

## INVESTMENT GUARANTEES - AN OVERVIEW

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After food, clothing, and shelter, man seeks security. Security is one of the basic needs of mankind. Financial security is no different and, across the world, the life insurance industry plays a central role in meeting this need through the provision of savings contracts that contain investment guarantees. Over time this market has steadily evolved so that today a wide plethora of financial options and guarantees exist – from plain, vanilla capital guarantees to more complex index related guarantees – and actuaries are having to adapt, learning and applying the principles of financial economics.

In this article we give a very brief overview of the types of investment guarantees available from life insurance companies and the issues to be considered in offering them.

But before proceeding, it is instructive to consider what can happen if investment guarantees are poorly managed. In Japan, seven insurance companies have become insolvent since 1997 due to interest rate guarantees. And in the UK The Equitable Life was forced to close to new business in 2000 due to embedded Guaranteed Annuity Options (GAOs) in its pension contracts whilst £85bn of With-Profit funds out of a total of £258bn have closed to new business as of 2003 due to interest rate guarantees combined with a low interest rate environment.<sup>1</sup>

### Types

Life offices offer many different types of investment guarantees to meet the varying needs of customers, a small selection of which are given below.

**1. Guaranteed Minimum Maturity Benefit** – A guaranteed minimum amount is payable at maturity of the policy based on an underlying asset-index. If the index performs better, the policyholder shares in the excess gains but if the index performs poorly then the guaranteed amount is paid. It is a type of European put option in the hands of policyholder.

**2. Guaranteed Minimum Death Benefit (GMDB)** – In a unit linked product, this benefit guarantees a minimum payment on death which may exceed the account value at the time of death. This guarantee may be either return of the premium or all premiums paid accumulated at a fixed rate of interest.

**3. Guaranteed Minimum Surrender Benefit** – This provides the policyholder a minimum amount at the time of surrender

and potentially is one of the most complex (and more expensive) guarantees to price for an actuary, particularly if offered on unit-linked contracts. Not only is the time of the surrender of the policy not known but also the risk of selective withdrawal when the index is not performing well is high, the guarantee is available on multiple dates and, unlike a GMDB, the policyholder stands to gain from exercise his option of the guarantee. This guarantee can be compared to an American option in the hands of the policyholder.

- 4. Guaranteed Minimum Withdrawal Benefit (GMWB)** – Another complex guarantee to both price and manage. This provides the policyholder with an option to withdraw a fixed percentage of the initial deposit (again from a unit-linked contract) every year until the entire principal is returned. This provides for the protection of the policyholder's income stream irrespective of market performance. On the other hand if the market performs well the policyholder participates in this growth.
- 5. Annuities** – Under deferred annuity and pension contracts, policyholders contribute premiums into a fund managed by the insurer. At retirement, the policyholder takes the cash equivalent of the maturity proceeds and must annuitise either with the original insurer or with another insurer. This benefit guarantees a minimum annuity for life. Here the insurer is providing both a financial and a mortality guarantee which becomes substantially more onerous if the terms of annuitisation are guaranteed prior to maturity.
- 6. Bonus Guarantees** – Reversionary Bonuses declared under participating plans add to the existing guarantee of the Sum Assured payable on death or maturity.

### Stakeholders to the Issue of Guarantees

There are a number of stakeholders involved in insurance contracts and each will have its own perspective on the issue of guarantees in insurance contracts.

- 1. Policyholders** – As we have seen, policyholders look for security of their investments and guarantees provide them with this. Financial theory says that, being risk averse in nature, a rational investor will prefer guaranteed returns even if it means giving up the opportunity to participate in the upside in the case of higher returns. But at the same time a policyholder must make an informed decision and should only make a purchase if he properly understands what he is buying.
- 2. Regulator** – The regulator's primary concern is the protection of policyholders' interests (and orderly market conduct). Accordingly, they will be concerned that insurers offer guarantees only if they have been properly priced, are backed by adequate capital, and are properly explained to policyholders. Not all policyholders will



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properly understand the nature of financial guarantees (as we have seen they can be complex) and it is incumbent upon insurers to properly explain the product features *and* the charges associated with them.

