

Plan

- ▶ Example Cash Flow analysis
- ▶ Equity linked insurance (based on Chapter 15 DHW)
- ▶ Unit-link insurance
- ▶ Deterministic profit testing for equity linked insurance

Cash flow analysis - example

A life insurer is planning to launch a new five year endowment assurance. There is some debate over the final product design so the following results have been produced for two options, A and B.

Option Profit Signature: A : (-1125 345 505 531 300)
B : (-603 146 256 224 451)

The insurer wishes to proceed with the product with the shortest discounted payback period, using a risk discount rate of 9% per annum.

- Determine which design the insurer should choose.
- Explain why the discounted payback period is a useful profit criterion for the insurer.

Cash flow analysis - example

c) The design that you have identified in part a) will be sold to policyholders aged 35, for a premium of \$2,000 payable annually in advance. Calculate the profit margin that the insurer will receive on the contract, on the following basis: Mortality AM92 Ultimate Life Table. Risk discount rate is 9% per annum.

Cash flow analysis - example

	V	0.917431193	
		discounted	cdf
A	-1,100	-1009.1743	-1009.1743
	345	290.3796	-718.7947
	500	386.0917	-332.7030
	530	375.4654	42.7624
	200	129.9863	172.7487
		172.7487	

Cash flow analysis - example

	v	0.917431193	
		discounted	cdf
B	-608	-557.7981651	-557.798
	145	122.043599	-435.755
	243	187.6405857	-248.114
	240	170.0220507	-78.0919
	386	250.8735151	172.7816
		172.7815853	

Cash flow analysis - example

- a) The insurer would choose contract *A* because it has a *DPP* of 3 years compared to contract *B* which has *DPP* of 4 years.
- b) Insurers only have limited amounts of capital. The *DPP* measures how quickly that capital is returned to the insurer so that they can invest in selling new policies.

Cash flow analysis - example

c) From AM92 we get q_x :

q_x	x
0.000689	35
0.000724	36
0.000765	37
0.000813	38
0.00087	39

Cash flow analysis - example

Year	probability	dicount	premium
1	1	1	2000
	0.999311	0.917431193	1833.598
	0.998587	0.841679993	1680.981
	0.997822	0.77218348	1541.003
	0.997009	0.708425211	1412.613
			8468.196
		Profit margin	2.04%

Equity Linked Insurance

- ▶ Modern insurance contracts where the main purpose of the contract is investment.
- ▶ These contracts include some life contingent guarantees, as a way of distinguishing them from pure investment products
- ▶ Equity-linked insurance - has an endowment insurance structure with a fixed term and benefit paid on earlier of the policyholder's death and the end of the contract term.
- ▶ The policyholder pays a single or regular premium which, after deducting expenses, is invested on the policyholder's behalf.
- ▶ The accumulating premiums form the policyholder's fund.

Equity Linked Insurance

- ▶ Regular management charges are deducted from the fund by the insurer and paid into the insurer's fund to cover expenses and insurance charges.
- ▶ On survival to the end of the contract term the benefit may be just the policyholder's fund and no more, or there may be a guaranteed minimum maturity benefit (GMMB).
- ▶ There may also be a guaranteed minimum death benefit (GMDB).

Unit Linked Insurance

- ▶ In the UK the policy holder is deemed to buy units in an underlying asset fund (hence unit-linked)
 - ▶ the bid-offer spread:
 - ▶ if a contract is sold with a bid-offer spread of for ex. 5% only 95% of the premium paid is actually invested in the policy holder's fund; the remainder goes to the insurer's fund
 - ▶ the allocation percentage
 - ▶ if 101% of the premium is allocated to units at the offer price and there is a 5% of bid-offer spread then 101% of 95% of the premium (which is 95.95%) goes to the policyholder's fund and the rest to the insure's fund.
- ▶ The bid-offer spread mirrors the practice of competitors for other types of investments.

Deterministic profit testing for equity-linked insurance

- ▶ Process similar to what we have done before
- ▶ We need to separate cashflows that are in the policy holder's fund and those that are income or outgoes for the insurer
- ▶ Note that we need to look through the insurer's perspective
 - ▶ we need to project first the cashflow of the policy holder's fund and use this to project the cash flow of the insurer's fund
 - ▶ the projected cashflows for the insurer's fund can be used for calculating project vector, profit signature, NPV, IRR, profit margin