TOWERS PERRIN

TILLINGHAST

RISK MANAGEMENT OF UNIT-LINKED GUARANTEES: CREATING COMPETITIVE ADVANTAGE

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RISK MANAGEMENT OF UNIT-LINKED GUARANTEES: CREATING COMPETITIVE ADVANTAGE

EDITORIAL

The European life insurance market is currently being flooded by unit-linked products with investment guarantees. While these products are relatively new to the European market, they are very well known in the US and Canada, where they trade under the name of 'variable annuities'. The design, pricing and risk management processes of these products present new challenges to the industry. Insurers need also to take into consideration the fact that available technology does not currently provide solutions to all of the problems that these products can generate.

This paper comprises four separate sections. The first presents an overview of the key drivers, including dramatic regulatory change, that have led to the transformation of Europe's traditional insurance market into something more closely resembling that of our North American counterparts. It also explores the opportunities that a greater freedom of services in the EU now presents to the insurer and how these might best be taken advantage of.

In the second section, the role of risk management, and more specifically hedging, is considered if companies are to succeed in the unit-linked with guarantee (ULG) market, where not only new products but a new regulatory framework must be skillfully navigated. Emphasis is also given to the insurer's capacity to manage risk once equipped with sophisticated asset management tools, such as 'dynamic hedging' and smart product design, which help to mitigate the potential pitfalls and complex problems of managing the risks associated with ULGs.

The third section is concerned with overcoming the complexity of ULGs by demonstrating in detail a sophisticated valuation process. The application of current best practice, that includes stochastic simulation, will ensure a pricing strategy that is accurate, reliable and market-consistent.

A successful hedging strategy, within a sound risk management framework, requires not only an understanding and awareness of external risks but also the development of a risk culture internally. A particular issue in the final section is the importance of internal risk awareness if an effective hedging strategy is to be successfully implemented.

Structure of this update

Section 1: Why is hedging of relevance now?

REGIME CHANGE

In the past, companies have enjoyed a generous measure of flexibility when reporting their liabilities, such as through book value accounting, where greater freedom was given to defining profits and losses. However, in the last ten years, following or anticipating regulatory changes within the European insurance sector, such as Solvency II, there has been a drive towards market consistency and, subsequently, the pricing of liabilities at market value. This has resulted in companies often appearing to carry higher levels of liability and volatility in the profit and loss account. These findings may then lead to the conclusion that a company has become exposed to a higher degree of risk, when in reality the business itself remains unchanged.

Up until recently, a company would find itself locked into the regulatory regime of the country in which it wanted to sell its business. If this regime required a cumbersome treatment of assets and liabilities, for example by not allowing financial derivatives (which are the basic building blocks of hedging), there was little a company could do. Moreover, the different regulatory conditions faced by banks meant that insurance companies were effectively shut out of the market for purely financial products.

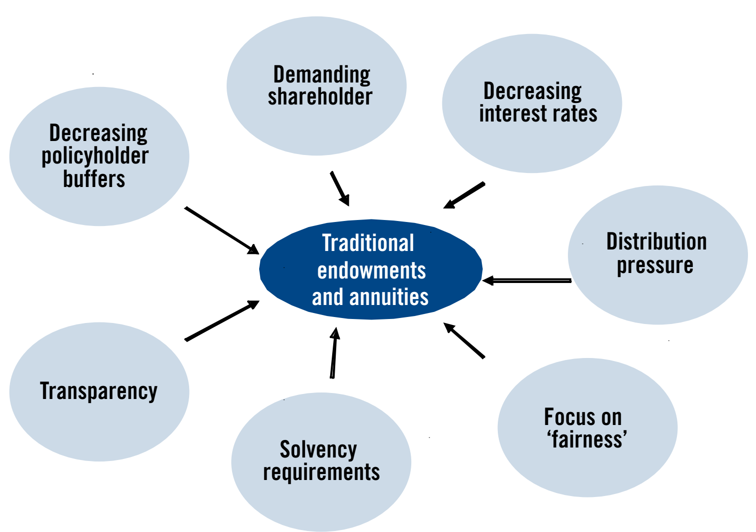
However, times do change. What, in many countries, would have been too complicated to do in the past, due to demanding regulatory constraints, can now be solved by making use of freedom of services in the EU. There are currently at least three countries in the European Economic Area (EEA) – Ireland, Luxembourg and Liechtenstein – where it is feasible to produce products that are linked to investment guarantees.

