
Dynamic Policyholder Behaviour Survey

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What is Dynamic Policyholder Behaviour (DPB)?

Dynamic Policyholder Behaviour (DPB) reflects the fact that a policyholder's propensity to exercise options available in a life insurance policy can be influenced by external factors.

Types of options which can be impacted by DPB on traditional products include:

- early guaranteed lapse / surrender
- guaranteed annuity options
- option to pay additional premiums on guaranteed terms
- option to extend the original policy term on guaranteed terms

External factors which can influence the policyholder's behaviour include:

- economic conditions
- customer type
- distributor
- tax / regulation
- secondary markets
- public perception, publicity

Background

Recent industry developments mean that life insurance companies need to consider DPB in their modelling.

MCEV Principles (European Insurance CFO Forum Market Consistent Embedded Value Principles¹) require:

- inclusion of DPB in TVFOG where material
- that impact of management discretion in TVFOG should allow for policyholders' reaction

Solvency II latest proposals:

- Best estimate of liabilities should include allowance for DPB:
 - assumptions should be appropriately based on statistical and empirical evidence where representative of future expected behaviour
 - include allowance for increasing awareness of policy options and policyholder reaction to reduced solvency position of company
- SCR stress scenarios and internal models should include impact of DPB

Critical areas of the management of life insurance companies are impacted by DPB:

ALM: DPB is generally non-hedgeable

Product pricing and design: DPB affects TVFOG and economic capital required

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Objective of the survey and methodology

During the second half of 2009 a survey was carried out to analyse:

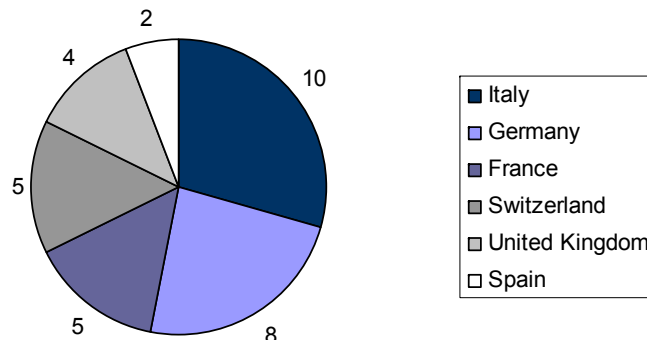
- the extent to which European life insurance companies model DPB
- for what purposes they use this modelling
- the structure of these DPB models and how they were derived

The survey covers **traditional participating business** with guaranteed surrender values, guaranteed maturity values and/or guaranteed annuity options. This therefore excludes, for example, unit-linked, index-linked or variable annuity products. In the UK, however, this could include unitised-with-profits products.

34 companies from 6 countries took part in the survey, including subsidiaries of multinationals and domestic companies. The questionnaire was either administered face to face or sent to companies.

A further survey is planned in 2010. Insurers who are interested in participating in this survey should contact their local Milliman office or write to dpbsurvey@milliman.com

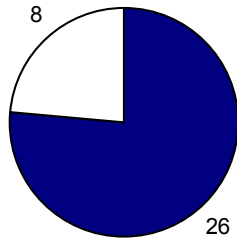
Geographic split



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A majority of companies model DPB for at least one type of guarantee.

Modelling of DPB



■ Some DPB modelled □ No DPB modelled

26 companies model DPB for at least one type of guarantee.

Reasons for not modelling any DPB vary:

- statistical analysis of experience showing insufficient correlation between policyholders' behaviour and market conditions
- the view that policyholders are not sufficiently informed to exhibit dynamic behaviour
- complexity of implementing DPB approach

