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Development of GMxB markets in Europe

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Abstract: This paper gives an overview of what GMxB benefits are, outlines the risks associated with these guarantees and the various methods of managing the risks. It outlines the attractions of the products, the development of the European market and discusses why Ireland is emerging as a base for selling these products into Europe.

Keywords: GMxBs, Variable Annuities, risk management, hedging, reserving, stochastic.

GMxB products in Europe

1. Introduction

This paper describes GMxB products and the growing market that is developing for these products in Europe. We start by describing exactly what GMxB products are and the attractions of such products. We give a brief description of the development of the US market for such products and then examine the key risks and the different methods that can be used to manage the risks. One of the key risk management techniques is that of hedging and we discuss this strategy in some detail. We also look at reserving for these products and some of the practical issues that can arise.

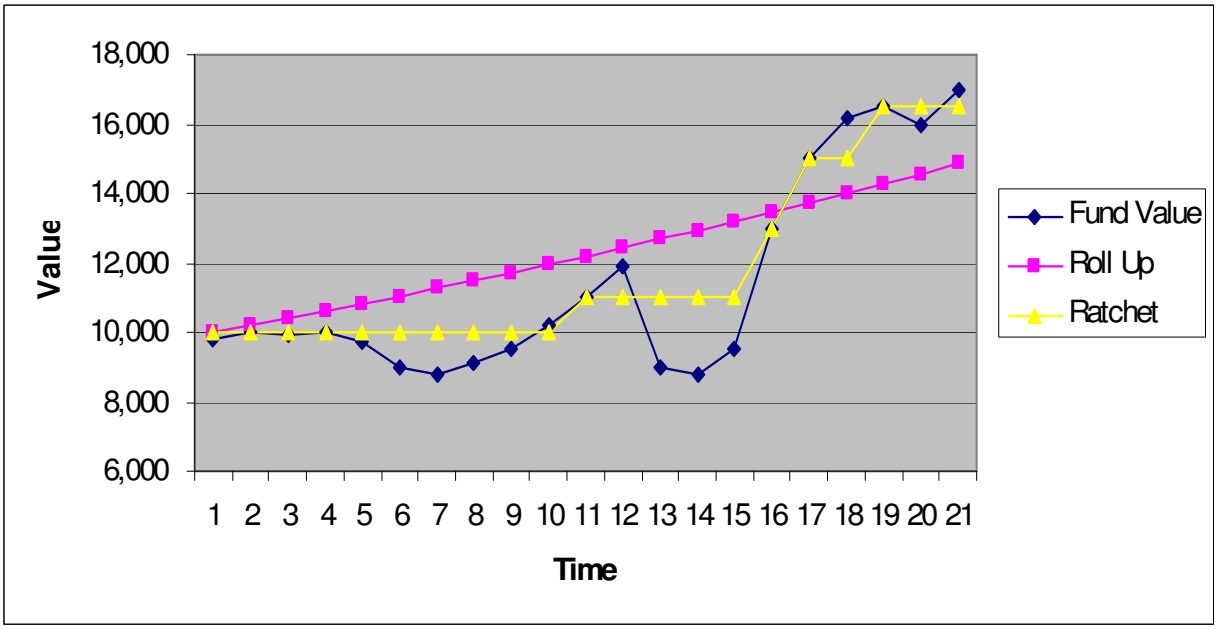
Finally we examine the development of the European market for these products. A number of insurers have started offering these products in Europe and a number of other groups are examining the possibility of doing so. We discuss the emergence of these providers and outline why we believe that GMxBs could become one of the major growth areas in European insurance over the next decade.

2. What are GMxBs?

GMxBs refer to the guaranteed living and death benefits associated with variable annuity business in the US. Variable Annuity (VA) contracts are unit-linked investment policies with deferred annuity benefits. The guarantees that are usually seen include guaranteed minimum death benefits, guaranteed roll-up rates that can be accessed at certain points in time, guaranteed income benefits and guaranteed minimum withdrawal benefits. We discuss each of these in the following sections.

2.1 Guaranteed Minimum Accumulation Benefit (GMAB)

The GMAB guarantees that the surrender value will be a minimum amount at a given point in time. For example, the guarantee might be a roll-up rate of 2% per annum which can be accessed at the tenth anniversary.

