

**Notice No:** MAS 312  
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**This Notice replaces MAS 312 dated 20 June 2005.**

## **STRESS TESTING ON FINANCIAL CONDITION OF DIRECT LIFE INSURER**

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### **Introduction**

- 1 This Notice is issued pursuant to section 64(2) of the Insurance Act (Cap. 142) (“the Act”). It comprises both mandatory requirements (Part I) and guidelines (Part II).
- 2 This Notice shall be read in conjunction with the provisions of the Act and the Insurance (Valuation and Capital) Regulations 2004, the Insurance (Actuaries) Regulations 2004 and the Insurance (Accounts and Statements) Regulations 2004.
- 3 This Notice applies to any direct insurer registered to carry on life business and shall come into effect on 8 May 2007.

### **Definition**

4. For the purposes of this Notice:
  - (a) “stress test” means a prospective test of the financial condition of each insurance fund established and maintained by the insurer under the Act, conducted or to be conducted by the appointed actuary of the insurer pursuant to regulation 11(b) of the Insurance (Actuaries) Regulations 2004;
  - (b) “stress test report” means a report on any stress test prepared or to be prepared by the appointed actuary of the insurer pursuant to regulation 12(1) of the Insurance (Actuaries) Regulations 2004;
  - (c) “short-term scenario” means any event that has a low probability of occurring in the normal course of the business of the insurer, but which occurrence will have a major impact on the financial position of the insurer through adverse effects on either a single risk factor or multiple risk factors of the insurer;
  - (d) “medium-term scenario” means any possible trend of the gradual deterioration in either a single risk factor or multiple risk factors of the insurer, which may impair the financial condition of the insurer.
5. The expressions used in this Notice shall, except where expressly defined in this Notice or where the context otherwise requires, have the same respective meanings as in the Act, the Insurance (Valuation and Capital) Regulations 2004, the Insurance (Actuaries) Regulations 2004 and the Insurance (Accounts and Statements) Regulations 2004.

## **Guiding Principles**

6. In order to develop a sound risk management strategy, an insurer needs to consider a wide range of plausible shocks and their potential impact to its current and expected future financial position. Stress testing is an important tool which an insurer can use to assess the impact of various risks on its financial condition, and thus should be a fundamental element in an insurer's overall risk management framework. Through stress testing, an insurer can:
  - (a) assess whether it has sufficient resources to withstand certain adverse shocks;
  - (b) determine the possible range of management actions that can be taken to recover from the shocks; and
  - (c) identify measures that can be implemented to mitigate its exposure to risks .
7. The board of directors and senior management of an insurer are primarily responsible for its sound and prudent management. In this regard, it is important that each stress test report is deliberated upon by the board of directors and senior management.

## **Part I - Mandatory Requirements**

8. The insurer shall ensure that the appointed actuary of the insurer conducts each stress test for each relevant insurance fund by projecting, in accordance with paragraphs 9 to 12C, the financial and capital adequacy positions of the insurer under various scenarios, including:
  - (a) the base scenario;
  - (b) short-term scenarios;
  - (c) medium-term scenarios; and
  - (d) stress-to-failure scenarios.

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

## **Base Scenario**

9. The base scenario projections shall comprise projections of the financial and capital adequacy positions of the insurer, based on best estimates of risk factors made by the appointed actuary, over the three-year period immediately following the end of the accounting period to which it relates. The projections shall be in the format specified in [Appendix A](#).