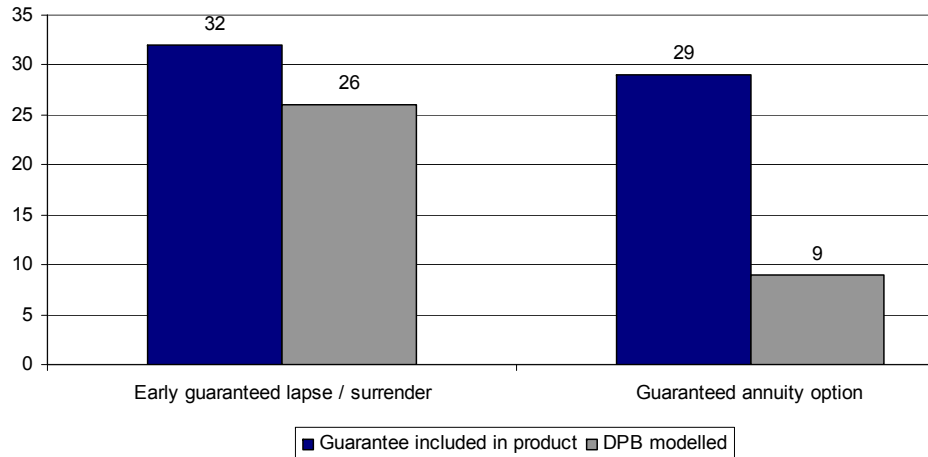
Some companies which do not currently model DPB are considering developing a DPB approach, in particular in the context of the run up to Solvency II.

Observations

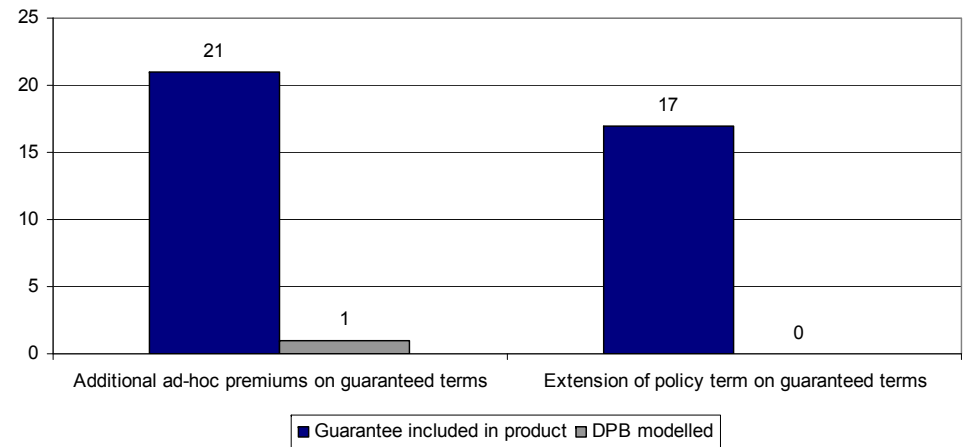
- The authors believe it is important to make at least some allowance for DPB, even when it is difficult to know the level of client rationality. In our view not assuming any dynamic behaviour is not a neutral assumption, but instead represents an explicit assumption that clients are not at all rational. A more neutral / prudent assumption would be to assume some level of dynamic policyholder behaviour.
- Just because there is no statistical evidence of rationality in past experience does not mean that policyholders will never act rationally in the future. For example, this could happen under more extreme economic scenarios than have been observed in the past data or as the level of public awareness of the value of embedded options increases over time.

Early guaranteed lapses / surrenders is the guarantee for which DPB is most frequently modelled.

Modelling of DPB by type of guarantee



Modelling of DPB by type of guarantee



Observations

- Early lapse/surrender is a key option in this type of product and this is reflected in the high level of companies modelling it as DPB.
- We feel that companies should consider modelling DPB for GAOs. Current low take up rates do not necessarily imply that this would continue in the future in extreme market conditions, particularly given the transparent nature of the value of this option.