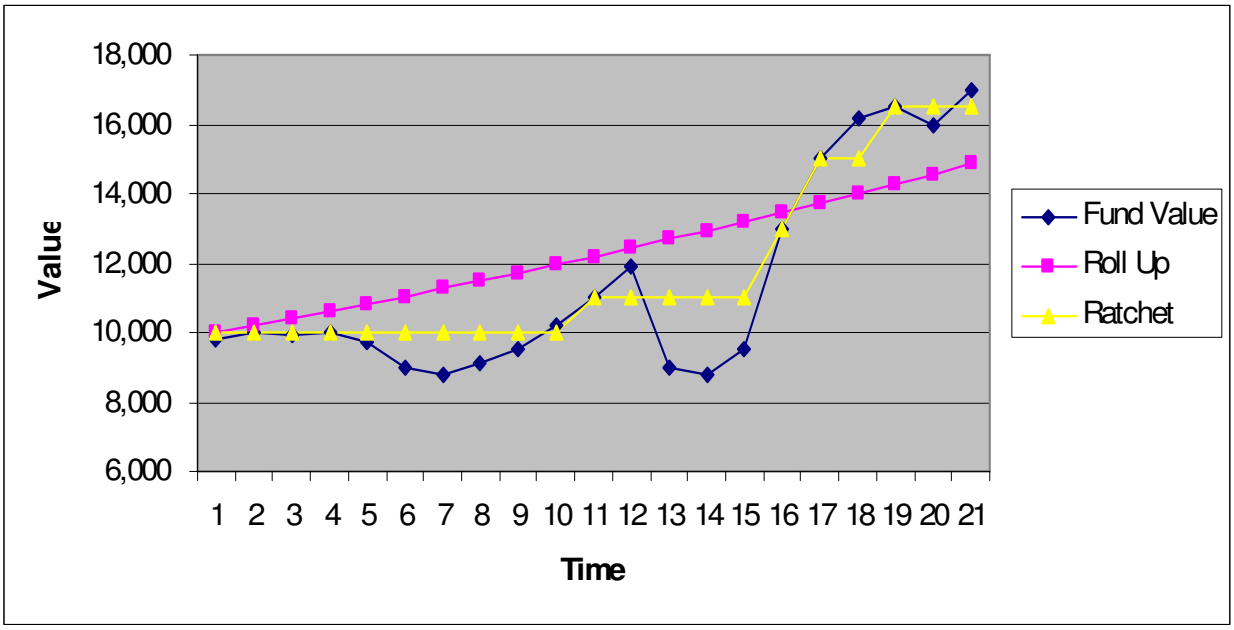


The diagram above shows the possible development of the Accumulation Benefit versus that of the fund value. In the example shown, the Accumulation Benefit is increasing at 2% per annum and at the tenth anniversary it is above the fund value, which is much more volatile.

2.2 Guaranteed Minimum Income Benefit (GMIB)

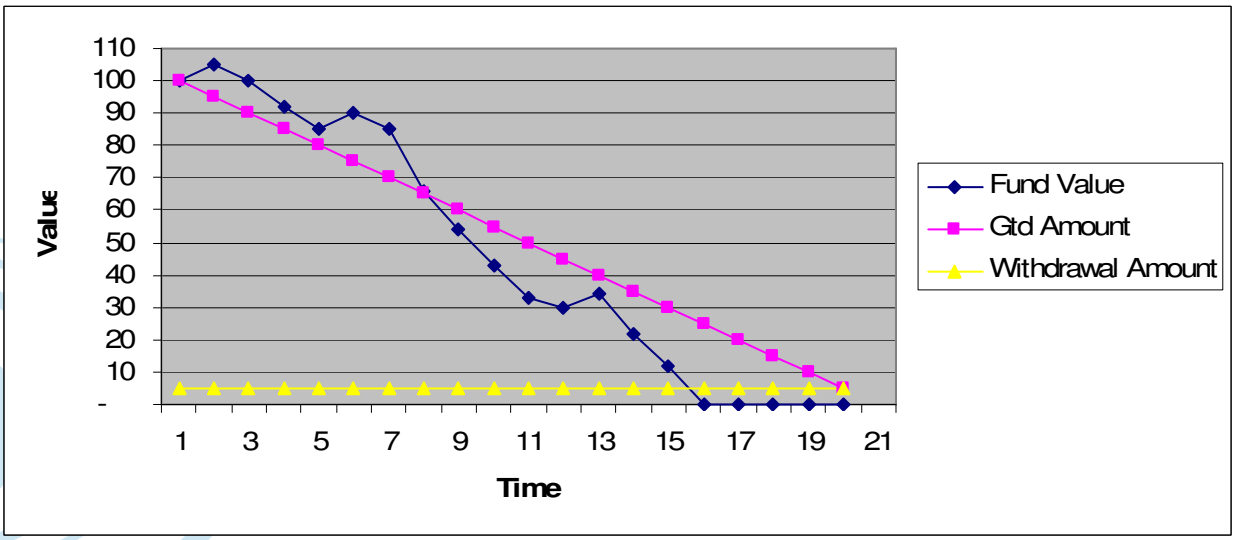
The GMIB guarantees a minimum annual income when the annuitisation option is selected. The policyholder might be guaranteed a minimum roll-up of 3% per annum and guaranteed annuity rates based on 3% per annum. Typically, the GMIB is based upon the Benefit Base rather than the Account Value. The Benefit Base will increase at the roll up rate or with

ratchets. At maturity, the policyholder can choose between converting the Benefit Base into an annuity at a guaranteed rate and using the fund value to purchase a market annuity.



