# Institute of Actuaries of India

## Guidance Note (GN) 22: Reserving for Guarantees in Life Assurance Business

**Classification: Recommended Practice**

**Compliance:**

Members are reminded that they must always comply with Professional Conduct Standards and that Guidance Notes impose additional requirements under specific circumstances

**Legislation or Authority:**

1. The Insurance Act 1938 and amendments thereto (hereinafter referred to as the Act).
2. Insurance Regulatory and Development Authority (Actuarial Report and Abstract) Regulations, 2000 ((hereinafter referred to as the Actuarial Report Regulations)
3. Insurance Regulatory and Development Authority (Assets, Liabilities and Solvency Margin of insurers) Regulations, 2000 (hereinafter referred to as ALSM regulations).
4. Insurance Regulatory and Development Authority (Appointed Actuary), Regulations 2000 (hereinafter referred to as AA Regulations)
5. Actuarial Practice Standard 1 - Appointed Actuary and Life Insurance Business, issued by Actuarial Society of India, (hereinafter referred to as APS1)
6. Actuarial Practice Standard 2 - Additional Guidance for Appointed Actuaries and other Actuaries involved in Life Insurance, issued by Actuarial Society of India, (hereinafter referred to as APS2)

**IAA International Actuarial Standards of Practice**

Currently there are no applicable International Actuarial Standards of Practice issued by International Actuarial Association

**Application**

This Guidance Note is applicable to an Appointed Actuary, referred to hereafter as the Actuary, appointed in accordance with provisions contained under AA Regulations.

**Status**

Issued under Due Process in accordance with the "Principles and Procedures for issuance of Guidance Notes (GNs) {ver. 3.00/27$^{TH}$ June, 2009}".

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| 1.0 | 31/03/2014 |

**A: Purpose**

The purpose of this guidance note is to ensure that the mathematical reserves are adequate to meet the minimum guaranteed benefits arising due to the contractual agreement. This guidance note is framed to address

- Regulations 7(3)(d) and 8(d) of Schedule II-A of ALSM Regulations;
- para 5.5(ii) and 6.2 of APS 1; and
- para 5.2 of APS 2.

**B: Scope**

1. This professional guidance note recommends suitable methods to be used by actuaries to reserve for embedded derivatives, such as minimum guaranteed maturity or surrender values. The guidance note recommends the minimum steps that should be taken by the Actuary.

2. An embedded derivative is a component of an insurance policy with the effect that some of the cash flows of the policy vary in a way similar to a stand-alone derivative. An embedded derivative causes some or all of the cash flows that otherwise would be required by the policy to be modified according to a specified interest rate, financial instrument price, commodity price, foreign exchange rate, index of prices or rates, credit rating or credit index, or other variable, provided in the case of a non-financial variable that the variable is not specific to a party to the policy. So, for example, a conventional non-participating immediate annuity, being fully guaranteed, would not be deemed to contain an embedded derivative, since its policy cash flows are not modified

according to some external factor; however, a unit linked policy with a guarantee that the maturity value would at least equal premiums paid, would be deemed to contain an embedded derivative.

3. The above definition is closely derived from International Accounting Standard 39. For the avoidance of doubt, compliance with that or any other International Accounting Standard or International Financial Reporting Standard is not required by this guidance note.

4. This guidance note recommends the use of stochastic models where appropriate to quantify reserves required to finance possible shortfalls in respect of guarantees. The Actuary may however make use of alternative methods, including deterministic methods, to quantify this liability, provided such models or methods are based on sound actuarial principles. Deterministic methods may be a suitable alternative to stochastic methods where the nature and size of the embedded derivatives are such that application of stochastic methods is unlikely to have caused material increase in total actuarial liability for the life assurance business.