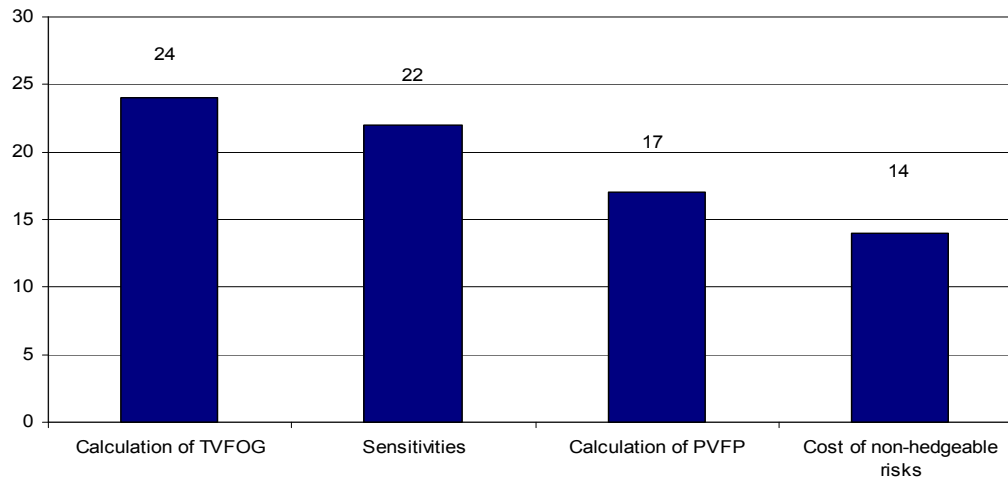
Observations

- Some consideration should be given to DPB for the option to pay additional ad-hoc premiums on guaranteed terms, particularly when considering extreme scenarios for economic capital purposes. In particular this can be an “open ended” guarantee.
- DPB should be considered for the option to extend the policy term on guaranteed terms as it could have a similar impact to dynamic lapses.

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Companies modelling DPB include modelling of DPB primarily for the purpose of MCEV / EEV.

Use of DPB modelling for MCEV / EEV purpose

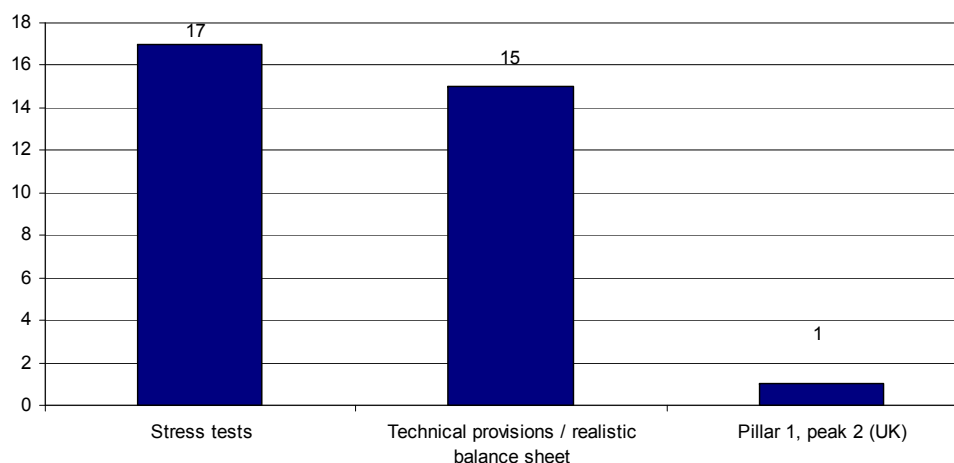


Observations

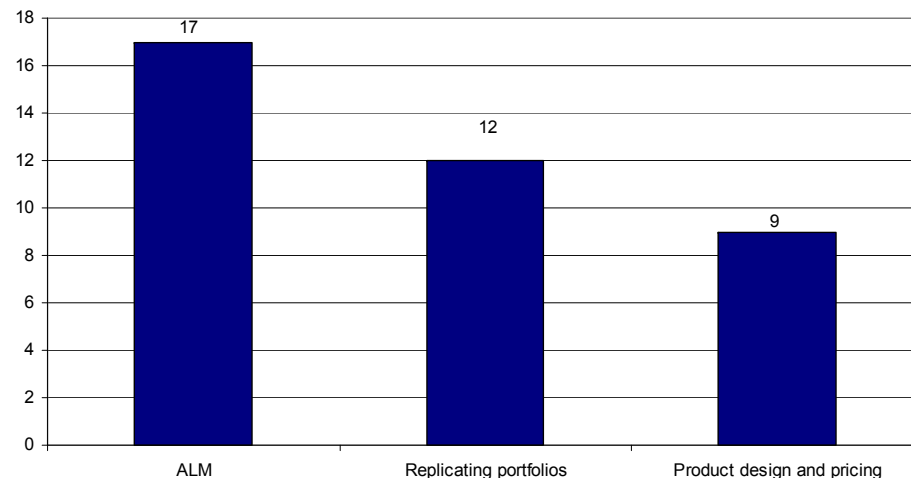
- The MCEV Principles require that DPB is included in the calculation of TVFOG.
- The MCEV Basis for Conclusions note that it is most appropriate to include the impact of DPB within the TVFOG rather than within non-hedgeable non-financial risks.
- The MCEV Basis for Conclusions also note that sensitivity results should include the impact of DPB, which is the case for most companies modelling DPB for MCEV / EEV purposes. This is particularly important in the case of economic sensitivities (such as interest rate stresses).