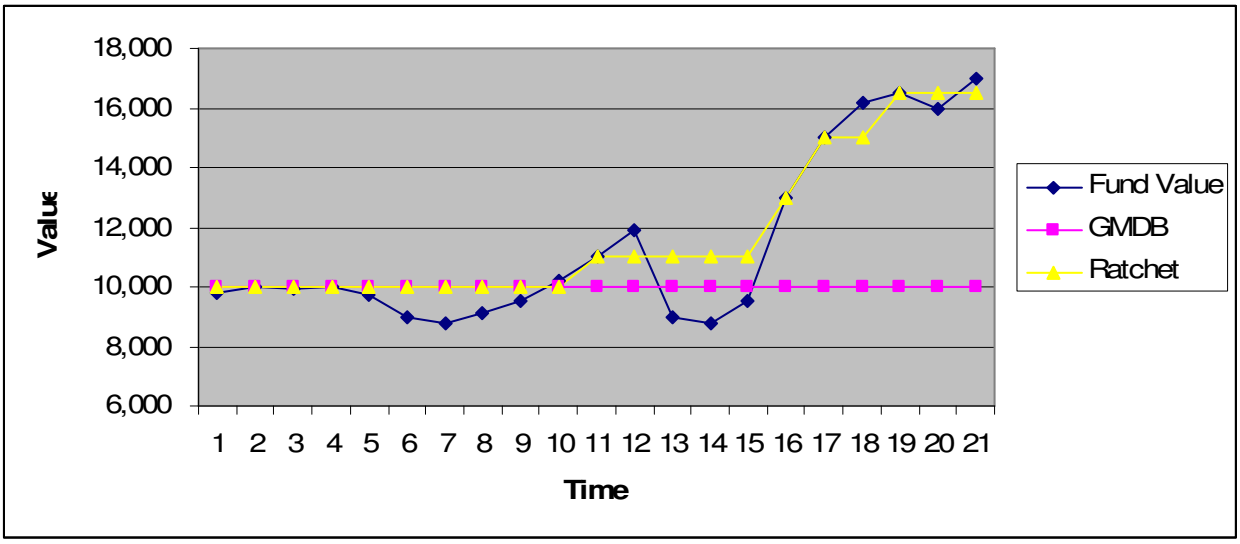
2.3 Guaranteed Minimum Withdrawal Benefit (GMWB)

The GMWB guarantees minimum periodic withdrawals. For example, it might guarantee that the policyholder will receive 5% of their initial premium each year for twenty years. The GMWB is perhaps more flexible than the GMIB from the policyholder's point of view because they can always surrender the product.



2.4 Guaranteed Minimum Death Benefit (GMDB)

The GMDB pays a guaranteed minimum lump sum on death. This could either be a return of the premium paid on death adjusted for withdrawals or a more valuable guarantee that provides a guaranteed death benefit equal to the initial premium paid rolled up at 2% per annum (for example) or the product might have an annual ratchet feature.



2.5 Structure of products

VA business is traditionally single premium investment business with an underlying unit fund. Surrender values are based on the value of the units, with the usual range of surrender penalties, and partial withdrawal options. The guarantees are often presented as riders that give certain minimum payouts in certain circumstances (death) or at certain times (e.g. maturity, survivorship post age 60) in addition to the base unit linked product.

GMWB, GMAB and GMIB are often referred to as Guaranteed Living Benefits or GLBs.

2.6 Features

It is also common to see products which offer combinations of the above guarantees. Sometimes the guarantees are offered as riders to the base product but in either case the charges for these guarantees are normally explicitly identified. The policyholder is typically given a limited choice of funds with varying proportions invested in equities (up to levels typical for aggressively managed funds). The charge will also probably vary in line with the equity proportion. A ratchet is another feature that is often seen on these products. If the fund value is above the guaranteed benefit on the policy anniversary then the ratchet would increase the guaranteed benefit to this level.

The latest versions of GMWB products might guarantee that the policyholder can withdraw a percentage of the original premium every year for the rest of their lives, products offering a 5% withdrawal are often referred to in the US market as “5 for life”.

2.7 Attractiveness of these products

Upside participation with downside protection

These products are attractive to policyholders as they offer the opportunity to participate in investment markets with the safety net of the guarantees to fall back on in the event of market downturns or interest rate movements. Policyholders pay an explicit charge for the guarantees and can decide which guarantees are valuable to them.

Attractive alternative to traditional annuities

They offer an attractive alternative to traditional annuity products because they can offer exposure to market growth as well as guaranteeing a certain level of income for life. They also offer death and surrender benefits, two major features not offered by traditional annuities. These features mean that the products do not suffer, as annuities do, from the perception of poor value.

Aging populations

The fundamental demographics of most European countries point to a major opportunity for retirement products. People are living longer and awareness of this factor is beginning to grow as journalists highlight the issue. The demographic profile of most European countries also means that there will be a substantial increase in the number of retired people over the next twenty years, as the large generation that was born after World War II reach retirement. Added to this market growth is the fact that many government pension schemes are funded on a pay-as-you-go basis and coming under increasing pressure.

Replace traditional guaranteed products

The products are attractive to the life assurance industry because they offer the possibility of replacing some of the traditional guaranteed products which are increasingly under threat either because of the introduction of market-consistent accounting methodologies or because of their lack of transparency to policyholders, such as traditional with-profits business in the UK. Likewise, some of the guaranteed products that are sold in mainland Europe are struggling to survive under modern accounting and capital requirement methodologies and because of their lack of transparency, which often leaves considerable scope to the company for judgement. In contrast to traditional products, GMxBs also offer an individual investment fund and allow some scope for choice of the underlying assets.

2.8 Typical charging levels

The level of charges varies substantially depending upon the competitiveness of the market and the richness of the guarantees. The table[1] below outlines the ranges within which the charges typically fall:

BENEFIT	CHARGE
GMDB	15-35 bps
GMIB	Up to 75bps
GMAB	25-75 bps
GMWB	35-75 bps

The charges will also depend upon the level of competition in any given market.