With the Financial Services Directive, a company is allowed to sell a product in one country – Germany, for example – while actually 'manufacturing' the product elsewhere – say, Ireland. This means that the policy appears as a liability in the Irish subsidiary's accounts of the multinational. By doing this, companies can choose, within the EEA, the regulatory environment that works most favourably in the treatment of these liabilities. It should be noted that the laws of the target country in which the product is actually sold still hold, such as treating customers fairly in the UK, other consumer protection laws and insurance contract laws.

NEW MODELS UNDER SCRUTINY

In spite of growing accessibility, a degree of hesitancy to introduce ULG products at all may continue for historical reasons. Guaranteed annuity options were seen to play a significant hand in the downfall of the company Equitable Life. This has meant some insurers are now resistant to all types of guarantee models. However, to succeed in the variable annuities market, confidence must be established that this type of product avoids the weaknesses of its predecessors. The design must bear up to the scrutiny from a wide audience (including customers, distributors and regulators) who may be nervous and sceptical about financial solutions with guarantees. So, if a company is going to introduce a product with guarantees then proper risk management, which involves hedging, is essential.

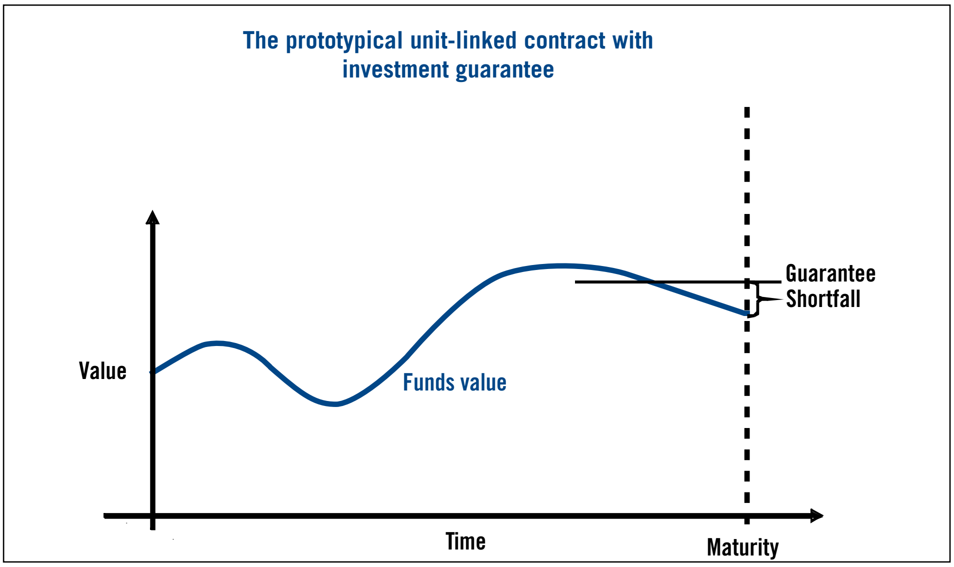
Traditional products lose advantages



SAFETY FIRST

Products are also changing. Traditional products that allowed companies to smooth out profits and losses now find themselves falling out of favour in the European market. Some responsibility for this adjustment can be attributed to the market crash at the turn of the century, which served as a powerful catalyst for greater transparency. Consequently, insurance products are now being compared with other investment products. This desire for greater transparency goes to explain the growing popularity of unit-linked products across the sector. Although the market may have changed shape, the underlying customer demand for long-term peace of mind remains and one limitation of these products, compared to their traditional counterparts, is their lack of guarantees. This explains the recent phenomenon of new unit-linked products with guarantees becoming popular in Europe.

The wide variety of unit-linked life insurance contracts typical to the European market is well known throughout the industry. The policyholder pays a single premium or regular premiums. The insurance company deducts expense charges and risk



premiums, and invests the remaining part of the premium in fund units, either mutual funds or funds created internally within the insurance company. The insurance company charges fees regularly to the funds account of the policyholder. Upon occurrence of a defined event, such as maturity, annuitisation or death, the policyholder receives the value of the funds account. Alternatively, the funds account can be converted into a traditional annuity or other benefit for the policyholder. These products have had remarkable success in Europe, admittedly in some countries more than others.