Companies modelling DPB also use DPB for economic / solvency capital, for ALM purposes and to a lesser extent for replicating portfolios and product design and pricing

Use of DPB modelling for economic / solvency capital purpose



Use of DPB modelling for other purposes



Observations

- The most recent proposals for Solvency II require the consideration of DPB in the calculation of technical provisions, SCR stress scenarios and internal models.
- Allowance for DPB is perhaps at its most important when considering the extreme scenarios which are likely to drive economic capital requirements and is a significant risk.

Observations

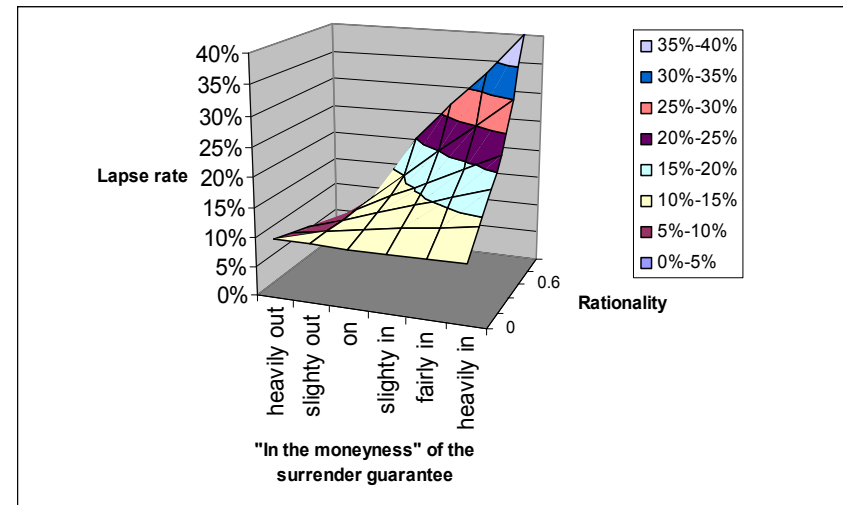
- DPB will directly impact the cash-flows upon which ALM decisions and replicating portfolios are based and should thus be considered for these purposes.
- DPB is a key risk in product design and consideration should be given to ways in which this risk can be mitigated and/or charged for adequately.

It is necessary to consider the uncertainty over the level of policyholder rationality in a given economic scenario

- A key question in forming DPB assumptions is how rational policyholders will be in reaction to changes in the values of their options.
- The Solvency II Framework Directive requires companies to assess their required capital on the basis of the “true risk profile”. If losses from particular economic circumstances are highly variable depending on the level of rationality of policyholders and there is significant uncertainty as to what this will be then the level of rationality itself can be an important part of this risk profile.
- We can therefore think of dynamic policyholder behaviour as being dependent on both the level of “in the moneyness” of the option and the level of policyholder rationality, as illustrated by the graph below.

- By choosing a best-estimate DPB function, we are choosing a best estimate of the level of rationality. This overlooks the potential for significantly heavier losses if we eventually prove to have underestimated rationality.
- We may therefore need to consider a stochastic approach to DPB in order to capture risks fully (in practice through the use of sensitivities). In most models, whilst the level of in the moneyness of options may be modelled stochastically, the level of policyholder behaviour for a given level of in the moneyness is deterministic.

