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# **Survey Report on**

# **Actuarial Guidance Note 7: Dynamic Solvency Testing**

**2005**

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**Actuarial Society of Hong Kong**

Life Insurance Committee

## **1. INTRODUCTION**

- 1.1 The Actuarial Guidance Note 7 (“AGN7”) on Dynamic Solvency Testing (“DST”) , which was issued by the Actuarial Society of Hong Kong (“ASHK”) in December 2004, required Appointed Actuaries of Long Term Insurance Companies (“Insurer(s)”) to include an assessment of the effect of adverse scenarios on the Insurer’s future capital adequacy as part of the annual financial condition review.
- 1.2 Subsequently, in March 2005, the Office of the Commissioner of Insurance (“OCI”) issued a circular to the Chief Executives of Insurers requiring the actuarial opinion on the DST assessment to be submitted to the OCI.
- 1.3 This report describes the results of a survey of Appointed Actuaries’ interpretations of the AGN7 requirements, including the adverse scenarios. For reference, a copy of the questionnaire is attached as Appendix 1.

## **2. GENERAL REPORTING**

- 2.1 Overall, all Appointed Actuaries expect to perform the DST requirements and report their findings to the Board of Directors in accordance with AGN7, unless exemption had been specially requested and received from the OCI. In addition, approximately 40% of the Appointed Actuaries expected to make significant recommendations to the Board of Directors as a result of the investigations.
- 2.2 For all companies, the DST investigations will include the individual business. In some cases, Group and Retirement Scheme businesses are excluded on the basis of immateriality.
- 2.3 In terms of the scope of the results that will be reported, the survey indicated the following:
  - Approximately 50% of respondents will include the previous 1-2 years’ results for comparison purposes. The reasons for not reporting past years’ results include non-relevance, not available and not required by AGN7.
  - Most companies expect to show 3 years of projected results in the report, with a few indicating five years.
  - Most companies expect to show the projected results for each scenario in aggregate, with only a handful of companies showing them by business lines.

## **3. ASSUMPTIONS FOR BASE SCENARIO**

All Appointed Actuaries expect the following assumptions for the Base Scenario to be essentially the same as those used for business planning purposes:

- Mortality & Morbidity
- Lapse & Surrender
- Expenses
- Inflation rate
- Tax
- New Business assumptions with regards to sales, product mix and distribution channels.

A few companies expect the reserving basis or investment return assumption to differ from those used for business planning purposes.

The survey responses with regards to base scenario assumptions are outlined in the following table:

<b>Assumption</b>	<b>Survey Responses</b>
Mortality	<ul style="list-style-type: none"> <li>• The same assumptions are used for both risk and savings products.</li> <li>• The assumptions are based on HK life tables or the company's own internal tables.</li> <li>• For annuity products, IM80/IF80 tables are used, where applicable.</li> <li>• All companies surveyed use differential rates for males and females.</li> <li>• Some companies use differential rates for smokers and non-smokers.</li> </ul>
Morbidity	<ul style="list-style-type: none"> <li>• The morbidity assumptions for approximately two-thirds of respondents are based on loss ratios.</li> <li>• Approximately one-third of respondents indicated that their morbidity rates are based on reinsurers' rates, in particular for critical illness products.</li> <li>• A couple of respondents indicated that the morbidity rates are a percentage of mortality rates.</li> </ul>
Lapse / Surrender	<ul style="list-style-type: none"> <li>• Lapse / surrender rates are defined at the product level for two-thirds of respondents, whereas one-third of respondents define it at a product group level.</li> <li>• Approximately 50% of respondents specify partial withdrawal assumptions, primarily for investment-linked products.</li> </ul>
Investment return for a bond portfolio	<ul style="list-style-type: none"> <li>• Approximately 50% of survey respondents expressed the return as the yield-to-maturity. Of these, two-thirds based it on a yield after investment expense whereas the balance based it on a yield before investment expense.</li> <li>• Approximately 25% of survey respondents expressed the return as the yield-to-maturity after investment expense and after adjustments for credit rating whereas the remaining 25% based it on a book value return.</li> </ul>
Investment return for an equity portfolio	<ul style="list-style-type: none"> <li>• This is expressed as the expected return based on market value.</li> </ul>