[1] Feng Sun, "Pricing and Risk Management of Variable Annuities with Multiple Guaranteed Minimum Benefits

3. Development of US market

3.1 History of Development in the US

Variable Annuities refer to unit-linked contracts with tax-deferral advantages sold in the US. They first emerged in the 1980's and the market for these products increased dramatically during the 90s from about $12 billion in 1990 to $155 billion in 2005. During the mid to late 90's companies began to offer guaranteed death and living benefits in order to boost sales. Following the market downturn of 2000 the value of the guarantees was more fully appreciated, reserves increased and reinsurers exited the market. Since 2000 companies in the US have typically initiated hedging programs and in the last number of years we are beginning to see more valuable (and complicated) guarantees being offered and reinsurance capacity has come back into the market.

The table below shows the companies with the largest sales of Variable Annuities in 2005.

Company	*2005 Sales ($Millions)*
TIAA-CREF	13,550
MetLife	13,212
Hartford Life	11,375
AXA Financial	10,668
ING	10,256
Lincoln National	8,408
AIG	8,145
John Hancock	7,850
Pacific Life	7,197
Prudential Financial	7,081
Total Market	137,500

During 2005 78% of non-group variable annuity sales offered a GMWB and 52% offered a GMIB.

4. What are the risks

GMXB riders have complex option-like characteristics. Traditional deterministic modelling cannot capture the risk profiles of the guarantees. Therefore, more sophisticated financial modelling capabilities are required, including stochastic scenario modelling. Stochastic modelling can reveal the distributions of claim costs and earnings and provide sufficient information to quantify the risk.

There is an argument that these equity guaranteed products have experienced optimal capital market conditions over the last few years. We have seen low volatility and low interest rates but the risk management techniques have perhaps not yet been fully tested in volatile market conditions.

4.1 Market Risk

GMxBs typically expose the life assurance company to equity market risks. Market risk is different to insurance risk in that aggregating exposures does not result in any reduction in risk as every policyholder is in the same position and could opt to avail of the guarantee at the same time.

When modelling this risk it is necessary to make assumptions regarding:

- Growth and volatility of fund returns (ideally should consider the term structure of volatility)
- Correlation between fund returns
- The yield curve for discounting cashflows

There can often be considerable debate about the appropriate assumption to make and of course the assumption will depend upon the purpose of the projection. For example, when deriving an assumption for equity volatility do you look at the historical rates or do you use the volatility implied from the current market prices for options. The traditional actuarial approach is to use an estimate derived from historical experience and this is still required when deciding upon capital requirements. In setting the appropriate level of capital we are normally looking at very extreme events for which there is no market price. Therefore, it is necessary to take a view using historical experience. However, when hedging the risk in the market it is necessary to take account of the rates implied by the market because typically the asset portfolio will be rebalanced on a regular basis.

4.2 Mortality Risk

Mortality experience dictates the date or duration of the guarantee claim and is therefore a very important factor in the design of these products. Increased longevity increases the value of the guarantee claim for GMAB, GMIB and GMWB products, whereas it is higher mortality rates that increase the cost of GMDB claims.

Mortality risks follow the large number theorem. Therefore, as the in-force portfolio increases the risk becomes much more predictable.

4.3 Policyholder Behaviour Risk

Policyholder behaviour can have a substantial impact upon the cost of offering these guarantees. When pricing and reserving it is necessary to make assumptions regarding:

- persistency
- fund mix and switching
- take-up rates on options

It is not possible to hedge these risks. They can only be managed by prudent product design and the use of reasonable assumptions, which reflect both past experience and the value of the guarantees in different scenarios. It is vital that companies constantly monitor experience and revise assumptions as appropriate.

GLBs differ from GMDB in the way that the options are utilised. GMDB can be expected to follow a mortality table but the take-up of GLBs can be much harder to predict because it is driven by policyholder behaviour.

These products are lapse supported and therefore the lapse assumption is a vital one and it is common for the lapse assumption to be a dynamic one depending upon the "in-the-moneyness" of the guarantees. Companies will assume less lapses as the guarantee increases in value and vice-versa.

It is also common for the take-up option to vary with the dynamically with the value of the guarantee. The more "in-the-money" the guarantee is the more likely it is that the policyholder will opt for it. It is dangerous to assume that policyholder inefficiency will continue in extreme markets, as in such situations press coverage of such guarantees would increase and there is always the potential for institutional investors to purchase secondary policies.

4.4 Operational Risk

Selling these guarantees exposes the company to different operational risks which vary with the approach used to manage the risks. Amongst the risks faced are:

- Model risk

The model used by the company to price and reserve for the guarantees might not be appropriate. For example, a simple lognormal model might be adequate for pricing a guarantee but will not accurately capture the fat-tails of the guarantee costs when reserving.

- Systems, infrastructures and controls

If it is decided to hedge the risks then the company will need systems allowing them to calculate the liability option value, the sensitivities of the option value and to decide what asset trades are necessary to match these sensitivities.

- Scenarios used

Insurers are faced with questions regarding the number of scenarios to be used, the calibration of the scenarios, should the scenarios be risk-neutral or real-world scenarios?

- Modelling of policyholder behaviour

Policyholder behaviour is often not modelled sufficiently, it is difficult to predict and there is a debate about the degree to which policyholders behave rationally. For example, just because a guaranteed annuity is more valuable than a market annuity does not mean that the policyholder will always exercise the option, because they might decide not to annuitise at all.