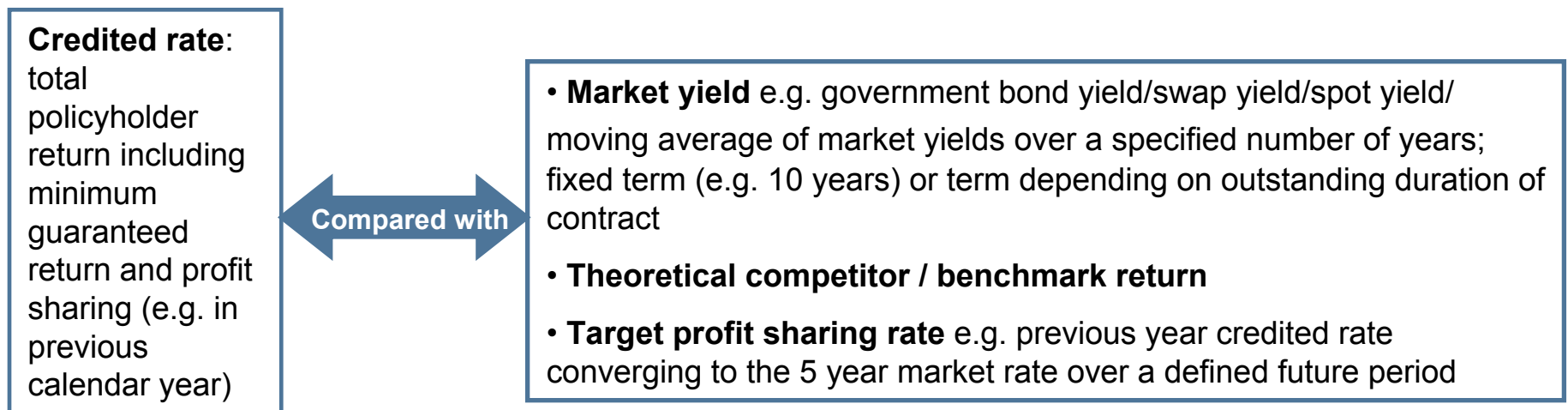
Lapse rate for products with surrender guarantees



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The most common “driver” in DPB models for early guaranteed lapse / surrender is the credited rate compared with an external rate

The factors to which policyholder are considered to be sensitive vary by company. The approach used by all companies but one is to compare the credited rate with some definition of “external” rate to determine the key “driver” of DPB:



Only one company applied a different type of formula, based on the in-the-moneyness of the guarantee.

Other drivers in DPB models for early guaranteed lapse / surrender

In addition to this key driver, various other factors are taken into account. The main ones are:

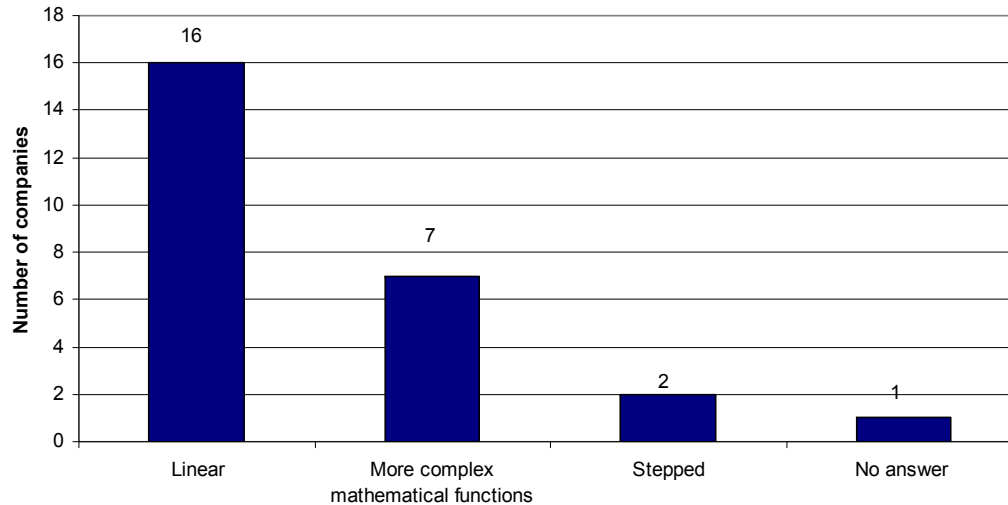
- the type of client: e.g. retail/corporate, individual/group
- the type of policy e.g. annual/single premium
- case size
- sales channel
- the outstanding/elapsed duration of the policy
- the minimum guaranteed rate
- surrender penalties
- tax considerations e.g. tax treatment disincentivising GAO take-up

Observations

- Whilst the difference between credited rate and an external rate may not fully reflect the value of an option, it is a measure which is reasonably transparent and understandable to a policyholder.
- A number of the other factors listed above could be significant in determining policyholder behaviour. For instance corporate clients might be expected to be more active in terms of DPB than retail.
- It should be noted that the MCEV Basis for Conclusions requires that alternative investment vehicles for policyholders should not be restricted to other insurers, which means that considering only competitor returns on other life policies may be insufficient.