#### 4. ASSUMPTIONS FOR PRESCRIBED ADVERSE SCENARIOS

The survey responses with regards to the interpretation of adverse scenarios are summarized in the following table:

Adverse Scenario	Survey Responses
Deterioration in mortality / morbidity rates	<ul style="list-style-type: none"> <li>• Almost all respondents reflect the deterioration of mortality / morbidity rates at the start of the forecast period.</li> <li>• A couple of respondents phased in the deterioration linearly over 3 years.</li> </ul>
Lapse / Surrender Rates	<ul style="list-style-type: none"> <li>• Almost all respondents reflected the deterioration of lapse / surrender rates at the start of the forecast period.</li> <li>• A few of the respondents phased in the deterioration linearly over 3 years.</li> <li>• Three-quarters of respondents expect the adverse direction of lapse rates (for more than 50% of the products) to be an increase in lapse rates.</li> </ul>
Interest rate drop / rise	<ul style="list-style-type: none"> <li>• For most respondents, the increase / reduction in interest rate is reflected as an increase / reduction in the value of the bond investment assets as well as an increase / reduction in the investment return assumption. [Note: For insurers which classify their bond investments as assets held-to-maturity, increase / reduction in interest rates do not change the book value of their bond portfolios]</li> <li>• Two-thirds of respondents reflected the increase / reduction in interest rate at the start of the forecast period whilst the remaining one-third phased in the change over 3 years.</li> <li>• Three-quarters of respondents reflected changes to valuation interest rates in accordance with interest rate changes whilst the remaining one-quarter maintained the same valuation interest rates.</li> </ul>
Equity and real estate drop of 25%	<ul style="list-style-type: none"> <li>• Three-quarters of respondents reflected this as a reduction in the market value of assets and some respondents reflected it as an increase in dividend / rental yields.</li> <li>• Two-thirds of respondents reflected the drop in equity / real estate at the start of the forecast period whilst the</li> </ul>

Adverse Scenario	Survey Responses
	<p>remaining one-third phased it in over 3 years.</p> <ul style="list-style-type: none"> <li>• 50% of respondents maintained valuation interest rates unchanged whilst 25% changed interest rates in accordance with changes in dividend / rental yields. The remaining 25% would consider changes in valuation interest rates in conjunction with other factors (such as the yield of the bond portfolio).</li> </ul>
High growth in New Business	<ul style="list-style-type: none"> <li>• The applicable scenario for 50% of respondents is a growth rate of 30% whilst for the remaining 50% of respondents; it is 150% of the plan growth rate.</li> <li>• Almost all respondents expect to increase the sales volumes by the same proportion for all products.</li> <li>• In terms of the impact on expenses, one perspective (approximately 80% of respondents) is as follows: <ul style="list-style-type: none"> <li>➤ Commission-related expenses are increased in proportion to sales.</li> <li>➤ Office acquisition and office maintenance expenses are increased at a slower rate compared to commission-related expenses. Hence, per policy expenses are expected to reduce.</li> </ul> <p>Another perspective (approximately 20% of respondents) is one whereby all expenses are increased in proportion to the increase in new business sales.</p> </li> </ul>
Low growth in sales	<ul style="list-style-type: none"> <li>• Almost all respondents intend to reduce all product sales by the same proportion.</li> <li>• Almost all respondents define sales of regular premium business in terms of Annualised First Year Premium (there is one respondent who defines it as first year premium income).</li> <li>• Approximately 50% of respondents define sales of single premium business as 10% of the Single Premium. The remaining respondents define it as 100% of Single Premium and set separate</li> </ul>

Adverse Scenario	Survey Responses
	business targets for single premium business.

## 5. PROJECTION TOOLS

- 5.1 For individual business, almost three-quarters of respondents use a third party propriety projection system to perform the DST calculations (the remaining one-quarter use spreadsheet models.) Of these, approximately 50% use individual data whilst the rest use grouped or modelled data.
- 5.2 For group business, almost all respondents use spreadsheet models to perform the projections. With the exception of a few respondents, most use grouped or modelled data.