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

### **Short-Term Scenarios**

10. The short-term scenario projections shall comprise projections of the financial and capital adequacy positions of the insurer over the one-year period immediately following the end of the accounting period to which it relates, in the format specified in [Appendix B](#) and based on the following adverse scenarios:
- (a) short-term scenarios to be specified by the Authority from time to time;
  - (b) at least one additional short-term scenario constructed with risk factors specified in Appendix D taken into account

[MAS Notice 312 (Amendment) 2011]

### **Medium-Term Scenarios**

11. The medium-term scenario projections shall comprise projections of the financial and capital adequacy positions of the insurer over the three-year period immediately following the end of the accounting period to which it relates, in the format specified in [Appendix C](#) and based on the following adverse scenarios:
- (a) medium-term scenario(s) to be specified by the Authority from time to time;
  - (b) at least one additional medium-term scenario constructed with risk factors specified in Appendix D taken into account

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

[MAS Notice 312 (Amendment) 2012]

12. In constructing the adverse scenarios, the insurer shall ensure that the appointed actuary takes into account risk factors specified in Appendix D and all other factors not specified in Appendix D that have significant relevance to the insurer's business.

[MAS Notice 312 (Amendment) 2011]

### **Stress-to-Failure Scenarios**

- 12A. The insurer shall ensure that the appointed actuary conducts stress tests based on 2 stress-to-failure scenarios, i.e. a short-term stress-to-failure scenario and a medium-term stress-to-failure scenario. For avoidance of doubt, stress-to-failure scenario is defined as the event that would most likely lead to:
- (a) the capital adequacy requirement of the insurer falling below:
    - i. the financial resources warning event, as defined in regulation 4(6) of the Insurance (Valuation and Capital) Regulations 2004, or

- ii. any capital adequacy requirement imposed by the Authority, pursuant to Section 18 (4) of the Act

whichever is the higher; or

- (b) the insurer being wound up as a result of its off-balance sheet liabilities.

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

- 12B. The insurer shall ensure that the appointed actuary includes in his short-term stress-to-failure scenario projections, projections of the financial and capital adequacy positions of the insurer over the one-year period immediately following the end of the accounting period to which it relates. The medium-term stress-to-failure scenario projections shall comprise projections of the financial and capital adequacy positions of the insurer over the three-year period immediately following the end of the accounting period to which it relates.

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

- 12C. When constructing the scenarios, the insurer shall ensure that the appointed actuary considers the correlation between the different risks factors used under the scenarios.

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

### **Impact on Solvency and Capital Adequacy Requirements**

- 12D. For any of the scenarios other than the base scenario, if the Authority so requires, the appointed actuary shall attribute the change in the financial and capital adequacy positions of the insurer/insurance fund to a single or a combination of risk factors/principal assumptions in a format to be specified by the Authority.

[MAS Notice 312 (Amendment) 2011]

- 12E. If the Authority so requires, the appointed actuary shall provide a more granular qualitative analysis, to a degree to be specified by the Authority, of the change in the financial and capital adequacy positions of the insurer/insurance fund by the underlying risk factors or principal assumptions.

[MAS Notice 312 (Amendment) 2011]

### **Stress Test Reports**

13. The insurer shall ensure that the appointed actuary prepares the stress test report in the format specified in Appendix E and lodges it with the Authority

in accordance with regulation 15(a) of the Insurance (Accounts and Statements) Regulations 2004.

[MAS Notice 312 (Amendment) 2011]

13A. The insurer shall ensure that its senior management reviews the stress test report and respond to the appointed actuary's recommendations ("stress test review"). The stress test review shall state whether its senior management agrees with the appointed actuary's recommendations. The insurer shall ensure that:

- (i) if its senior management agrees with the appointed actuary's recommendations, its senior management proposes actions to be taken to implement the appointed actuary's recommendations and the targeted timeline of completion; and
- (ii) if its senior management disagrees with the appointed actuary's recommendations, its senior management states its reasons for such disagreement

("senior management's stress test recommendations").

[MAS Notice 312 (Amendment) 2011]

13B. The insurer shall ensure that its senior management submits the senior management's stress test recommendations, together with the appointed actuary's recommendations, for the board of directors' deliberation.