The relationship between the lapse rate and the driver is in the majority of cases linear.

Relationship between driver and lapse rate

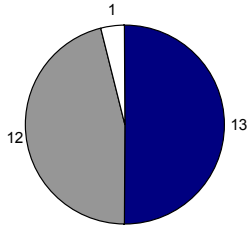


Observations

- Clearly the fitting of a function is a very subjective process.
- However, whilst a linear function may be reasonable in more moderate scenarios, extreme scenarios need to be considered which could drive large volumes of lapses and in such scenarios other functions could be more suitable.

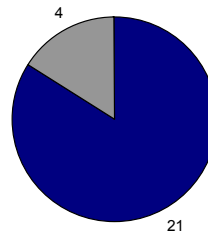
Impacts of DPB allowed by the models for early guaranteed lapse / surrender

Impacts of DPB allowed by the model



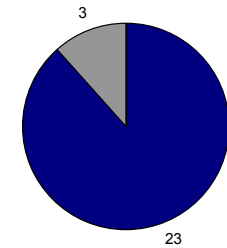
■ Increased lapses only ■ Increased and reduced lapses
□ No answer

Impacts of DPB allowed by the model



■ Cap on lapse rates ■ No cap on lapse rates

Impacts of DPB allowed by the model



■ Band in which no DBP assumed to happen ■ No band

Observations

- We feel that the model should allow both increased and reduced lapse rates under DPB.
- In particular, over the full range of stochastic scenarios considered the mean lapse rates should be consistent with the deterministic (“best estimate”) lapse rates. This is not possible if only an increase in lapse rates is possible under DPB.

