



Ortec Finance bv

Boompjes 40
3011 XB Rotterdam
The Netherlands
Tel. +31 (0)10 700 50 00
Fax +31 (0)10 700 50 01

Ortec Finance bv

Barajasweg 10
1043 CP Amsterdam
The Netherlands
Tel. +31 (0)20 700 97 00
Fax +31 (0)20 700 97 01

Ortec Finance Ltd

23 Austin Friars
London EC2N 2QP
United Kingdom
Tel. +44 (0)20 3178 3913
Fax +44 (0)20 3178 6164

Ortec Finance AG

Poststrasse 4
8808 Pfäffikon SZ
Switzerland
Tel. +41 (0)55 410 38 38
Fax +41 (0)55 410 80 36

www.ortec-finance.com

Insurance Risk Management:

Product Development

ORTEC
FINANCE

ORTEC
FINANCE

Product Development

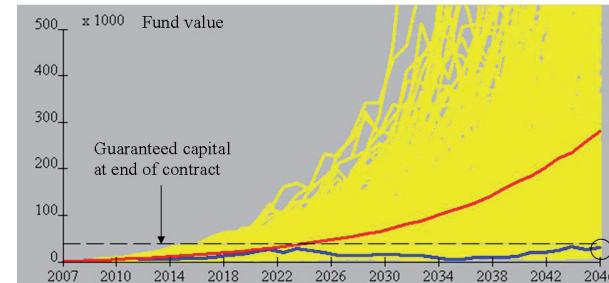
Risk Management Solutions for Insurers

When developing new insurance products, important parameters must be set regarding the pricing of such products. This becomes especially clear if the product under development concerns a unit linked investment product with some sort of capital or return guarantee. Besides calculating the current value of such a guarantee, it is useful to establish a fee which has to be charged to the policy holder in order to cover the cost of the guarantee. One may, as a next step, also use this fee to hedge the financial risks with available financial instruments.

Analysis of a unit linked product

A unit linked investment product with a capital or return guarantee may cause a significant amount of risk for an insurance company. Gaining insight in the magnitude of this risk is extremely important, even when the product is still in the development phase. Ortec Finance's ALM model for insurers offers the possibility to model a unit linked product in detail by defining model points that contain the age, time to maturity and the asset allocation of (groups of) policy holders. Using this information it becomes possible to analyze the risks that originate from the guarantee in detail. An example of such an analysis is shown in the figure below. In this case, there is a significant possibility (9%) that at maturity the fund value will be insufficient with respect to the guarantee level. Hence, the probability of incurring costs for the insurance company cannot be ignored.

The advanced Monte Carlo module of Ortec Finance's ALM model can provide an exact valuation of the expected cost of this guarantee. In order to obtain such a market-consistent valuation, the Monte Carlo module is first calibrated on relevant data like the interest rate curve and market prices of traded instruments (e.g. stock options). Using this calibrated model, we find that the current value of the guarantee is equal to 1192.

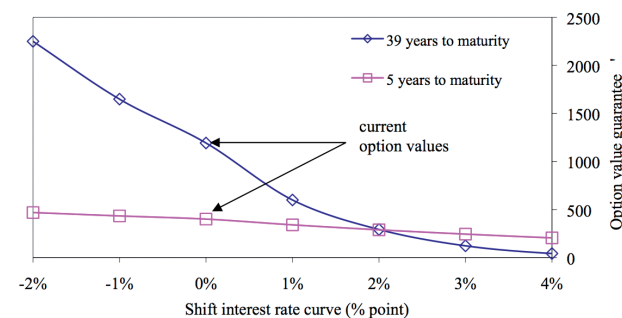


Risk analysis of a unit linked guarantee. We here consider a policy which starts at the end of 2007. A net premium of 1,000 is invested annually during 39 years. All premiums are invested in a stock fund. There is a 0% return guarantee, which means that when the contract matures the policy holder will receive at least the total amount of invested premiums (39,000). The horizontal line is the level of the guaranteed capital. We show different scenarios for the development of the invested capital. The red line shows the average value over all scenarios; the blue line shows a selected scenario for which the invested capital is (just) below the guaranteed capital when the contract matures.

This figure shows that the value of the unit linked guarantee increases for both policies when the interest rate drops. Notice, however, that the impact of a changing interest rate is especially large for the contract with a long maturity. This is due to two factors. First, the average equity return decreases for a lower interest rate in the applied risk-neutral valuation model. These low equity returns lead to a high payoff when the guarantee option expires, especially when the time to

maturity is large. Second, a low interest rate level also implies that the discounted value of the guarantee payoffs will become larger.

It is important to note that the risk analysis and valuation presented in this example is highly depending on aspects like the interest rate level and the time to maturity of the contract. This becomes clear in the following figure



Sensitivity of the option value of the unit linked guarantee with respect to the interest rate level and the time to maturity of the contract. For both policies a premium is invested annually; they also both have a 0% return guarantee on all invested premiums. The only difference between these policies is their time to maturity: respectively 39 years and 5 years. The effect of the interest rate level is studied here by applying a parallel shift of the current interest rate curve.

Determining an appropriate fee structure

Using the above simulation and valuation techniques an insurer is able to get insight in the (expected) costs associated with unit linked return guarantees. As a next step, it is also possible to determine fees which depend on the risk and return of the specific funds and the age of the policy holder. Because the applied valuation techniques in Ortec Finance's ALM model are broadly applicable, it even is possible to determine appropriate fees if the underlying investment strategy becomes quite complex (for example depending on the age of the policyholder).

As an example, we consider different investment strategies, ranging from an aggressive equity fund for a young (20 year old) policy holder to a conservative fixed income fund for a 55 year old policy holder. We assume that the contracts expire at the retirement age (65 years). The mix fund consists of 70% fixed income and 30% equity; for the life cycle fund the investment mix is age dependent and shifts from equity for young investors to fixed income for older investors. The next table represents the option value of the guarantee in terms of the number of basis points that are withdrawn from the realized return of the fund. Since the applied valuation technique can be used for arbitrarily complex investment strategies (life cycle funds, dynamic investment strategies, etcetera) the insurer has almost unlimited possibilities when designing the product at hand.

Guarantee						
Age	Maturity	Fund type	0%	1%	2%	3%
20 year	45 year	Equity	20	37	72	153
20 year	45 year	Mixed	8	19	42	103
20 year	45 year	Fixed income	4	11	28	77
20 year	45 year	Life cycle	7	17	39	97
40 year	25 year	Mixed	15	31	64	138
40 year	25 year	Fixed income	4	11	29	79
40 year	25 year	Life cycle	8	19	44	105
55 year	10 year	Fixed income	38	67	115	197

Value of a unit linked return guarantee in terms of the number of basis points withdrawn annually from the fund. The number of basis points that is withdrawn is based on a "break-even" analysis, which means that the option value of the guarantee equals the present value of the withdrawals. The option value of the guarantee is determined using 5,000 risk-neutral scenarios for the equity returns and the interest rates. The guarantee percentage (ranging from 0% to 3%) is the guaranteed return on the invested premiums.