ULGs, on the other hand, provide an extra element of safety for the policyholder. The policyholder can choose between the value of the funds and a pre-defined guaranteed amount, which can depend on the development of the funds account. Thus, the policyholder always receives a minimum amount in case of the insured event.

FLEXIBLE DESIGN

In the US, ULGs (variable annuities), are currently commanding net assets under management of $1.3 trillion, and in Japan they have accumulated $80 billion in assets in just five years. It is important to note that this new American-style variable annuity bears little resemblance to the traditional annuity recognised in Europe.

The simplest example, which will be referred to throughout this paper, is that of a unit-linked product, financed by a single premium of say 80,000 Euros. In this case, the policyholder is entitled to receive the funds value at expiry, for example after 30 years (if he survives this term) or the funds value at time of death or surrender. The amount he receives at expiry has a minimum guarantee in nominal terms, for this example, of 100,000 Euros.

In the US market, a popular classification for these types of guarantees has emerged, classifying them according to the event where they guarantee a minimum payment:

GMAB: guaranteed minimum accumulation benefit, as in the example above.

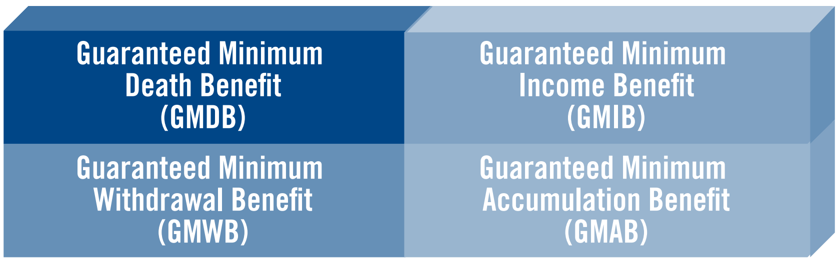
GMDB: guaranteed minimum death benefit.

GMIB: guaranteed minimum income benefit.

GMWB: guaranteed minimum withdrawal benefit.

By combining and tweaking these four simple building blocks, a sophisticated offer can be built. These four options also enable the provider flexibility in future product design as the target market profile changes. This has been demonstrated in the US where a myriad of over 40 different types of complex guarantees has been produced in the past 20 years. This is a continuously and rapidly evolving process; making provision of a full and up-to-date list of all these features a Herculean task. However, mapping the basic structure of these products (as above) is sufficient for the purposes of this paper.

Four basic building blocks of ULG products



Section 2: The impact of new products on the marketplace – a risk management perspective

OVER-EXPOSED

Once these new products are combined with the new regulatory framework, the unavoidable consequence of adopting a ULG is to make the level of risk very apparent. Also, once the commitment is made to provide a product with guarantees, an insurer needs to protect itself against the risk that the guarantees will become too onerous. Even if it is possible to value a ULG product and, thus, to determine a proper market price to charge the client, the product can still create a large risk exposure to the issuing insurance company. This refers to the situation where the issuing company, and not a third party such as a funds provider, gives the guarantee. The typical risks involved are:

- Financial risk: The funds value might be lower than the investment guarantee when exercised. The insurer then has to finance the resulting shortfall. This is, of course, the main risk of these products.

- Mis-pricing risk: For various reasons, the pricing of the embedded guarantee might not be adequate.

- Policyholder behaviour risk: The insurance company might value the products and structure its risk management based on assumptions about the policyholder's behaviour in different capital market scenarios. These assumptions might prove to be not conservative enough, exposing the insurance company to risk.

- Liquidity risk: The value of the guarantee and the capital markets might develop in a way requiring the insurance company to set aside more risk capital. The hedging operations used to mitigate the financial risks might require the insurance company to pass on assets to a third party as collateral while the policyholder amortises this asset only over time. If the insurer does not have sources for liquidity, these situations create a risk for the company.

- The risks associated with a dynamic hedging strategy, as outlined in the following section.