## 6. INTEGRATED SCENARIOS

- 6.1 Approximately two-thirds of respondents have the capability to do Integrated Scenarios.
- 6.2 Scenarios that will be considered include:
- High lapse rates together with low new business production.
  - High lapse rates together with reduction in interest rates.
  - Poor investment return, adverse mortality, adverse lapse and low sales.
  - High new business growth, lower fee receipts, higher expenses, higher surrender rates and lower investment returns.
  - High growth in new business and reduction in interest rates.
  - High growth in new business and changes in lapse / surrender rates.

## 7. RIPPLE EFFECTS

- 7.1 Approximately 50% of respondents have the capability to model ripple effects.
- 7.2 Scenarios that will be considered include:
- Reduce dividend rates under poor investment return scenarios, which in turn leads to higher lapses / surrenders.
  - Shocks on economy resulting in low asset values, high lapse / surrender experience and low sales.
  - Aggressive sales leading to high expenses and adverse mortality experience.

## 8. LIST OF RESPONDENTS

The list of respondents is attached as Appendix 2.

**AGN7 Questionnaire**

<p><b>Q1. Do you intend to perform the Dynamic Solvency Tests outlined in the Actuarial Guidance Note 7?</b></p> <p>(Please answer the following questions if the response to Q1 is “Yes”.)</p>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<p><b>Q2. Do you intend to present the findings to the Board of Directors?</b></p>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<p><b>Q3. Do you expect to make any significant recommendations to the Board of Directors as a result of the investigation?</b></p>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

**Q4. Scope of the investigations and report**

**4.1 Lines of business**

<p><b>The lines of business of the company include:</b></p> <p><b>Life Insurance:</b></p> <p>Individual Non-linked savings business</p>	<input type="checkbox"/>	
<p>Individual Linked savings business</p>	<input type="checkbox"/>	
<p>Individual Risk Business</p>	<input type="checkbox"/>	
<p>Group Risk business</p>	<input type="checkbox"/>	
<p>Retirement Scheme Non-linked business</p>	<input type="checkbox"/>	
<p>Retirement Scheme Linked business</p>	<input type="checkbox"/>	
<p><b>General Insurance:</b></p>	<input type="checkbox"/>	
<p><b>Others, Please specify:</b></p> <p>_____</p> <p>_____</p> <p>_____</p>	<input type="checkbox"/>	
<p>All lines of business of the company will be included in the scope of the investigations and the report.</p> <p>If “No” which lines of business are excluded and why.</p> <p>_____</p> <p>_____</p> <p>_____</p>	<input type="checkbox"/> Yes	<input type="checkbox"/> No

**4.2 Scope of results**

<p>(i) Do you intend to include historical data or previous years' results in the report?</p> <p>If "Yes", how many years of historical data? If "No", why not?</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p><input type="checkbox"/> Yes</p>	<p><input type="checkbox"/> No</p>
<p>(ii) _____ years of projections will be shown in the report.</p>		
<p>(iii) The report will show the results of each scenario:</p> <p>By business line</p> <p>In aggregate</p> <p>Others, please specify:</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	

<b>Q5. Base Scenario</b>			
Do you expect the assumptions for the Base Scenario of the Dynamic Solvency Test to be the same as the Company's business plan for the following:			
	<b>Yes</b>	<b>No</b>	<b>If "No", please give a reason</b>
(i) Mortality	<input type="checkbox"/>	<input type="checkbox"/>	
(ii) Morbidity	<input type="checkbox"/>	<input type="checkbox"/>	
(iii) Lapse & Surrender	<input type="checkbox"/>	<input type="checkbox"/>	
(iv) Investment Return	<input type="checkbox"/>	<input type="checkbox"/>	
(v) Acquisition expenses			
Office expenses	<input type="checkbox"/>	<input type="checkbox"/>	
Commission-related expenses	<input type="checkbox"/>	<input type="checkbox"/>	
(vi) Maintenance expenses	<input type="checkbox"/>	<input type="checkbox"/>	
(vii) Inflation rate	<input type="checkbox"/>	<input type="checkbox"/>	
(viii) Tax	<input type="checkbox"/>	<input type="checkbox"/>	
(ix) New Business Projections			
Sales	<input type="checkbox"/>	<input type="checkbox"/>	
Product Mix	<input type="checkbox"/>	<input type="checkbox"/>	
Distribution Channels	<input type="checkbox"/>	<input type="checkbox"/>	
(x) Reserving Basis	<input type="checkbox"/>	<input type="checkbox"/>	
(xi) Other Reserving Considerations			
Reserves for bonuses and policyholders' reasonable expectations	<input type="checkbox"/>	<input type="checkbox"/>	
Currency mismatching Provisions	<input type="checkbox"/>	<input type="checkbox"/>	
Other provisions, if any Please specify:			