- 3. Shareholders** – Shareholders want steady profits and their target return on capital achieved. What they do not like is surprises such as being called upon to make unexpected capital injections. Yet financial guarantees introduce many risks onto the balance sheet of an insurance company such as market risk and interest rate risk which shareholders entrust management of the insurance company to manage effectively. But shareholders are very unlikely to have complete knowledge about the management's approach to these risks and hence could find that the company's exposure to guarantees exceeds their overall risk appetite. This is part of the phenomenon called agency effect.

### Pricing and Management of Guarantees

Investment guarantees constitute an entirely different risk from the more traditional insurance risk of mortality and morbidity. The latter is generally diversifiable and more predictable making pricing and reserving for them relatively straightforward. That is not to say that insurance risk is always free of complications – secular trends and volatility about an expected path are but two of the factors that insurers have to contend with in annuity portfolio but that is a story for another day. Investment risks on the other hand are systemic in nature meaning that they cannot be diversified away by increasing the size of the portfolio. All the contracts in the insurance portfolio simultaneously depend on the value of the same underlying risk source such as an equity index so that a fall in it will make the guarantee immediately valuable for all policyholders in the portfolio. In other words the guarantee bites for all policies together. This makes the traditional deterministic approach unsuitable for the pricing and establishment of capital requirements for investment guarantees. More sophisticated techniques are required which recognise that guarantees are effectively options (put and call) in the hands of policyholders.

The various approaches which life insurers can and are using to price and reserve for guarantees are-

- 1. Reinsurance** – One of the potentially easiest ways is to reinsure the investment risk with third parties such as investment banks, by purchasing options equivalent to those sold in the original insurance contracts. This approach, however, results in profit being passed to the reinsurer and introduces third party credit risk. But perhaps the greatest obstacle is that it may not be possible to cost-effectively buy traded options that match the option provided in the original insurance contract. A more specific issue for the Indian market is that the derivatives market for longer term durations that are typical of insurance contracts is not fully developed.
- 2. Dynamic hedging** – This is a method commonly used by investment banks to hedge their derivative positions. A bank will

aim to hedge its short position in an option (i.e. it has sold the option), by synthetically creating a long position in the option using the principle that if the change in the value of a derivative is only caused by a change in the value of the underlying financial asset, it is possible to maintain a quantity of the underlying asset such that a change in value of the derivative is exactly cancelled out by the change in value of that underlying asset. In this way it creates a riskless portfolio. For example, under a delta-hedging scheme the riskless portfolio consists of a short position in the option and a long position in  $\Delta$  shares of the underlying asset where delta,  $\Delta$ , is defined as the rate of change in the option price with respect to the underlying asset price. With such a portfolio, if the underlying asset price increases by  $\Delta S$  (producing a profit on the underlying assets purchased of  $\Delta \times \Delta S$ ) the option price will increase by amount  $\Delta \times \Delta S$  (creating a loss on the options sold also of this amount) and vice versa. Thus gains (losses) on the option are exactly offset by losses (gains) on the underlying asset position. The strategy is dynamic since, because the delta of the option will change as the price of underlying asset changes, the portfolio has to be periodically re-balanced.

This, in essence, is how the Black-Scholes-Merton (BSM) model for pricing options works and explains why the expected return is irrelevant to the pricing of an option. Both the option price and asset price are affected by the same source of uncertainty and since the profit on one offsets the loss on the other the overall value of the portfolio is known with certainty. The BSM model can be used to price guarantees within insurance contracts, however the complex nature of guarantees in insurance contracts which, for example, depend on more than one financial variable means that such closed form solutions cannot always be used. The BSM model also makes certain assumptions which may not be borne out in practice, for example that short selling of securities is possible and that share prices follow a geometric Brownian motion process.