APPROACHING RISK MANAGEMENT

ULGs clearly have significant risks attached to them, typically economic in nature, which need to be mitigated. Fortunately, a lot of these risks and the perceived volatility that comes with them can be reduced with smart product design. 'Dynamic hedging' solutions can mitigate some of the risks, such as the typical market risk where the funds at payment date can be lower than the guarantee, but there are many other types of risks to be taken into consideration.

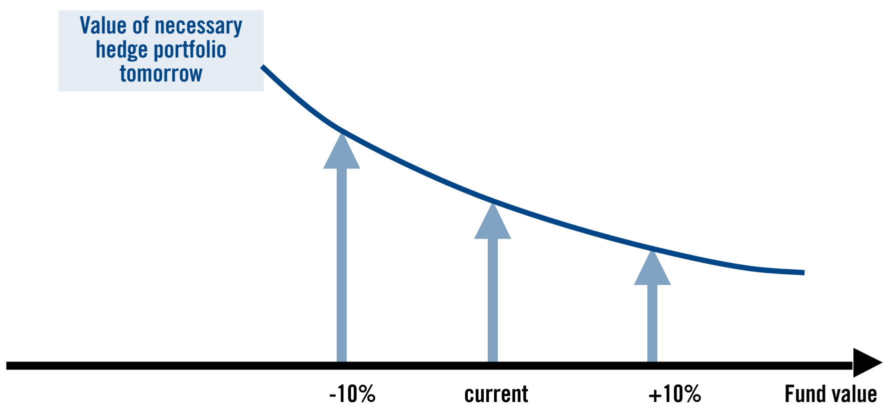
Product design is the most important aspect of risk managing a ULG product. It is astonishing how many risks can be eliminated or reduced considerably by smart product design. While there exists a number of possible options to help mitigate the remaining risks associated with ULG products, this paper focuses on an approach which allows the insurance company issuing ULG contracts to manage these risks internally using a method of sophisticated asset management called dynamic hedging. This approach can, of course, be combined with other measures, including reinsurance solutions or purchasing options from investment banks. In most situations a combination of sophisticated internal asset management and other measures is indeed the optimal strategy.