**Q6. Prescribed Scenarios**

**6.1 Mortality**

Assumption for Base Scenario:				
Product Type	Mortality Assumption		Adjustment for	
	Male	Female	Non smoker	Smoker
Risk products	_____ % of _____ table			
Saving products	_____ % of _____ table			
Annuity	_____ % of _____ table			
Other product groupings, please specify:				

How is the Deterioration in mortality rates projected?	
At the start of the forecast period	<input type="checkbox"/>
Phased in over 1 year	<input type="checkbox"/>
Phased in over 2 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year:
Phased in over 3 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year: 3 <sup>rd</sup> year:

**6.2 Morbidity**

Assumption for Base Scenario is based on:	
A percentage of the mortality rate	<input type="checkbox"/>
Loss Ratio	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>How is the Deterioration in morbidity rates projected?</b>	
At the start of the forecast period	<input type="checkbox"/>
Phased in over 1 year	<input type="checkbox"/>
Phased in over 2 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year:
Phased in over 3 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year: 3 <sup>rd</sup> year:

### 6.3 Lapse / Surrender

<b>Lapse / Surrender rates are:</b>	
Specified at product group level (e.g. investment-linked products versus traditional)	<input type="checkbox"/>
Specified at product level	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>Partial withdrawal assumptions are specified for:</b>	
Investment-linked products	<input type="checkbox"/>
Non-linked products	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>The adverse direction for lapse / surrender rates were due to:</b>		
	<b>Class A</b>	<b>Class C</b>
Increase in lapse rates for all products	<input type="checkbox"/>	<input type="checkbox"/>
Increase in lapse rates for at least 50% of products	<input type="checkbox"/>	<input type="checkbox"/>
Increase in lapse rates for less than 50% of products	<input type="checkbox"/>	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>	<input type="checkbox"/>

<b>How is the Deterioration in lapse / surrender rates projected?</b>	
At the start of the forecast period	<input type="checkbox"/>
Phased in over 1 year	<input type="checkbox"/>
Phased in over 2 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year:
Phased in over 3 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year: 3 <sup>rd</sup> year:

**6.4 Interest rate drop of 15% (rise by 30%) of inforce bond portfolio rate**

<b>The bond portfolio rate is based on:</b>	<b>After Investment expense</b>	<b>Before investment expense</b>
Yield to maturity	<input type="checkbox"/>	<input type="checkbox"/>
Yield to maturity adjusted for credit rating	<input type="checkbox"/>	<input type="checkbox"/>
Total projected book value return on bonds	<input type="checkbox"/>	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>	<input type="checkbox"/>

<b>Interest rate drop/rise is reflected as:</b>	
Increase / Reduction in the value of the bond investment assets	<input type="checkbox"/>
Decrease / Increase in investment return assumption	<input type="checkbox"/>

<b>How is the Interest rate drop / rise projected?</b>	
At the start of the forecast period	<input type="checkbox"/>
Phased in over 1 year	<input type="checkbox"/>
Phased in over 2 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year:
Phased in over 3 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year: 3 <sup>rd</sup> year:

<b>The valuation interest rates underlying the statutory reserves were:</b>	
Unchanged over the forecast period	<input type="checkbox"/>
Changed according to interest rate drop/rise	<input type="checkbox"/>

<b>Other comments (if any)</b>

**6.5 Equity and real estate drop of 25%**

<b>This is reflected as:</b>	
Reduction in market value of assets	<input type="checkbox"/>
As a result of the reduced market value of assets, the prospective dividend /rental yields of assets are assumed to increase accordingly (i.e. the dollar amount of dividend and/or rental remain unchanged).	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>How is the equity and real estate drop / rise projected?</b>	
At the start of the forecast period	<input type="checkbox"/>
Phased in over 1 year	<input type="checkbox"/>
Phased in over 2 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year:
Phased in over 3 years	<input type="checkbox"/> 1 <sup>st</sup> year: 2 <sup>nd</sup> year: 3 <sup>rd</sup> year:

<b>The valuation interest rate underlying the statutory reserves were:</b>	
Unchanged over forecast period	<input type="checkbox"/>
Changed assuming that the prospective dividend / rental yields change accordingly	<input type="checkbox"/>
Other comments	<input type="checkbox"/>

## 6.6 High growth in New Business

<b>The scenario selected was:</b>	
30% growth	<input type="checkbox"/>
150% plan growth rate	<input type="checkbox"/>

<b>The product mix for high growth scenario:</b>	
Increased for all products by same proportion	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>The corresponding increases in expenses were:</b>					
	<b>Unchanged</b>	<b>≤10%</b>	<b>10% - 20%</b>	<b>20% - 30%</b>	<b>30% - 40%</b>
Acquisition expenses	<input type="checkbox"/>				
Increase in office expenses	<input type="checkbox"/>				
Increase in commission-related expenses	<input type="checkbox"/>				
Increase in Maintenance expenses	<input type="checkbox"/>				
Others, please specify					

**6.7 Low growth in sales**

<b>The Product Mix for low growth scenario:</b>	
Decreased proportionally for all products	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

<b>Rate of decrease in sales is interpreted as follows:</b>
1 <sup>st</sup> year: _____ % of current year sales
2 <sup>nd</sup> year: _____ % of current year sales
3 <sup>rd</sup> year: _____ % of current year sales

<b>Sales is defined as:</b>	
Regular Premium business:	
AFYP	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>
Single Premium business:	
10% Single Premium	<input type="checkbox"/>
Others, please specify	<input type="checkbox"/>

**Q7. Projection Tools**

Line of Business	Projection Tool			Data	
	Spreadsheet	Third party propriety projection system	Others, please specify	Individual data	Grouped or modelled data
<b>Life Insurance</b>					
Individual Non-linked business	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Individual Linked business	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Individual Risk business					
Group Risk business	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Retirement Scheme Non-linked business	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Retirement Scheme Linked business	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>General Insurance</b>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
<b>Others, please specify:</b>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>

**Q8. Plausible Adverse Scenarios**

<b>List any considered</b>

**Q9. Integrated Scenarios**

<b>Do you have modeling capabilities to do Integrated Scenarios?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>If “yes”, list any scenarios considered</b>		
<b>If “No”, are there any plans to do this in future?</b>	<input type="checkbox"/> Yes, within 1-2 years <input type="checkbox"/> Yes, after 2 years <input type="checkbox"/> No	

**Q10. Ripple effects**

<b>Do you have modeling capabilities to do this?</b>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<b>If “yes”, list any scenarios considered</b>		
<b>If “No”, are there any plans to do this in future?</b>	<input type="checkbox"/> Yes, within 1-2 years <input type="checkbox"/> Yes, after 2 years <input type="checkbox"/> No	

**Responding Companies (in alphabetical order)**

The following companies have responded to this survey:

1. Abbey plc
2. American Family Life Assurance Co Of Columbus
3. American International Assurance Co Ltd
4. Aviva Life Insurance Co Ltd
5. AXA China Region Insurance Co Ltd
6. BOC Group Life Assurance Co Ltd
7. China Insurance HK (Holdings) Co Ltd
8. CIGNA Worldwide Insurance Company
9. Citi Fubon Life Insurance Co HK Ltd
10. CMG Asia Ltd
11. CMI Insurance Company Limited
12. Dah Sing Life Assurance Co Ltd
13. Friends Provident International Ltd
14. Hong Kong Life Insurance Ltd
15. HSBC Life (International) Ltd
16. ING Life Insurance Co (Bermuda) Ltd
17. Manulife (International) Ltd
18. MassMutual Asia Ltd
19. Metropolitan Life Insurance Company of Hong Kong Ltd
20. MLC (Hong Kong) Ltd
21. New York Life Insurance Worldwide Ltd
22. Pacific Century Insurance Holdings Ltd
23. Prudential Assurance Co Ltd
24. QBE Hong Kong & Shanghai Insurance
25. Sun Life Financial (Hong Kong) Ltd
26. Winterthur Life Insurance Company
27. Zurich Life Insurance Company Ltd