[MAS Notice 312 (Amendment) 2011]

13C. The insurer shall ensure there is documentary evidence of the stress test review specified in paragraph 13A, and on senior management's stress test recommendations for the Board of Directors' deliberation specified in paragraph 13B. The documentary evidence shall be signed off by the Principal Officer, and submitted with the reviewed stress test report to the Authority. The documentary evidence may for example, take the form of minutes of meeting for the stress test review or a letter setting out the senior management's stress test recommendations.

[MAS Notice 312 (Amendment) 2011]

#### **Submission Deadline and Format**

13D. The insurer shall submit to the Authority a hard and soft copy of the stress test report, and a hard copy of the documentary evidence of the stress test review and senior management's stress test recommendations, 3 months from the end of the accounting period which the stress test report relates to. Unaudited accounts may be used for this purpose. However, for the stress test report relating to the accounting period ending 31 December 2011, the submission deadline is 31 May 2012.

[MAS Notice 312 (Amendment) 2011]  
[MAS Notice 312 (Amendment) 2012]

### **Submission of Board of Directors' Deliberations on Stress Test Reports**

14. The insurer shall submit to the Authority an extract of the minutes of the board of directors' meeting detailing the deliberations made by the board of directors on the stress test report and any recommendations made on or arising out of the stress test report (the 'Extract of the minutes') at the time of lodgment of the stress test report in accordance with paragraphs 13 to 13D. If an insurer is unable to submit the Extract of the minutes together with the stress test report, the insurer shall undertake and confirm in writing to the Authority the date by which the Extract of minutes will be submitted to the Authority. The insurer shall submit the Extract of the minutes no later than four months from the date of lodgment of the stress test report with the Authority.

[MAS Notice 312 (Amendment) 2011]

### **Contravention of Requirements Imposed**

15. Contravention of any requirement imposed under Part I of this Notice shall be an offence and shall attract the penalty specified in section 55(2) of the Act.

## **Part II - Guidelines**

### **Base Scenario**

16. In order to perform each stress test properly and effectively, the appointed actuary should construct the base scenario in a manner that is consistent with the insurer's business plan. The base scenario should take into account the insurer's management and business philosophy and strategies such as marketing plans, sales objectives, investment policies, pricing philosophy, underwriting philosophy, reinsurance practices and its policy on allocation to participating policyholders and shareholders.
17. The appointed actuary should observe the following guidelines for the construction of projections:
- (a) The projections should be comprehensive in scope and cover all key products and lines of business and all assets of the insurer that are material to the solvency of the insurer.
  - (b) Separate projections should be made for each insurance fund established and maintained by the insurer under the Act.
  - (c) Where the assets or liabilities of an insurance fund that are material to the solvency of the insurance fund have different inherent characteristics, the appointed actuary should make separate projections by major product lines and asset classes within the insurance fund.

18. The appointed actuary should also conduct adequate checks on the appropriateness of any data or projections that form the bases for the stress test report. If the appointed actuary relies on any other person for any aspect of the data or projections used to support his opinion, the appointed actuary should be satisfied that the person relied on is qualified for such purposes. The nature and extent of the reliance on such person and his particulars should be disclosed in the stress test report.

### **Constructing Short-Term Scenarios**

19. In constructing the short-term scenarios, the appointed actuary should analyse the key risk exposure of the insurer in the face of catastrophic events such as natural calamities, a severe economic recession or a major crash in the equity, property or bond market. The appointed actuary should also take into consideration the prevailing environment, including the economic, medical, demographic, social and political situation at the relevant time.
- 19A. [Deleted by MAS Notice 312 (Amendment) 2012]
- 19B. [Deleted by MAS Notice 312 (Amendment) 2012]
20. The appointed actuary should present in the stress test report the likely scenario or scenarios that will have the largest impact on the financial condition of the insurer, and specify the reasons for the choice and construction of the scenarios presented in the stress test report. The appointed actuary should also include a brief description of the scenario in the stress test report, such as “financial crisis with adverse claims experience” and “decrease in new business and large terminations due to drop in confidence in the insurer”.

