Tutorial 2 semester 1 2020: valuation

Question 1

You have been asked to investigate cash flows arising from a home equity release product sold by a retail bank.

The main features of the product are:

* it is sold to individuals and to couples, on a last survivor basis;
* the amount of loan depends on the age of the policyholder at outset and ranges from 20% to 50%;
* the minimum age is 60 for males and 63 for females (and you may assume this is legal);
* the loan is repaid on the death of the policyholder;
* the amount repaid is the lower of the house price, net of associated sales costs, and original loan increased daily by a variable rate of interest;
* the variable rate of interest is defined as the inflation rate plus 5%; and
* early repayment is possible but exit fees apply.

1. Sketch a few diagrams that illustrate cash flows that may arise under the contract. Provide a brief explanation below each graph.
2. By using your diagrams, or otherwise, explain how the health of policyholders affect the value of the product.

Suppose the product terms are amended so that the loan is repaid when a policyholder moves into a care home.

1. Construct a multiple decrement table assuming the appropriate mortality rates are those in the spreadsheets in Module 5 and that the rate of moving into a nursing home is 1% per annum from ages 60 – 70, 3% p.a. for ages 71-75, and increasing by 2% p.a. for each subsequent year of age.
2. What is the mean date at which the loan is repaid with the amended policy conditions and how does that compare with the mean date under the original policy conditions.

Answer to Question 1

An outline solution is discussed in the tutorial via the spreadsheet LI&R Valuation

Did you consider from whose perspective – policyholder or bank?

What scenarios did you consider. For example, you could consider policyholders who die early, as expected (i.e. life expectancy) and late.

Loan value increases with CPI + 5% - house price inflation by CPI + retail property risk premium but the latter may be volatile and hard to measure? Did you consider different growth rates e.g. what happens if a sale occurs following falls in house prices?

Did you allow for a small value of on-going expenses?

What about the expenses on selling the asset? What about timescale for selling the asset? For example, the price sought by the bank may be on a quick sale basis and less than current market value.

How did you label your sketches? Did you provide some words to explain the diagrams?

Key learning points:

* + - 1. Setting out the spreadsheet
      2. Discussing implications
      3. Multiple decrement table.

Question 2

Outline the benefits and risks to both the purchaser and the seller of no-par, par and investment linked immediate lifetime annuities.

Outline answer

You need to begin with a definition of the three types of contracts.

Note that there were no questions on the discussion board on whether the annuities were of a fixed term, deferred or immediate. This document has been altered to clarify that the question was on immediate annuities. It feels odd that not one student wanted clarification?

I think the definition in the textbook needs amending (page 27) - what are your thoughts?

An immediate annuity provides a series of payments to a policyholder, on known dates, provided that he policyholder is alive on those dates and that the policyholder has paid the initial premium.

There are many variations in terms of the life protected. The main variants are: single life, joint life first death where payments cease on the first to die, joint life last survivor where payments cease on the last to die.

A common version pays a balance of the purchase price and income received by the policyholder.

The frequency of payments is contractually defined e.g. monthly.

Payments are defined via a formula:

Non-par – the formula will state that payments are fixed, increase by a known amount (e.g. 3% per annum0 or inflate in line with an index (e.g CPI).

Investment linked annuities define the number of units that will be paid. The insurance company will convert the number of units from the currency of units into the local currency (e.g. AUD).

Par annuities are more complicated and have a variable payment depending on how bonuses are declared.

All contracts protect the purchaser against longevity but there is the risk that they die early and receive poor value for their premium. The converse is true for the provider.

Fixed non par provide a higher income initially than those that inflate but are exposed to inflation risk. The purchaser is not exposed to assets being insufficient to pay for benefits as that risk is borne by the insurance company. The insurance company is exposed to expense risk as they have no ability to recover excess expenses.

Investment linked annuities provide an income that will vary in line with underlying movements in the investment linked fund. The more volatile a fund leads to a more volatile income. That may be a risk for some but desired by others, especially of the price of the increased volatility is a higher mean return. Similar comments apply to longevity, expenses, and assets.

Par annuities by definition share risks. (Many of the points here are beyond what I expect in this subject.) The risk sharing may be restricted to asset sharing or there may be pooling of mortality risk either across all policyholders or by defined cohorts (c.f. the CIPR products under discussion in Australia). Policyholders anticipate future bonuses and thus face a risk of income reduction although higher bonuses through good investment returns are possible. There will be a minimum guaranteed level of payment that provides some protection and consequently provides a risk to the life company. Expense risk is usually borne by the insurance company.

As an exercise – reword the above in a table format.