5. The guidance applies to linked business with guarantees, to variable insurance products, to participating business and to any other line of business with embedded derivatives. It is assumed in all cases, that the liability may be split into the base assets backing the policy, be they the unit fund, the policy account or asset share, which are expected to be paid out at maturity, and an embedded derivative that acts as a floor to the payout on maturity or, possibly, surrender. The Actuary should refer to APS2 for guidance on how best to incorporate a reserve for embedded derivatives in statutory reporting and, in any case, should adopt a prudent approach.

## C: Methods

### 1. Stochastic Models

The recommended method is to estimate the market consistent or fair value of the embedded derivative, i.e. that value at which it would be traded in an arms' length transaction between willing counterparties. Simulation-based techniques will often be required, though in simple cases closed-form (or analytic) solutions may be implemented.

a) Asset models

i. These are also known as Economic Scenario Generators (ESGs).

ii. In order to quantify the reserves it is desirable for the Actuary to stochastically model investment returns.

iii. No specific investment return projection model is prescribed. The Actuary may use any stochastic investment return projection model that is deemed appropriate for purposes of quantifying reserves required to meet guaranteed minimum values.

iv. The Actuary should pay close attention to the calibration of the stochastic model, in particular to the volatilities and the correlations between asset classes, to ensure that it is appropriate.

v. Where the market consistent value of the embedded derivative is being modelled using risk neutral methods, the Actuary must be able to justify the rates of risk free return and volatility assumed for the different underlying asset classes. It is recommended that in any case, the yield on Government Securities be taken as risk-free returns for this purpose.

vi. Where assets are held in foreign currencies, these should be modelled as a separate asset classes and the exchange rate should be explicitly modelled.

vii. The Actuary should ensure that the stochastically simulated investment returns display an appropriate level of inherent variability to adequately reflect the asset composition of the underlying investment portfolio.

viii. Stochastic models and the associated parameters should be appropriate for the business being valued, internally consistent and, where appropriate, based on the most recent market data. Volatility assumptions should, wherever possible, be based on those implied from derivative prices rather than the historical observed volatilities of the underlying instruments.

ix. Stochastic models should cover all material asset classes.

x. The calibration of the model should be based on market values such as equity option implied volatilities and swaption implied volatilities for market-traded contracts that are as similar as possible in nature to the embedded derivatives contained within the liabilities. The model should reproduce these values to a high degree of accuracy.

xi. Volatility assumptions should be based on the most recently available information as at the valuation date. Where market data is not available or there are concerns over the depth or liquidity of the market or if the market displayed unusual characteristics as at the valuation date then less recently observed measures and expert opinion should be considered. Alternative approaches for setting volatility assumptions where market data is not available include using the available market data from other markets, adjusted to the Indian market, and considering historical volatility adjusted to be consistent with implied volatilities.

xii. The Actuary must decide on a practical number of iterations of future investment return scenarios, but the minimum number of scenarios should be such as to reduce the sampling error to an acceptable level.

xiii. The Actuary should pay particular attention to the calibration of the tail of the distribution, since the simulations of tail events are likely to contribute significantly to the calculated liability.

xiv. Where a stochastic model is chosen, the Actuary should be able to justify both the model and its calibration.

b) Liability models

In modelling non-economic factors such as lapses the Actuary should take into account likely future policyholder behaviour and the extent to which this is correlated with the value of the guarantee. Thus in certain adverse scenarios where the guarantee becomes valuable lapse rates should be appropriately chosen, having regard to the prudence required in a statutory valuation.

**2. Deterministic models**

The Actuary may decide to use a deterministic model. Such a situation may arise where, for example:

a) the guarantee is to be internally dynamically hedged, and the embedded derivative will give rise to a payout only on failure of the hedging strategy, for example on operational failure or if a gap event occurred in the market.

In such circumstances, it would be normal for the Actuary to hold capital in respect of the residual risk. However, the loss arising from a gap

event may be modelled either using a discontinuous stochastic model or a set of severe deterministic stresses.

or

b) no adequate stochastic model or credible calibration for the underlying assets exists.

Where a deterministic model is chosen, the Actuary should be able to justify it.