- 3. Actuarial Approach** – This approach is very similar to the Value-at-Risk (VaR) approach used by banks for risk management and entails many stochastic simulations under which financial variables are allowed to vary in a manner that is representative of future market behaviour; using these simulations we can obtain a distribution of the cost of guaranteed liabilities in the future and thereby determine what price to charge for providing the guarantee. This technique can also be used to assess the level of capital required to support the guarantees by choosing an appropriate percentile of the loss distribution, say the 95<sup>th</sup> percentile which we can broadly interpret as meaning that insurer can be 95% certain that will be able to meet all its guarantees. Such an approach, though computationally difficult, is more appropriate for the complex guarantees found in life insurance contracts. The main issue to resolve when constructing such models is the calibration of them. If they are to give reliable results they need to be able to reproduce the market prices of traded

options. Producing such market consistent results, as they are known, in an Indian context is extremely difficult given the lack of market data as highlighted above. Another issue to resolve is what assets the capital should be invested in. If it assumed that capital is invested in the same 'risky' assets as the underlying policy then further capital will be needed against the risks which the capital is itself exposed to. An alternative would be to assume that the capital is invested in risk-free assets.

Such techniques are also used by insurers in their overall Asset Liability Management (ALM) to determine appropriate investment strategies for the liabilities given the level of capital available to it. They are now commonplace in developed markets and in many cases are explicitly required by the regulator to establish prudential capital requirements. As another example, The Canadian Institute of Actuaries Task Force on Segregated Funds (SFTF 2000) also used this approach as the underpinning methodology for

determining capital requirements.

### Conclusion

As we have seen there exists a genuine need for investment guarantees and life insurance companies are ideally placed to offer them. But it is crucial that the guarantees be properly priced and that adequate capital is available to support them. There are many stakeholders whose differing interests need to be balanced. Various approaches are available to insurers to both price and reserve for them with stochastic approaches appearing to be the most relevant.

As the Indian market gains further in sophistication all of these issues will come into starker focus and life insurers will need to respond proactively. At the end of the day insurance companies are in the business of accepting and managing risk.

<sup>1</sup> *Embedded Options and Guarantees – By Rob van Leijenhorst (AAG), Jiajia Cui*

## the Actuary India - Editorial Policy

**“the Actuary India” published monthly as a magazine, aims to be a forum for members of the Actuarial Society of India for;**

- a. disseminating information,
- b. communicating developments affecting ASI members in particular and the actuarial profession in general,
- c. articulating issues of contemporary concern to the members of the profession.
- d. Cementing and developing relationships across membership by promoting discussion and dialogue on professional issues.
- e. Discussing and debating issues particularly of public interest, which could be served by the actuarial profession,
- f. Student members of the profession to share their views on matters of professional interest by way of articles and write-ups.

**The Editorial Board recognizes the fact that;**

- there is a growing emphasis on the globalization of the actuarial profession;
- there is an imminent need to position the profession in a business context which transcends the traditional and specific actuarial applications.
- The ASI members increasingly will work across the globe and in global context.

Given this background the Editorial Board strongly encourages contributions from the following groups

of professionals:

- Members of other international actuarial associations across the globe
- Regulators and government officials
- Professionals from allied professions such as banking and other financial services
- Academia
- Professionals from other disciplines whose views are of interest to the actuarial profession
- Business leaders in financial services.

The magazine also seeks to keep members updated on the activities of the Actuarial Society of India including events on the various practice areas and the various professional development programmes on the anvil.

Finally and most importantly the Editorial Board strongly believes that the magazine must play its part in motivating students to grow fast as actuaries of tomorrow to be capable of serving the financial services within n ever demanding customer expectations.

**Principles for publication in the Actuary India;**

1. Letters should be letters to the Editor.
2. Such letters should be in response to publications already made in the Actuary India or about the Actuary India.
3. Articles/reportage and alike specifically meant for the Actuary India.

All the above is subject to Editors responsibility to edit.