[MAS Notice 312 (Amendment) 2011]

### **Constructing Medium-Term Scenarios**

21. In constructing the medium-term scenarios, the appointed actuary should analyse the insurer’s ability to withstand continuous adverse developments over the period of projection. Such adverse developments should include persistent inflation, recession, falling stock markets and claims experience. In deriving the assumptions relating to the scenarios, the appointed actuary should consider the differing nature of various assumptions as compared to others:
  - (a) Some assumptions, such as mortality or renewal expenses in real terms, may reasonably be relied on as fairly stable or having a stable trend. However, attention should be paid to both the risk of sudden change (e.g. a new infectious disease) and the possibility of a change in the trend.
  - (b) Other assumptions, for example policy persistency, may need to be considered in the context of both historical experience and changes

anticipated in the light of different operating methods now used by the insurer.

- (c) Yet other assumptions may be highly uncertain and totally outside the control of the insurer. This is particularly true of investment conditions, the volatility of which may have significant implications for the financial condition of the insurer.
22. The appointed actuary should also take into consideration the prevailing environment, including the economic, medical, demographic, social and political trends at the relevant time.
23. In deciding the scenarios to be included in the stress test report, the appointed actuary should investigate a wide range of scenarios and select those which he considers likely to have a material effect on the financial position of the insurer. The appointed actuary should specify the reasons for the choice and construction of the scenarios presented in the stress test report. The appointed actuary should also include a brief description of the scenario in the stress test report, such as “financial crisis with adverse claims experience” and “economic recession in the first two years and recovery in the third year”.

[MAS Notice 312 (Amendment) 2011]

### **Constructing Stress-to-failure Scenarios**

- 23A. In constructing the stress-to-failure scenarios, the insurer should determine the combination of risk factors that would most likely lead to the stress-to-failure scenario as defined in Paragraph 12A.

The appointed actuary should specify the reasons for the choice and construction of the stress-to-failure scenarios presented in the stress test report. The appointed actuary should also include a brief description of the scenario in the stress test report, such as “financial crisis with adverse claims experience” and “macroeconomic downturn”.

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

### **Contagion Effects**

24. Contagion effects refer to the consequential effects on other assumptions relating to the scenario as a result of the interdependence of these assumptions with the principal assumptions made to construct the scenario.
25. During the analysis and construction of each short-term and the medium-term scenario, including but not limited to those specified by the Authority, the appointed actuary should consider contagion effects on the principal assumptions made. The principal assumptions and contagion effects considered by the appointed actuary should be clearly identified in the stress test report.

[MAS Notice 312 (Amendment) 2011]

## **Management Action**

26. The stress test report should show the impact on the insurer's financial condition if no management action is taken. In the stress test report, the appointed actuary should also demonstrate how, with appropriate and timely management action, the insurer can maintain or regain a satisfactory financial condition under each scenario on a going concern basis<sup>1</sup>. The target financial and capital adequacy positions should be consistent with the following:

- (a) the levels set out in the insurer's own capital management plan; or
- (b) what has been agreed with the senior management and board of directors for the purposes of the stress test exercise.

[MAS Notice 312 (Amendment) 2012]

26A. Management action refers to any action taken by an insurer in direct response to the shocks in each scenario. For the avoidance of doubt, management action should be taken immediately if, in any scenario, the insurer is unable to meet the solvency or capital adequacy requirements on an ongoing basis. Such management action includes, but is not limited to, injection of capital, cuts in bonus rates and restructuring of assets. The choice of management actions should be based on the following:

- (a) the insurer's own capital management plan; or
- (b) what has been agreed with the senior management and board of directors for the purposes of the stress test exercise.

[MAS Notice 312 (Amendment) 2011]

[MAS Notice 312 (Amendment) 2012]

26B. In relation to paragraph 26, where the insurer is able to meet the regulatory solvency and capital adequacy requirements, management actions should still be required in cases where the financial and capital adequacy positions have fallen below a level deemed satisfactory by the insurer.