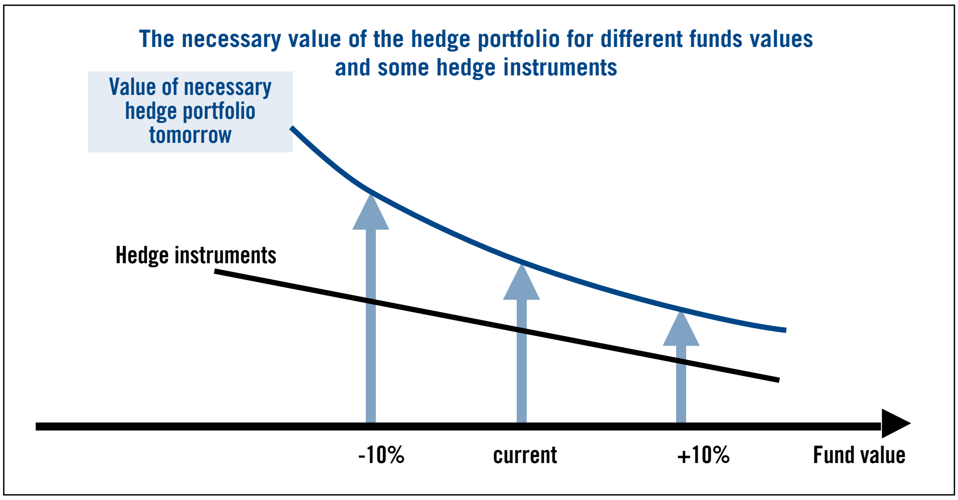
DYNAMIC HEDGING

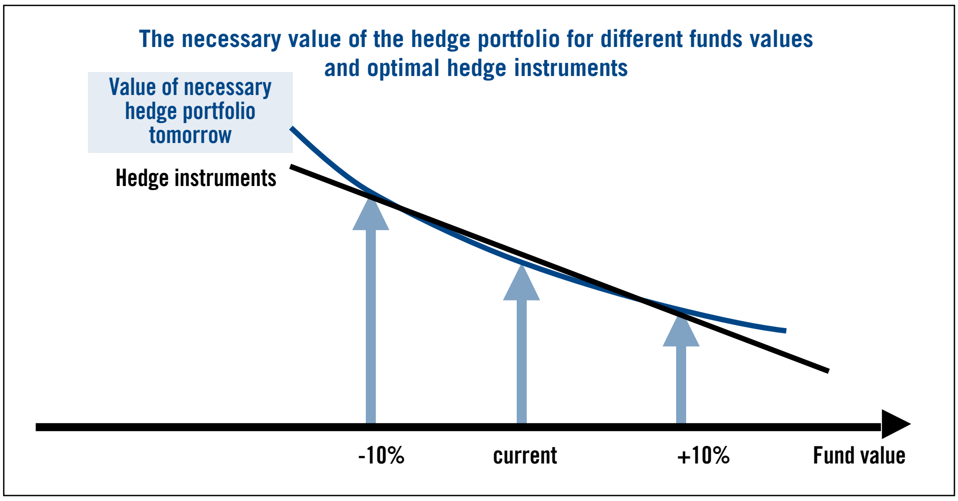
Dynamic hedging is an approach where, in addition to the usual funds associated with a unit-linked contract, a hedge portfolio is purchased and actively managed in such a way that all shortfalls arising from an investment guarantee can be financed by this portfolio under all possible financial market situations.

But how can this work? Let us assume that the value of the necessary hedge portfolio can be determined at any point in time and for any capital market situation. The methods which can be used to achieve this are described below. We can then determine the value that the necessary hedge portfolio should have tomorrow, for example, and in all possible market situations. Once this is visualised, we get a picture similar to the one below: The picture shows the value of the necessary hedge portfolio under the current market situation and, also, along various possible values of the underlying fund. The points where the value is 10% higher or lower are highlighted.

The necessary value of the hedge portfolio for different funds values







The next assumption is that there are financial market instruments, called hedging instruments, which show the same dependency on the risk factors as the necessary hedge portfolio. These particular factors include, for example, underlying funds-value and interest rates; for simplicity the graphs concentrate only on funds-value. We also assume that these instruments can be short-sold. This means that we receive a payment if the funds-value falls and vice versa. Typically, these hedging instruments show linear behaviour with the underlying variable, as illustrated in the picture above.

The trick now is to determine the exact amount of hedging instruments and cash required for the hedge portfolio, which consists of these instruments, to show broadly the same behaviour as the value of the necessary hedge portfolio.

If we succeed in this, then for any (small) change in the value of the underlying funds, the value of the necessary hedge portfolio and the value of the actual hedge portfolio will behave similarly.

Then, if we actually invest into this hedge portfolio, regardless of how the markets evolve until tomorrow, we will have roughly the necessary amount in the actual hedge portfolio to continue the hedging operations with no additional costs.

Given these assumptions, the value of the guarantee is equal to the value of the hedge portfolio at any point in time. In particular, the value of the guarantee at policy inception is simply the initial value of the necessary hedge portfolio.

Of course there will be small deviations between the value of the actual hedge portfolio and the value of the necessary hedge portfolio at the end of the period, usually called hedge-slippage, due to the fact that the hedge instruments do not perfectly mimic the behaviour of the necessary hedge portfolio. This is illustrated in the graphs above by the linear behaviour of the hedging instruments compared to the convex behaviour of the necessary hedge portfolio.

If such a hedge portfolio is purchased and we follow the above described active management, or “dynamic hedging approach”, then all shortfalls arising from an investment guarantee can be financed by this portfolio under all possible financial market situations. This is because:

- we always have an actual hedge portfolio equivalent to the necessary hedge portfolio;

- at maturity, the value of the necessary hedge portfolio is exactly the gap you need to fill, or zero if the funds-value is higher than the guarantee.

Dynamic hedging brings with it clear advantages over rival techniques. These include:

■ the ability to continuously adapt to changing market conditions;

■ the value created by managing hedging in-house;

■ limited credit risk;

■ a better knowledge of your risks;

■ a more flexible approach to product pricing and design; and

■ a reduced tail risk.

