Summary Report on Pension Product Profitability

# Objective

Sunset Life are developing a new pension investment product called the ‘Simple Saver’. This report covers the results of the analysis of profitability on this product, taking expected future sales into account.

The Government has also just announced that it is changing the regulations to limit the charge that can be levied on early exit prior to an individual’s retirement date. In the Pricing Team we have investigated the potential impact of this change. Specifically, we have investigated:

* The impact on the profitability of the product as a result of the new regulation capping charges on early exit; and
* The required change in fund charges needed to offset the impact of the new exit charges, and maintain profitability at the level it was before the regulation.

# Data

The following data was provided:

* Product specification, provided by the Marketing Actuary. This includes information on all charges, product limits and parameters.
* Pricing basis, provided by the Pricing Actuary. This covers investment growth, interest rates, mortality, exits, expenses and inflation to be used in determining product profitability.
* Expected future sales, broken down into low, medium and high term and premium categories. Total sales are expected to be $1m in the next year.

The data was checked for reasonableness, and there is no reason to doubt its accuracy.

It is suggested that the data provided be validated further.

# Assumptions

The following assumptions have been made in completing the analysis:

* Premiums do not escalate, and remain level over time.
* The simplified pricing basis (including a flat mortality rate) is appropriate for the purposes of this investigation
* Exit and mortality rates apply linearly over the course of the year, and are independent of each other.
* The ongoing expense applies monthly, from the first month of the policy.
* The fund charge applies to the fund value at the end of each month.
* Sales take place on the first day in the year, and profit figure is given as at that date.
* **Initial expenses include all charges involved with launching this product i.e. including marketing costs, sales costs.**
* **The discount factor proposed is suitable to determine the profitability of the product and it is reasonable that this remains fixed over the policy term.**
* **The new regulations on Exit charges apply immediately and there is no transition period.**
* **Sunset Life will levy the maximum possible charge under the new regulations.**
* **The change in charging structure of the product will not affect sales levels in the future.**
* **The change in exit charges will not change the number of policies lapsing through withdrawal or early retirement.**
* **There will be no future changes to Government regulations.**
* **The sales figure provided by the Marketing Actuary are realistic, and are appropriate for use in the pricing process.**
* **The Low, Medium and High Premiums chosen are a good representative of the new policies that will be sold.**
* **There will be an even split of new business premium across the nine sample policies chosen.**
* **The three terms chosen are suitable for pricing potential future product sales.**

# Methodology

In order to allow the model to easily be applied to a number of different scenarios, the projection of each policy was split up into three pieces.

Firstly, the probability of a policy being active was calculated. At the start, this is 1, but each month, the probability of death and exit will reduce the probability of a policy being active. The probability of death is equal to the mortality rate (divided by 12 to get the monthly rate) multiplied by the probability of a policy being active at the start of the month.

Similarly, the probability of exit is equal to the exit rate multiplied by the probability of a policy being active at the start of the month. The probability of a policy being active at the start of a month is calculated as the probability of a policy being active at the start of the previous month less the probability of death less the probability of exit for that month.

Next, the fund value projection for a premium of $1 was modelled. The fund projection is:

Fund at end of month = fund at start of month + premium of $1 + investment return – fund charge

The investment return is the fund at the start of the month plus a premium of $1, multiplied by the monthly investment return (which is annual investment return divided by 12).

The fund charge is calculated based on the fund value at time t multiplied by the monthly fund charge percentage.

Note that because the charges and investment return are defined as proportions of the premium, this fund projection can be used for any premium level – it can be multiplied by the actual allocated premium to determine the appropriate fund value.

The expenses as per the pricing basis are also calculated for each month. In month 1, this is the initial expense plus the renewal expense. From month 2 onwards, it is the renewal expense increased by a monthly inflation rate. The annual inflation rate is divided by 12 to get the monthly rate.

Finally, a range of term and premium scenarios are projected. For each combination of premium and term, the following calculations are performed for each month of the projection:

* The premium charge (premium multiplied by premium charge percentage)
* The fund charge (from the fund projection, multiplied by the allocated premium).
* The exit charge, which takes the probability of exit for that term and multiplies it by the expected fund value at that point in time and applies the exit charge percentage at that term.
* Profit, which is the sum of the policy charge and the exit charge, less the expenses calculated earlier.
* Discounted profit, which is the total of profit for each month plus the discounted profit from the following month discounted to the start of the month using the monthly discount rate from the pricing basis. A recursive approach is adopted here.

There are nine combinations of premium and term, and thus the above calculations are completed nine times. The discounted profit for each combination is divided by the first year’s premium to return a profit percentage. This is done individually for each sample policy combination. The unweighted average is then taken of the nine profit percentages to get the total profit percentage for the product. This is multiplied by the expected sales to get the profit amount for the next year.

In order to determine the impact of the change in exit charges, the projections were run again, using the lower exit charges as imposed by the government. These calculations were completed on the same basis as above but the exit charge was calculated using the new exit charge structure i.e. the alternative exit charge percentages were applied. All other parameters were kept the same.

To restore the overall level of profitability of the product to the original value, ie before the exit charge change, we have determined a new fund charge. The fund projections were completed using the updated fund charge. As the fund values will have changed as a result of this, the profit projections were also recalculated. In order to determine the new fund charge, the charge was varied in the model so that the expected profit amount from this scenario was equal to the expected profit amount from the original scenario.

# Results

The profitability of the sample policies (before allowing for the cap on exit charges) is summarised in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Monthly Premium** | | |
| **Term** | **$50** | **$100** | **$200** |
| **5** | -25.2% | -9.6% | -1.8% |
| **10** | -6.4% | 8.9% | 16.6% |
| **15** | 15.3% | 30.8% | 38.6% |

The average profitability across these sample policies is 7.5%. Based on the expected sales in the next year, the total expected profit figure is £ 74,599.

