activities so as to obtain a complete picture of its risk profile.

The stress testing program should consistently and comprehensively cover numerous risk factors in respect of products, business units and the institution. Using an appropriate level of granularity, the program should examine the impact of various shocks affecting the risk factors, taking into account the possible interrelations among such factors.

The institution should also use stress testing to identify, control and monitor residual and concentration risks. In this respect, the scenarios developed should:

- be complete and detailed;
- cover all the institution's operations as well as balance sheet and off-balance sheet assets and liabilities;
- cover risks whether contingent or not, regardless of contractual obligations.

The impact of a scenario should be assessed using measures that are consistent with the nature and purpose of the scenario as well as the risks and portfolios being analyzed. In general, a range of measures needs to be considered for a complete assessment of a scenario, such as:

- asset and liability values;
- accounting profit and loss;
- economic profit and loss;<sup>9</sup>

<sup>9</sup> For purposes of this guideline, "economic profit/loss" is defined as the difference between the income from the sale of goods or services and the opportunity cost of inputs used to produce the goods or services, including the opportunity cost of capital.

- regulatory capital and risk-weighted assets;
- economic capital;
- actuarial liabilities;
- the number of claims on policies;
- deposit activities;
- liquidity and funding gaps.

The goal of this exercise is to integrate the program results effectively into the institution's various decision-making processes, while ensuring that all the institution's relevant risks are thoroughly covered.

#### **Principle 6: Range of scenarios**

The AMF expects the stress testing program to cover a range of scenarios, including forward-looking scenarios.

An effective stress testing program should include scenarios that cover a broad spectrum of events and various levels of severity. Emphasis should be placed on the events that are potentially the most damaging for the institution.

The scenario creation process should be conducted with rigour, flexibility and imagination so as to increase the likelihood of identifying all potential vulnerabilities. It goes without saying that the range of scenarios considered should be representative of the institution's nature, size, risk profile and complexity.

The scenarios should:

- cover all the institution's material risks (for example, credit risk, market risk, operational risk, insurance risk, legal risk, corporate risk and liquidity risk);
- address institution-specific vulnerabilities; for example, regional, structural, legal and sector-based factors;
- take into account the interactions and feedback effects among the risk factors considered;
- supply new scenarios, primarily in the case of sensitivity analyses in which results may suggest the combined analysis of a group of risk factors;

- include a complete description, clearly identifying the trigger events, channels of shock transmission and assumptions in terms of covariation of risk factors. The description should show that the scenario is free of paradox and non-plausible phenomena.

Since historical scenarios are backward-looking, recent developments and current vulnerabilities could be overlooked. As a result, scenario design should be based on a forward-looking approach, with a focus on the short term.

Forward-looking scenarios differ from other types of scenarios in that they incorporate the knowledge and judgment of a number of experts—such as economists, financial management specialists, actuaries and operating unit representatives—in addition to being based on the concerns of senior management. The challenge consists in stimulating discussion and using the information available effectively.

Forward-looking scenarios should specifically incorporate:

- changes in portfolio composition;
- new information;
- the emergence of new sources of risk not covered by historical risk management or previous stress episodes;
- numerous time horizons depending on the risk characteristics, analyzed exposures and the purpose of the test in question. The time horizons should reflect the liquidity of the underlying exposures appearing in the portfolios covered by the testing;
- recessions, in which the ability of institutions to react in the medium and long term is compromised. Systemic reactions and feedback effects should be an integral part of macroeconomic scenarios.

## **Principle 7: Severity and relevance of scenarios**

The AMF expects the stress testing program to contain scenarios covering several levels of severity, including events that could generate the worst damage in terms of losses and impact on reputation.

The range of scenarios included in the program should cover the most potentially damaging events for the institution. The identification of such events requires a thorough knowledge of the institution's risk profile, as well as a great deal of imagination.

Reverse stress testing, discussed in this guideline, is an adequate tool for considering a range of serious events. Integration of this technique in the stress testing program can help discover hidden risks and interactions among different risks.

A reverse stress test should prompt the institution to consider scenarios beyond its normal business settings.

Areas that may benefit most from reverse stress testing are:

- business lines in which traditional risk management approaches indicate an exceptionally high risk-return ratio;
- new products;
- new markets that have not experienced stress episodes;
- exposures in low liquidity markets.

### **Principle 8: Simultaneous pressures to various risk factors**

The AMF expects the financial institution to have a complete stress testing program, which incorporates simultaneous pressures to various risk factors.

For a deposit institution, financing and asset markets may be highly interrelated, particularly during periods of stress. A financial crisis puts downward pressure on the balance sheets of financial institutions, which can restrict the availability of liquidity, erode the health of institutions and hamper the stability of the financial system.

Deposit institutions should incorporate in their stress testing program interrelations between various factors, including:

- price shocks for specific asset classes;
- a drying-up of liquidity in the case of assets sustaining a shock;
- the possibility of significant losses damaging the institution's financial soundness;
- the possibility of having to add assets after a negative shock to the balance sheet;
- the possibility of a massive withdrawal of deposits;
- globally diminished access to secured and unsecured financing markets.

In the case of insurers, particular attention should be paid to material links among the various risk factors.

For insurers of persons, changes in economic conditions can significantly influence the behaviour of policyholders, especially in terms of lapse rate, recourse to options in insurance contracts, and morbidity and recovery rates.

For damage insurers, changes in economic conditions can both influence investment income and expenses and generate an increase in provisions for claims. The relationship between the various factors depends on the insurer's products, investment policy and approach to managing its operations.

#### 4. Risk mitigation

##### **Principle 9: Contribution to development of risk mitigation plans**

The AMF expects stress testing to facilitate the development of risk mitigation and contingency plans.

The stress testing program should be a major input in the risk mitigation plan development process and should be used to assess and challenge the effectiveness of established plans.

Stress testing designed to measure the adequacy of risk mitigation and contingency plans under stress conditions should be implemented. The fact that numerous institutions could activate similar emergency plans simultaneously and major market downturns could occur in stress situations should be considered.

### **Supervision of sound and prudent management practices**

In fostering the establishment of sound and prudent management practices within financial institutions, the AMF, acting within the scope of its supervisory activities, intends to assess the degree of compliance with the principles set out in this guideline in light of the specific attributes of each institution. Consequently, it will examine the effectiveness and relevance of the procedures implemented as well as the quality of the oversight and control exercised by the board of directors and senior management.

Stress testing practices are constantly evolving. The AMF therefore expects decision makers at financial institutions to keep abreast of best practices in this area and to adopt such practices, to the extent that they address their needs.