However, it is equally important not to be blind to the challenges that hedging may entail, besides the obvious complexity of this method. These include:

■ The remaining market risks, resulting from;

□ Hedge slippages;

□ Basis risk, due to active funds management and the presence of non-hedgeable assets in the under lying funds;

□ Exposures which are difficult to hedge, such as long-term volatility or correlation, and are left unhedged as a result.

□ Lack of market liquidity for hedging instruments.

■ Transaction expenses;

■ The necessity of continuous checks, controls and reporting;

■ Operational risks associated with the complex dynamic hedging schemes;

■ The requirement for sophisticated systems and expertise;

■ Liquidity problems arising from the fact that it is necessary to put up collateral for shorted instruments;

■ Policyholder behaviour risk associated with the capital market, which may not only be unknown but also deviate from the expected behaviour; and

■ Difficulties of obtaining required agreement internally.

Some people refer to sudden jumps in the stock market as a typical risk of hedging, but this is a risk which only exists if the value of the guarantee and the value of the hedging instrument do not behave similarly for such jumps and produce a high hedge-slippage (“convexity”). For this reason, this risk is a typical “non-linearity” risk and part of the hedge-slippage issue.

It is important to note that this approach scales linearly. In other words, for a portfolio of contracts this hedge operation does not need to be performed on a contract by contract basis. Instead, it can be established using the overall sensitivities of the whole portfolio and use these to determine the proper amount of hedging instruments.

As can be seen, there are three basic assumptions made:

■ The value of the necessary hedge portfolio can be determined at each point in time over the whole portfolio of contracts and for all sensitivities.

■ There are hedging instruments available at all points in time for all risk factors.

■ The hedge-slippage is small for small time intervals (“linearity”).

Section 3: How best to value unit-linked guarantees

The dynamic hedging approach described previously is based on the possibility of determining the value of the necessary hedge portfolio at any point in time and for any capital market situation. The value of the necessary hedge portfolio is exactly what financial economists would call the value of the option embedded into the unit-linked product, represented by the guarantee feature.

ULG products are nothing more than complex exotic financial options which, if possible, have to be valued using the methods of financial economics. There is no liquid secondary market for these products so the market prices of the embedded option – the investment guarantee – has to be determined by marking to model instead of marking to market.

Of course, there is a wide range of pricing techniques and numerical methods available in order to value such options. However, some of these products have features which make market-consistent valuation difficult.

Potential problems in valuing ULG products might be:

- Non-financial risk: There is no market for mortality exposure and longevity. If the benefits are linked to such events in a non-symmetric way finding market prices will prove problematic.

- Policyholder behaviour: One should assume that policyholders surrender policies when the guarantee represents a large value as opposed to when the guarantee represents a low value. While it would be conservative to assume that the financial behaviour of all policyholders is rational, we all know that this is not the case for several reasons. For example:

  - □ policyholders do not actively monitor their insurance policies;
  - □ tax effects;
  - □ frictional costs;
  - □ other benefits of the contract outweigh purely financial considerations.

As there is no market price for policyholder behaviour (or even derivatives on this), obtaining a market-consistent price if such effects are involved is far from straightforward.

- Basis risk: Typically, the underlying funds are actively managed and are difficult to replicate using either market indices or other instruments which could be easily valued. However, basis risk is usually a diversifiable risk.

- Long-term volatility: Insurance products are long-term products which, typically, can have terms of 30 years or more. Therefore, they can represent put-options on certain assets for these periods. But, there are no liquidly traded options on equity-indices available for these terms which would allow determining implied volatilities to be used in a market-consistent valuation. This issue is also a considerable source of risk as long-term volatility cannot yet be hedged efficiently. There are some providers of long-term volatility hedges, but the margins are usually quite high.

- Correlation: In a lot of cases the correlation between asset classes, notably between bonds and equity, is important. Few assets exist in the market to determine this parameter reliably.

All these issues have to be addressed by smart product design. We, therefore, focus on the valuation element and assume that the capital markets allow the necessary calibration parameters to be determined.

In order to value ULG products it is necessary to take a financial economic approach. An important valuation requirement is that the no-arbitrage assumption is valid. This means that cash flows which are similar for all possible future developments of relevant variables, such as asset prices and mortality, should have the same net present values.

It is a fact that in most cases no closed-form solutions are available for valuing the cash flows associated with ULG products, although good approximations exist for single and regular premium products. Therefore, other approaches have to be used to value ULG products.