- Basis risk

There can often be a performance mismatch between the underlying funds and basket of futures indices. The extent of this mismatch can be examined using historical data.

- Liquidity holes

It might not be possible to trade in volatile markets.

- Simplifying assumptions

Simplifying assumptions might be made such as not considering the term structure of interest rates or the term structure of volatility.

4.5 Credit Risk

Depending on the methods used to manage the risks then the company might have counterparty exposures, such as exposure to reinsurers or asset managers.

4.6 Regulatory and Accounting Risks

The relevant accounting standards in some countries might not appropriately recognise the impact of hedging these risks. Likewise the relevant regulation might not encourage or allow for the hedging in calculating the reserves or capital requirements or might require such high levels of capital as to make the product uneconomic.

5. Risk Management

The risks underlying these products can be managed in a number of different methods ranging from setting aside sufficient capital to reinsurance to hedging. The appropriate method will depend upon the size of the company and the GMXB business, the type and value of guarantees offered and the availability of reinsurance. The impact of product design on risk management also needs to be carefully considered. For example, one of the reasons that ratchets are sometimes added to products is that if the market is up a large amount from the date the guarantee was bought then the value of the guarantee is significantly reduced. In this scenario the policyholder should question whether it is worthwhile to continue paying a guarantee charge for a guarantee that is significantly reduced in value. However, if the product offers a ratchet then the value of the guarantee will not have reduced and there is no reason to consider lapsing and taking out a new policy. It is also common to offer incentives to defer partial withdrawals.

5.1 Hold sufficient capital

The insurer could decide to set aside sufficient capital and run the risks on its own balance sheet without taking any other action. This approach is also known as self-insurance and could be appropriate if the guarantees offered were not particularly valuable. For example, this strategy might well be appropriate for a GMDB that offered return of premium. However, if the company were selling large volumes of other guarantees then it is likely that the capital required would render the products uneconomic.

5.2 Reinsurance

Perhaps the simplest way for the insurer to manage the liability from these options is to purchase offsetting options from third parties, such as reinsurers. The reinsurance offered might not totally offset the risks, as the reinsurers might place certain limits upon the total claims or the maximum size of claim and they might also not be willing to run certain behavioural risks over which they have no control, such as lapse rates and the take-up of options.

For smaller companies reinsurance is perhaps the most practical method for managing the risks underlying these guarantees, given the costs of implementing a dynamic hedging program.

In the US most of the VA business was reinsured in the 90s but the reinsurers did not price these guarantees accurately and the capacity of the market became very restricted. In the last few years we have seen capacity starting to come back into the market.

Of course, reinsurance introduces a third party to which the company is exposed to the risk of default. Some of the investment banks are also willing to assist insurance companies in the hedging of these guarantees although they typically won't take on any of the policyholder behaviour risks such as lapses and take-up rates.

5.3 Static Hedging

Buying customised long-dated options is one approach used to hedge the exposure associated with GMxBs. If possible, this method can allow the company to purchase options which exactly offset the options offered to policyholders. The company is still left with the policyholder behaviour and mortality risks and the availability of options with terms beyond ten years is limited. Similar to reinsurance, hedging introduces counterparty risk.

5.4 Dynamic Hedging

The complexity of the products offered often means that it is not possible for static hedging to offset the options. Dynamic hedging can be used in these instances.

Dynamic hedging is an approach that attempts to construct a portfolio that will perfectly replicate the liability payments of the portfolio as a whole. It requires a different view to the normal actuarial view. Instead of thinking of the liability as a long-term liability that can be valued by projecting the future payouts and establishing a liability for this figure, instead you view the liability as something that can be duplicated in the market by the use of derivatives. Therefore, you can establish a portfolio that will match the movements in the liability in the short-term. If you continually rebalance then you will establish a portfolio that will match the liability in the long-term. The advantage of this approach is that instead of a very variable cost payable at a certain point in the future you translate the cost into a much less variable cost that is paid over the life of the contract. This also makes it much easier to strip out the guarantee and offer it to the policyholder in exchange for an explicit charge, for example a percentage of the funds under management.

Your asset portfolio should have the same sensitivities as the liability portfolio. The liability value is exposed to a number of sensitivities which are known as “the Greeks”.

5.5 The “Greeks”

The “Greeks” represent the sensitivity of the liability option value:

- Delta - the rate of change of the option price with respect to the underlying fund value.
- Rho - the rate of change of the option price with respect to interest rates
- Vega - the rate of change of the option price with respect to volatility
- Gamma - the second order sensitivity to the underlying price
- Theta - the sensitivity to time