[MAS Notice 312 (Amendment) 2012]

27. The appointed actuary may propose several alternative courses of management action the insurer could take to mitigate its financial loss in any given scenario. The rationale for each course of action, and the potential implications should be clearly described in the stress test report. The appointed actuary should specify the financial impact of each management action taken. Where the proposed management action involves capital transfer or injection,

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<sup>1</sup> "Going concern" in this Notice means the financial condition deemed appropriate by the insurer such that normal business operations can be conducted. For example, the target financial and capital adequacy positions should not be set at the financial resources warning event level specified in regulation 4(6) of the Insurance (Valuation and Capital) Regulations 2004.

the appointed actuary should specify the amount, the source and the type of capital in the report.

[MAS Notice 312 (Amendment) 2011]

28. If more than one course of management action is proposed, the appointed actuary should select the course of management action that he views most beneficial to the insurer for each scenario. The financial impact of pursuing that course of action should be reflected in the tables of Appendices A, B and C.

[MAS Notice 312 (Amendment) 2011]

### **Key Areas of Concern and Recommendations**

29. The appointed actuary should identify the key areas of concern noted from the stress test results and recommend in the stress test report measures that could be put in place to mitigate the risks and the timeframe for implementing these measures. The appointed actuary should comment in the stress test report on the adequacy of the mitigating measures, and where applicable, conduct further analysis to quantify the likely impact of such measures and set out the results of the analysis in the stress test report.
30. These measures may include, but are not limited to, changing the asset mix, hedging investment risks wherever appropriate, changing the mix of new business, withdrawing from certain lines of business or revising reinsurance arrangements.
31. [Deleted by MAS Notice 312 (Amendment) 2011]

### **Board of Directors' Deliberations**

32. For purposes of ensuring an insurer's compliance with the requirements in paragraph 14, the board of directors should:
- (a) deliberate on both the results of the stress tests as well as the recommendations of the appointed actuary and senior management;
  - (b) comment on the feasibility of the management action proposed to mitigate the impact of the potential shocks after the shock materializes; and
  - (c) comment on the recommendations of the appointed actuary and senior management, and ascertain and conclude whether any measures need to be taken by the insurer, whether immediately or in the near future.
33. If capital injection is amongst the management actions proposed for any of the scenarios, the board of directors should also ascertain and conclude whether such capital resources are available, and the source or likely source of those capital resources.

Notes on history of amendments

- 1 MAS Notice 312 (Amendment) 2010 with effect from 29 January 2010
- 2 MAS Notice 312 (Amendment) 2011 with effect from 7 February 2011

[Appendix A](#) – Excel Template for Base Scenario

[Appendix B](#) – Excel Template for Short-Term Scenario

[Appendix C](#) – Excel Template for Medium-Term Scenario

**List of Short-Term Risk Factors to Take Into Account in Constructing Short-Term Scenarios**

[MAS Notice 312 (Amendment) 2011]

1. Mortality/ Morbidity: adverse deviation in experience
2. Investment returns
  - (a) Yield curve
    - (i) Parallel yield curve shift
    - (ii) No change for duration less than 5 years, parallel shift for duration more than 5 years, linear interpolation
    - (iii) Parallel shift for duration less than 5 years, no change for duration more than 5 years, linear interpolation
    - (iv) Change in credit spreads
  - (b) Equity market
    - (i) Equity crash – fall in all market, by market
    - (ii) Stock specific event risk - move in each individual stock, by stock
3. Expenses: increase in expenses
4. Termination rates: adverse deviation in experience
5. New business: fall in new business
6. Where material, the appointed actuary shall also include shock scenarios to company's experience in the next projection year arising from changes in:
  - (a) reinsurance ceded;
  - (b) reserving basis;
  - (c) exercise rate of policy options;
  - (d) distribution to shareholders; and
  - (e) taxation.
7. The appointed actuary may also consider any other factors that have significant relevance to the insurer's business