The current best practice approach for valuing ULG products is to use stochastic simulation:

- Produce a sufficiently large set of market-consistent scenarios describing all relevant market parameters.

- Determine the cost of the option for each scenario.

- The (potentially weighted) average value over all scenarios is then an estimation for the value of the option.

In order to value a large portfolio of ULG contracts, market-consistent scenarios must be created alongside the determining of cash flows as implied by the guarantee for each scenario, at each point in time and for each policy. This process, not surprisingly, can be quite time-consuming. Nevertheless, this process must be carried out because, as we have seen, it is necessary to determine the value of the guarantee and its sensitivities for a proper risk management of these products. Since the hedge instruments are only assumed to match the necessary hedge portfolio for a small amount of time, these time-consuming stochastic simulations must be carried out frequently; potentially every day.

The full stochastic approach described above is a brute-force approach and it is common knowledge that many approaches of far greater elegance exist that allow companies to determine the value of the guarantee and its sensitivities for a large portfolio of contracts. These approaches use the most recent techniques of financial economics, like replication portfolios or change of measure-techniques. Tillinghast has specialist expertise in supporting providers of ULG products in using such techniques.

Section 4: What do insurers need to action now?

GET INSIDE KNOWLEDGE

As previously mentioned, insurers need to not only manage their risks but also be seen to manage them. Instead of taking direct responsibility for setting up a hedging programme internally, one option is to buy hedging services from a bank. However, not only is this significantly more expensive and less flexible, but it also risks sending the wrong message to stakeholders. Outsourcing to a bank does not fit well within the profile of a company responsible for taking charge of its own risk exposure.

At Tillinghast, it is believed that risk management – which is fundamental to the business of any insurer – is far more effective as a core competency of an insurance company than as a peripheral service to be outsourced to a third party. After all, much of the ability that is required for companies to do this in-house may already be in place, except for a select number of specialists tools that are necessary to take them to the next level, such as the capacity to set up and direct hedging strategies.

The importance of developing a risk culture internally, rather than outsourcing to an external body should not be underestimated. Hedging requires managers to analyse the risks that are carried by writing business and quantify what those risks are. This process also involves a clear appreciation of the risks within the business. Once this has been established, the board can make a judgement call, with open eyes, as to how much of that risk they are going to hedge and how much they are going to carry. This represents one of the final hurdles to launching a unit-linked product with an investment guarantee. Senior management needs to be totally confident that the product will succeed. In some instances pilot projects may be considered. This enables the products to be tested in order to iron out any pre-launch issues, create in-house confidence in the overall process and, if necessary, fine tune the product's structure.

A company will always be rewarded for good disclosure and risk management because it demonstrates a clear understanding of the risks that are being taken on and provides comfort around the risk management approach.

VALUE DETERMINATION IS KEY

At first glance, there may appear to be a daunting selection of hurdles to clear in order to successfully hedge unit-linked life insurance contracts with investment guarantees. However, the good news is that this type of product is underpinned with proven techniques, from stochastic modeling to hedging activities and interactive distribution tools. Global consultancies, such as Tillinghast, have developed considerable expertise and specialist knowledge on how best to identify and mitigate the risks associated with ULGs, based on experience in established markets such as the US and Japan. Given the speed at which ULGs are spreading across the European market, now may be the time to take a closer look.

CONTACTS

For further information, please contact:

Tigran Kalberer +41 44 218 1234
tigran.kalberer@towersperrin.com

Manuel Sales +44 20 7170 2582
manuel.sales@towersperrin.com

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ABOUT TOWERS PERRIN & TILLINGHAST

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The firm has served large organisations in both the private and public sectors for 70 years. Our clients include three-quarters of the world's 500 largest companies and three-quarters of the Fortune 1000 US companies.

Our businesses include Tillinghast, HR Services and Reinsurance.

The Tillinghast business of Towers Perrin provides global actuarial and management consulting to insurance and financial services companies and advises other organisations on risk financing and self-insurance. We help our clients with issues related to mergers, acquisitions and restructuring; financial and regulatory reporting; risk, capital and value management; products, markets and distribution; and financial modelling software solutions.

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