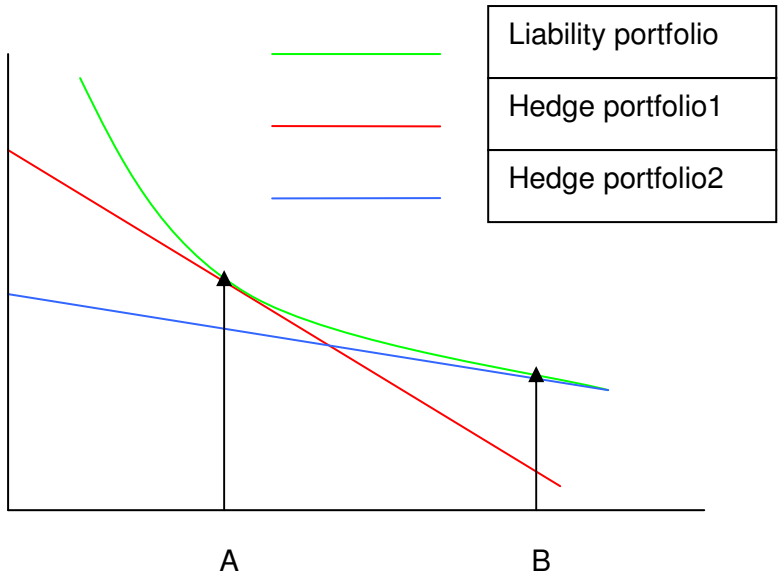
The simplest and most common form is delta hedging. Rho hedging can also be important depending upon the guarantees offered. A more sophisticated program will also seek to mitigate volatility risk by matching vega, but few companies currently do so.

Rho can be hedged via the use of swops and delta can be hedged using futures but in order to hedge the gamma and vega it is necessary to use options.

5.6 Process of dynamic hedging:

- Firstly, the company has to calculate the market value of the liability option value.

- Then it is necessary to quantify the sensitivities of the option value by calculating the greeks. It is necessary to calculate the sensitivities at a policy by policy level and the overall sensitivity is the sum of the individual sensitivities.
- Then the company has to calculate an asset portfolio that has the same sensitivities as the liability portfolio.
- Finally, the company has to rebalance the existing portfolio to the desired portfolio calculated in the previous step. There is also a decision to be made at this point because there is a trade-off between the accuracy of the portfolio and the transaction costs of rebalancing. Other practical limitations such as minimum deal sizes might also create difficulties.



The above graph is an illustration of dynamic hedging. The green line represents the liability portfolio and at point A we can see that the red line, hedge portfolio A, has the same sensitivity as the liability portfolio. However, hedge portfolio A only has the same sensitivities for small movements in the liability value. Therefore, as the liability value moves towards point B it will be necessary to readjust the hedge portfolio until we arrive at the blue line, hedge portfolio B. If we do not rebalance frequently enough then there will be profits and losses because the change in the value of the hedge portfolio will not match the change in value of the liability portfolio.

Companies need to define the acceptable amount of tracking error with the greater the acceptable error the greater the capital required but the lower the transaction costs. It is also necessary to measure the correlation between the hedge gain/loss and the change in the liability valuation. This monitoring allows companies to examine the efficiency of the hedging strategy and gives an estimate of historical tracking error. This tracking error should be allowed for when reserving or setting capital requirements.

Companies also need to decide exactly what they are trying to hedge. For example, is it cashflow, IFRS profit or the company's solvency position? It might well be the case that the optimal hedging strategy for one of the above measures mightn't produce the optimal result for another measure.

6. Reserving for GMXB products

As mentioned previously, stochastic approaches are required to quantify the value of these complex option like benefits. In order to quantify the required reserve the insurer first needs to decide at what level should the reserve be set? Is it a market consistent reserve or is there to be a greater level of prudence? Of course, this question will normally be addressed by regulation or guidance depending on the purpose of the valuation.

It is then necessary to generate a large number of economic scenarios, derive fund returns in these scenarios, project forward the guarantee premiums and claims in each scenario and calculate the required level of assets to meet the claims in each scenario.

6.1 Level of capital required

One of the first questions that need to be considered is the appropriate level of capital to hold for these products and the measure to be used.

There are two measures that are commonly used, Value At Risk (VAR) and Tail-VAR or Conditional Tail Expectation (CTE). VAR is equivalent to expressing the desired percentile that you require capital to cover. For example, you might require that the company hold sufficient capital to cover the 99th percentile scenario over one year. This means that the company would have to project a number of scenarios, determine the relative order of the scenarios and hold sufficient capital so that in 99 out of 100 scenarios it would have sufficient capital to meet its liabilities.

Using CTE the company might decide it needed sufficient capital to meet the CTE98 level over one year. This means that again it is necessary to project a number of scenarios and determine their relative order but instead of just examining one scenario the company would take the average of the worst 2% of scenarios. This could be considered at least as prudent as taking the 99th percentile but probably more so because it is likely that there isn't a uniform progression between the 99th and 100th scenarios.

Another question that needs to be considered is the time-frame that is looked at. Do you examine a one-year period and require that the company have sufficient capital to meet any risks over that period or do you examine the full life of the contract and determine that the company have sufficient capital to meet a certain level over that period? Obviously it is necessary to have a higher level of prudence over the one-year period.

6.2 Various Approaches to Capital Requirements

Regulators in a number of different areas have outlined their required level of capital using the above measures.

GMxB products in Europe

6.2.1 US

In the US, C3 Phase II[2] is the proposed minimum capital requirement for products with embedded guarantees. A number of scenarios are projected and the Total Asset Requirement is determined for each scenario. TAR is the amount of assets required to ensure that statutory surplus at all future years will not be less than zero. Then the TARs are sorted and the average of the worst 10%, or CTE90, is the capital requirement.

6.2.2 UK

In the UK companies are required to calculate their Individual Capital Assessment (ICA)[3]. The level of confidence referred to is a 99.5% probability of surviving a one-year period.