[MAS Notice 312 (Amendment) 2011]

**List of Medium-Term Risk Factors to Take Into Account in Constructing Medium-Term Scenarios**

[MAS Notice 312 (Amendment) 2011]

1. Mortality/ Morbidity: yearly deterioration in experience over the projection period
2. Investment returns
  - (a) Yield curve:
    - (i) Parallel yearly yield curve shift
    - (ii) No change for duration less than 5 years, yearly parallel shift for duration more than 5 years, linear interpolation
    - (iii) Yearly parallel shift for duration less than 5 years, no change for duration more than 5 years, linear interpolation
    - (iv) Change in credit spreads
  - (b) Equity market
    - (i) Equity dividend yield fall over the projection period
    - (ii) Equity total returns deteriorate over the projection period
3. Expenses: Yearly deterioration in experience over the projection period
4. Termination rates: Yearly deterioration in experience over the projection period
5. New business: Yearly fall in new business income over the projection period
6. Where material, the appointed actuary shall also include scenarios on deterioration of company's experience over the projection period arising from changes in:
  - (a) bonus scales;
  - (b) reinsurance ceded;
  - (c) reserving basis;
  - (d) exercise rate of policy options;
  - (e) distribution to shareholders; and
  - (f) taxation;
7. The appointed actuary may also consider any other factors that have significant relevance to the insurer's business

[MAS Notice 312 (Amendment) 2011]

## **Format for the Stress Test Report**

### Introduction

1. Purpose of the report
2. Limitations and reliance
- 2A. Comment on the management actions taken in the past year in response to the actuary's recommendations stated in the previous stress test report.

[MAS Notice 312 (Amendment) 2011]

### Scenarios

3. Base scenarios
  - Construction of base scenario
  - Description of assumptions
4. Short-term scenarios
  - Brief description of scenario [MAS Notice 312 (Amendment) 2011]
  - Construction of scenario
  - Description of assumptions that deviate from base scenario assumptions
5. Medium-term scenarios
  - Brief description of scenario [MAS Notice 312 (Amendment) 2011]
  - Construction of scenario
  - Description of assumptions that deviate from base scenario assumptions
- 5A. Stress-to-failure Scenarios
  - Brief description of scenario [MAS Notice 312 (Amendment) 2011]
  - Construction of scenario
  - Description of assumptions that deviate from base scenario assumptions

[MAS Notice 312 (Amendment) 2010]

### Methodology

6. Methodology
  - Projection software used

- Description of projection model used

Results

7. Summary of results

- Base scenario
- Short-term scenarios
- Medium-term scenarios
- Stress-to-failure scenarios
- Analysis of the change in the financial and capital adequacy positions by the underlying risk factors

[MAS Notice 312 (Amendment) 2010]

[MAS Notice 312 (Amendment) 2011]

8. Qualifications of results (if any)

Analysis of Experience

9. Comparison of actual experience (including the Capital Adequacy Requirement) vis-à-vis projection from the prior year.

[MAS Notice 312 (Amendment) 2011]

10. Comment on the suitability of projection assumptions in light of experience.

Appointed Actuary's Assessment and Recommendation

11. General assessment on results of the projections and the implications on the financial condition of the insurer, before and after incorporating any management actions. The appointed actuary's comments should include, but not be limited to, the following areas:

- the ability of the insurer to meet fund solvency and capital adequacy requirements; and
- the appropriate and timely management action required to be taken in the event these requirements are not met; and
- the key risks that threaten the financial strength of the insurer.

12. Key areas of concern identified from these stress tests.

13. Recommendations on measures to be implemented to mitigate the risks identified as key areas of concern, and the timeframe for implementing these measures.

Attachments

14. Detailed projections in the format presented in Appendices A, B and C (in soft copies only).

[MAS Notice 312 (Amendment) 2011]

[MAS Notice 312 (Amendment) 2012]