**3. Impact of prevailing market conditions**

The impact of prevailing market conditions may depend on the method adopted. Where a market consistent value of the liability is calculated, the ESG should be calibrated so as to replicate the observed value of relevant traded instruments as at the date of valuation, e.g. options of appropriate term and moneyness. Where such options do not exist, the Actuary must exercise his or her judgement. He or she may for example refer to overseas markets where they do exist, or examine the historical volatility of the relevant asset classes, and set appropriately prudent assumptions. Since in any case, under current regulation the liability could not be hedged with such instruments, the Actuary should consider the extent to which day to day price fluctuations in the potential hedging instruments are relevant to the valuation basis.

**D: Documentation and Disclosure**

Where the Actuary has exercised judgement in any of the above areas, he or she should document the conclusions and their rationale, and be prepared to share these with the Peer Reviewer and the Regulator.

**Appendix: Reserving Method**

In this Appendix, we describe the method of using simulations to calculate the liabilities.

**1. Calculating reserves**

a) The ESG should be used to generate a set of simulation outputs.

b) For each simulation:

(1) For each policy with an applicable minimum contractual guarantee value, the market value of the base backing assets,

excluding any assets allocated to the liability in respect of the embedded derivative, as at the valuation date is used as the starting point. This value is accumulated with future premiums at the simulated investment returns allowing for charges, taxation, investment mix, etc., to determine the projected value for each policy. The projected values are calculated based on best estimates of all future contingencies (e.g. bonuses, mortality, persistency, etc.). Where appropriate, future contingencies should be modelled dynamically, i.e. they should be related to the investment return of each scenario.

(2) Management actions may be assumed in each scenario only if they have the approval of the body that would have authority for sanctioning the action in practice. So for example, assumed actions on bonus rates would require the explicit approval of the Board. Other typical management actions for with profits business would be alteration of the asset allocation, change in any charge made on the asset share, and the extent to which policy benefits may be smoothed and cross-subsidies employed among the subsets of policies. Where a dynamic trading strategy is assumed, the Actuary should consider the effect of any transaction costs that would arise and make allowance for them if they are material.

(3) For each policy the projected value is compared to the contractual minimum guaranteed value. This guaranteed value may also require to be projected in each simulation, for example in participating business where the guarantee will depend on future bonus rates which may, in turn, depend upon the simulation. If the projected value exceeds the guaranteed value, a nil shortfall is recorded. If the projected value is less than the guaranteed value, the actual shortfall should be recorded.

(4) The shortfall at maturity dates or, possibly, surrender, must be discounted to quantify the value of the required reserve at the valuation date.

c) Once all the policies have been projected on one set of simulation outputs, step (b) above is repeated for each of the simulations.

d) In this manner a series of reserves, equal in number to the number of simulations, is calculated at the valuation date. The average of these would be the expected cost of guarantees.

e) The reserve arising is a component of the mathematical reserves required to be calculated by the ALSM Regulations, specifically, under Regulations 7(3)(d) and 8(d) of Schedule II-A. We note that Section 2(5)

of the same Schedule requires, that for the demonstration of solvency, the mathematical reserves should be compared with zero, or guaranteed surrender value, if any, and the higher amount taken.

f) The calculations may be performed on grouped model points, if the Actuary is satisfied that the grouping does not introduce any material mis-statement.

**2. Market consistent valuation**

The shortfall on surrender or maturity, subject to a floor of zero, is discounted to the valuation date at the risk free return implicit in that simulation. The mean shortfall is the market consistent value of the embedded derivative.

For the avoidance of doubt, the mean of the discounted shortfalls (subject to a floor of zero) should be calculated over all the simulations, not just over those in the tail.

**3. Extreme Observations**

Due to the skewness of the distribution of the reserves, the investment return projection model might give rise to a number of relatively large reserves that result from particularly poor future investment return projections. It is recommended that these values are not discarded or artificially reduced. If the level or number of these reserves is not credible, it is suggested that the Actuary revisit the calibration of the particular investment returns projection model used or alternatively choose a different stochastic model.