6.2.3 IAA

The Insurer Solvency Working Party issued "A Global Framework for Insurer Solvency Assessment" in 2004. It advocated a stochastic approach to setting capital requirements with the level of required capital determined using a CTE methodology. It recommended that capital be set at the higher of two results:

1) the amount required to be sufficient with a high level of confidence (e.g. 99%) to meet all obligations over the following year as well as the present value at the end of the year of the remaining future obligations based on a best estimate value with a moderate level of confidence (e.g. 75%) and

2) The amount required to be sufficient with a slightly lower level of confidence (e.g. 90% or 95%) but with the projection being over the full lifetime of the existing business in-force.

6.2.4 Solvency II

It appears that Solvency II is moving towards a VAR approach with the required level of confidence being 99.5% over a one year time period. This is the benchmark specified in the latest QIS 3[4].

6.2.5 Canada

The Office of the Superintendent of Financial Institutions Canada has specified a CTE95 measure for internal models used to calculate capital requirements[5].

6.2.6 Rating agencies

S&P have stated a view that CTE90 approximates "BBB" capital benchmark and CTE95 approximates "AA". AM Best consider that capital at the 99.5th percentile approximates an "AA" rating.

[2] C3 Phase II requirements of American Academy of Actuaries, www.actuary.org
[3] Integrated Prudential Sourcebook of FSA, www.fsa.gov.uk
[4] QIS 3 Technical Specification, www.ceiops.org
[5] Minimum Continuing Capital and Surplus Requirements for Life Insurance Companies, www.osfi-bsif.gc.ca

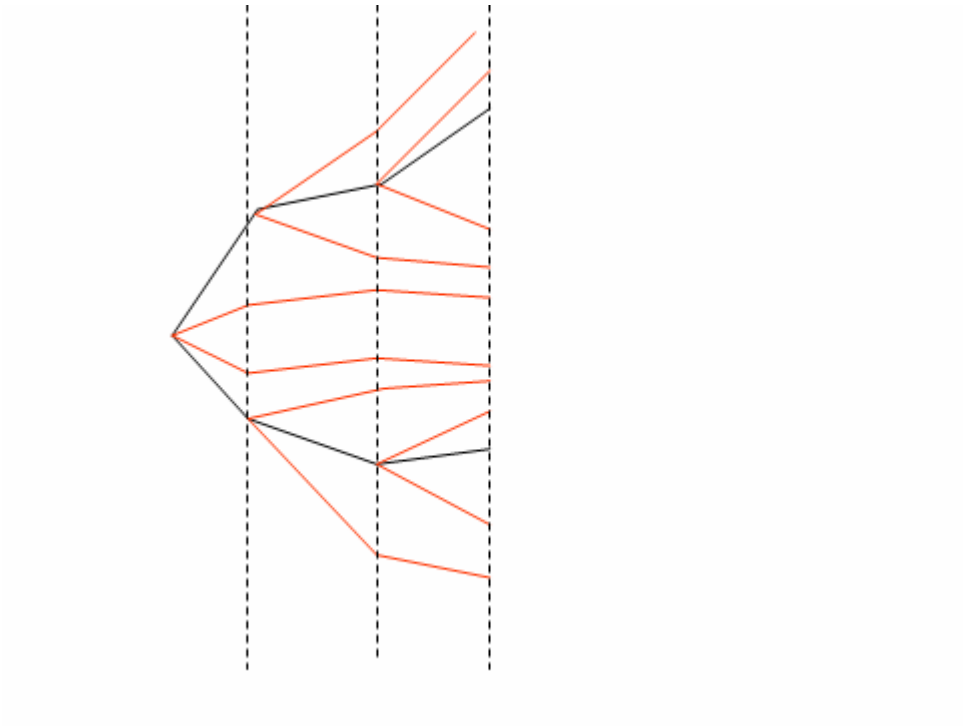
6.3 Real-world or Risk-neutral

Another question to consider is whether to use real-world or risk-neutral scenarios. Again, this will depend upon the purpose of the valuation. If the insurer is attempting to calculate the market-consistent value of the guarantees then risk-neutral scenarios might be used but if attempting to decide upon the appropriate level of capital then real-world scenarios might be more appropriate. Risk neutral scenarios often assume a relatively simple model, such as the log-normal model and this is sufficient when looking at the market consistent price because we are mostly concerned with the average outcome. However, the tails generated by this model might not be sufficiently "fat" to capture the likelihood of extreme outcomes and therefore, real-world scenarios might be preferred.

6.4 Allowance for hedging in calculating capital requirements

Allowing for hedging in calculating the reserve is a complex task because it requires stochastic on stochastic projections. In order to allow for the hedging in a particular scenario we need to project forward for the first time period and examine the value of hedge assets and liabilities at that point in time. We then need to determine the hedge trades that would be performed to rebalance the portfolio. This requires knowledge of the liability sensitivities which normally requires a stochastic projection. Therefore, we need to perform a stochastic projection at that point and calculate the required trades. We then need to project forward to the next time period and replicate this step. This needs to be done for every scenario so we end up with a huge number of scenarios. This requires huge computing power and time resources.

The diagram on the next page shows two real world scenarios (the black lines) with just two risk neutral scenarios at each point in time. This helps illustrate the rate at which scenarios multiply when doing stochastic within stochastic projections.



Allowing for hedging when calculating the capital requirements results in a significant reduction in capital. Therefore, we should consider how can we be confident that the hedging will produce the stated outcomes?