The policies with the higher terms and premiums have the higher profitability. This is because the discounted value of the charges is less than the discounted value of the costs for these policies. This is primarily a result of the costs being fixed in monetary terms whereas the charges are based on premiums and fund values. Fund values will increase for longer terms and this will result in higher charges.

Increasing the term improves profitability more than increasing the premium.

The following graph shows the expected profit of policies varying by Term:

Policies with the lowest term of 5 years have a negative profit percentage. There is an initial cost for Sunset Life of each policy of $200 but there is no initial charge incurred by policyholders. This cost therefore needs to be recouped over the term of the policy which, for shorter term policies, is insufficient. Conversely for higher term policies, there is the highest profitability as the initial costs are more than recouped.

Similarly the profitability is higher for policies with higher monthly premiums as illustrated in the graph below.

This is again reasonable as costs are fixed monetary amounts whereas charges applied are based on premium and fund values. Policies with higher premiums will result in higher fund values and therefore the charges payable to Sunset Life based on premiums and fund values will be higher. Note for the policy with a $200 premium, there is no premium charge. However the fund charge for this policy will be higher because the fund will grow sufficiently high such that the fund charge becomes significant, particularly for policies with higher terms.

The following graph shows the development of annual undiscounted profit on a policy with a 10 year term and a monthly premium of $100, together with the accumulated discounted profit:

It can be seen that apart from the first year, the product produces a net annual profit. This means that charges exceed expenses in every year except the first.

However, it takes more than 6 years for the accumulated profit to become positive. This is reasonable given the loss in the first year is significantly higher than the profit made in the second year.

The charges relating to fund value will increase exponentially as time progresses because the fund value will increase significantly over time. This explains the increase in the profit from year 2. As annual profit is continually increasing, the accumulated profit increases exponentially.

Following the introduction of government’s cap on exit charges, there is expected to be a reduction in the overall total profit to $48,477, or 4.8% of the first year’s premiums. This is illustrated in the following graph:

This is because the pricing basis includes an assumption for exit rates, and for each exit taking place 2 or more years before retirement, the exit charge will be lower under the government’s proposal. In particular, for exits which occur within 5 years of retirement, no exit charge will be payable (whereas under the existing approach, an exit charge is incurred between years 2 and 5). In addition, the existing percentage charges applied by Sunset Life is higher than the 1% cap.

The lower exit charges will only reduce income for Sunset Life and there is no corresponding reduction in the charges received by Sunset Life. It is therefore reasonable that there will be a reduction in expected profit.

In order to counteract this reduction in profit, it is proposed that the fund charge be increased to produce more profit. This is achieved by an increase from 1%p.a. to 1.1%p.a. in the fund charge.

This is a relatively small increase. However, the increase in the fund charges received by Sunset Life later in a policy’s life will be significant as fund values will be high given the length of time premiums have been received and given the assumed positive investment returns.

In addition, the change in exit charges only impacts the policies expected to lapse. Over a 15-year period, it is expected that around 50% of the policies will lapse so the change in exit charges only impacts 50% of policies.

It also results in policyholders who remain paying more in charges than those who leave early, which is perhaps an undesirable form of cross-subsidisation.

The impact of profit for the sample policies is shown in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Monthly Premium** | | |
| **Term** | **$50** | **$100** | **$200** |
| **5** | -24.8% | -9.1% | -1.3% |
| **10** | -6.2% | 9.4% | 17.2% |
| **15** | 14.1% | 30.0% | 37.9% |

It can be noticed that the profit percentage for the middle policy is slightly higher in this scenario. In addition, the spread of possible values is slightly reduced – the lowest and highest profit percentages (for 10 year/$50 premium and 15/$200 premium policies respectively) are closer to the middle than in the original scenario.

These calculations are been based on assumptions about the future. Actual profitability of the product will depend on the types of policies bought, and actual experience.

# Next Steps

Validate the information provided by the various actuaries. In particular, the parameters for the new product and the details of the new regulation should be checked.

Verify that the proposed discount rate is appropriate for the Sunset Life’s pricing basis.

Build a more sophisticated cash flow model capable of running more model points and building a more accurate picture of the expected profit. This would use a wider range of premium sizes and terms.

Update the model so that premiums can vary over time or increase in line with inflation.

Investment return and inflation could be modelled stochastically to get a range of possible fund growth profiles to better understand the impact of fund growth on profitability.

Consider the impact of an extreme event such as a market crash, resulting in a one-off reduction of fund values or a large proportion of policyholders lapsing in any one year.

Sensitivity test product pricing basis. In particular, expenses (both initial and renewal) should be varied.

Changing lapse rates should also be investigated to understand whether this has a significant impact in the context of the change in regulation.

Validate sales figures for next year – are these realistic in the current environment? Is the assumed premium and term mix in line with our current sales experience? These figures should be sensitivity tested, especially balance of low / high terms & premiums.

Allow for inflation and investment returns that varies over time.

Increase profit by increasing premium charge instead of fund charge. This brings charges earlier in the policy lifetime, and is therefore less risky.

Enhance the model to allow for the need to hold reserves, such as Solvency II requirements.

Consider the impact of capital strain the ability to sell the product. Take the cost of capital into account in determining overall profitability.

Consider alternative sales channels where initial expenses may be lower.

Take tax on company profit into account.

Find a charging structure which maximises return to the policyholder that doesn't exit, such as levying higher charges early on in the policy. This could be a higher premium charge in the early years of the policy.

Do market research on acceptability of increased fund charge. Find out whether other options exist to increase charges or improve profitability that would be more appealing to potential customers.

Update the model as time progresses to allow for actual experience, especially for mix of actual sales

Obtain a peer review of the work performed