The American Academy of Actuaries has stated that companies can allow for hedging in calculating their capital requirements if it is following a Clearly Defined Hedging Strategy[6] in accordance with an investment policy adopted by the Board of Directors. The clearly defined hedging strategy must, at a minimum, identify:

1) The specific risks being hedged (e.g. delta, rho etc)
2) The hedge objectives
3) The risks not being hedged (e.g. variation from expected mortality, withdrawal and other decrement rates assumed in the hedging strategy)
4) The financial instruments that will be used to hedge the risks
5) The hedge trading rules including the permitted tolerances from hedging objectives
6) The metric(s) for measuring hedge effectiveness
7) The criteria that will be used to measure effectiveness

[6] Update to Actuarial Guidance DIS from the American Academy of Actuaries' Life Reserves Working Group, www.actuary.org

8) The frequency of measuring hedge effectiveness
9) The conditions under which hedging will not take place
10) The person or persons responsible for implementing the hedging strategy

6.5 Some other issues

The European Communities (Life Assurance) Framework Regulations, 1994[7] and the regulations in most countries were not written with these stochastic approaches in mind. Therefore, some of the regulations can create difficulties for insurers trying to manage and reserve for these products in a modern market-consistent manner.

Some of the particular regulations that can create difficulties are regulations dictating that reserves be calculated on a policy-by-policy basis and that the reserve for any policy should not be less than the guaranteed surrender value. Interestingly, the FSA recently announced that policies that didn't have a guaranteed surrender value (and where a guaranteed surrender value only became applicable after a specified period of time) could have a negative reserve[8]. These requirements that do not allow the company to treat the block of business as a portfolio restrict its ability to manage the portfolio in the most efficient manner.

Another issue that companies need to be aware of when hedging their portfolios is that marked-to-mark requirements can result in significant cash outflows (even while the economic exposure is perfectly hedged) and companies must understand the potential cash flow implications of any hedging strategy. The Liability Option Value is equal to the present value of claims less the present value of charges. Therefore, a scenario in which equity markets increase will result in a decrease to the present value of charges and a reduction in the present value of claims. Therefore, the liability option value goes negative and the value of the hedging assets will also go negative. The company will be required to make margin payments on the negative hedge assets but it will not receive the increased charges for a period of time. Therefore, it must find some method of financing this cashflow problem.

[7] Directive 2002/83/EC of the European Parliament and of the Council of 5 November 2002 concerning life assurance
[8] Policy statement PS06/14, December 2006

GMxB products in Europe

7. European Market

A number of major global companies have recently set up life assurance companies in Ireland in order to sell GMxBs into other European countries (the reasons for doing so apply equally to the domestic Irish market). These companies have committed significant capital and resources to their new operations as they see Ireland as providing an excellent base from which to pursue opportunities in Europe:

- Hartford Europe, selling into the UK
- MetLife Europe, selling into the UK
- AXA Life Europe, selling into Germany

AEGON Scottish Equitable International, an established company which is part of the AEGON group, has also recently started selling a GMXB product from Ireland into the UK.

AIG Life is selling a GMAB product with an income in the UK through Living Time Limited, an appointed representative in the UK.

Hartford, MetLife, AXA, Aegon and AIG Life are among the largest providers of variable annuity products in the US. In Life Strategies we have worked with all of the above companies, with the exception of AIG Life, in either the application process, product design stage or in developing the reserving methodology for these guaranteed products.

7.1 Why Ireland?

Given that the majority of the companies which have commenced selling these products are basing themselves in Ireland the question becomes why is Ireland being used as a base?

The answer to this is a combination of the usual reasons why Ireland is one of the largest centres for cross-border sales in Europe and some reasons specific to these types of products. The generic reasons why Ireland is a base for cross-border business include:

- A developed and efficient life assurance infrastructure
- One of the lowest corporation tax rates in the world at 12.5%
- The availability of gross roll-up taxation for policyholders (tax is only paid at exit)
- English speaking
- Member of the EU

The reasons specific to this product include:

- Ireland's principles based regulatory regime
- The possibility of using derivatives as admissible assets

The principles based regulatory regime is vital as, subject to certain constraints, it is possible to allow for the impact of dynamic hedging when calculating capital requirements and

reserves in Ireland. This means that companies can hold a level of capital appropriate to the risks under consideration. The implementation of Solvency II should hopefully achieve a similar result across Europe but Ireland is one country that offers this possibility in the interim.

8. Summary

In summary, we believe that GMxB products have the potential to help answer a market need for retirement products. This business has grown significantly in the US over the last ten years and we believe that it will become a major growth area in the European life insurance market over the next number of years. These products offer valuable guarantees to policyholders and given the problems that traditional guaranteed business is experiencing in Europe there is a significant market opportunity for products of this nature. A number of major global insurers have commenced writing this business in Europe and we know that others are also examining the possibility of doing so.

Most insurers are either using sophisticated hedging techniques to manage the risks associated with this type of business or are reinsuring the business. Developments in accounting and solvency requirements are encouraging people to manage the risks in this manner.

Finally, Ireland has already established itself as a centre of excellence for GMxB business for the general reasons that have led to Ireland become a leading international financial services centre as well as some additional reasons that are specific to GMxB business. At Life Strategies we have assisted a number of insurers in developing and reserving for GMxB products.

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