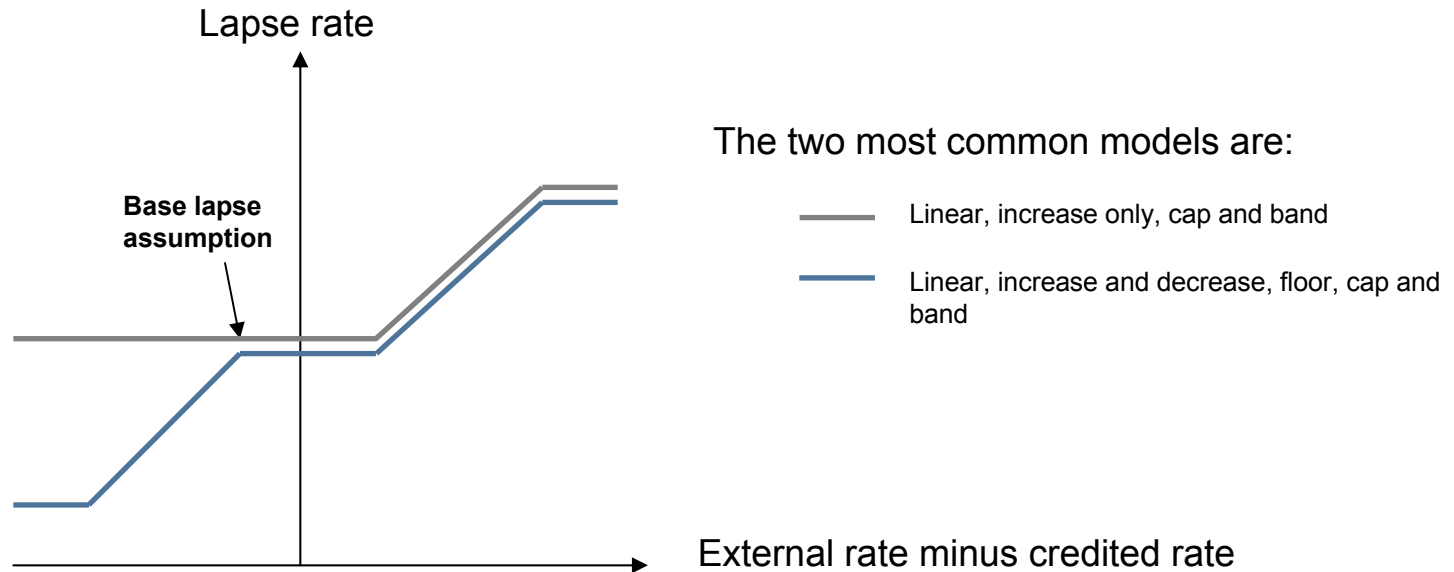
Observations

- Care should be taken in setting caps and floors (i.e. maximum and minimum lapse rates under DPB). Extreme scenarios could drive large volume of lapses, which the DPB function should take into account. This is particularly the case for more sophisticated investors, such as corporate investors. In addition policyholders may become more aware in the future.
- All companies allowing a reduction in lapse rates under DPB modelled a floor.

Observations

- It is reasonable that there is a band in which no DPB is assumed to happen (e.g. no DPB when the key economic driver is between -1% and +1%) as policyholders are unlikely to react to very small market movements.

Illustration of the most common DPB models for early guaranteed lapse / surrender

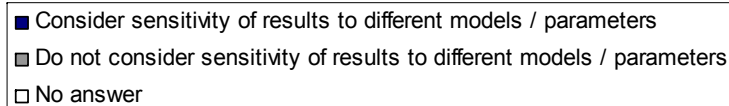
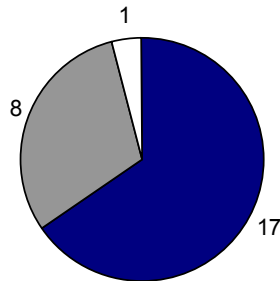


Observations

- The most appropriate function will depend on what underlying behavioural drivers are assumed to influence policyholder actions based on an understanding of the policyholders, distributors and the nature of the options which they may exercise.

The majority of companies consider the sensitivity of results to different DPB models and parameters before finalising their DPB models for early guaranteed lapse / surrender

Approach used in setting up model

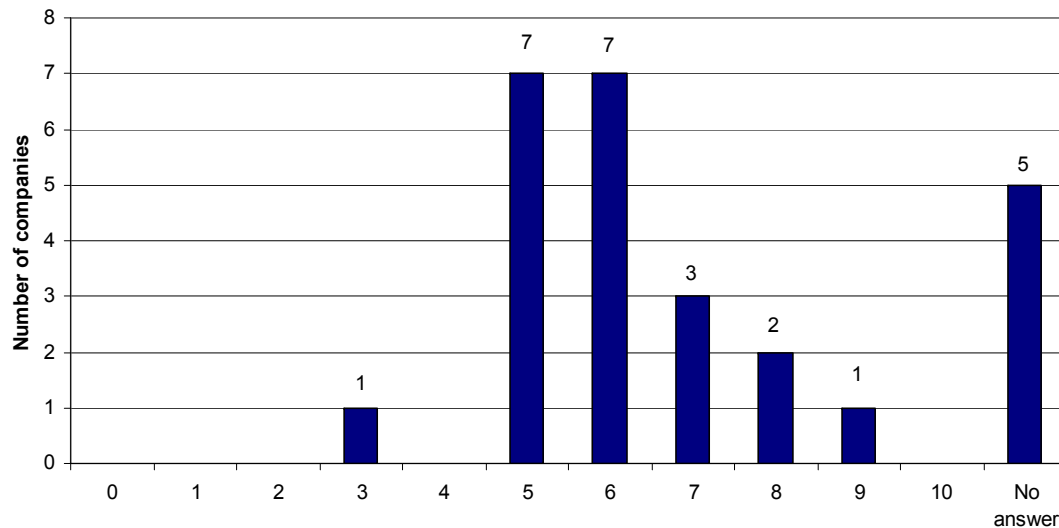


Observations

- Since there is a great deal of uncertainty over DPB models, we feel that companies should consider the sensitivity of results to different models and model parameters.
- Failure to consider such sensitivities could result, for instance, an understatement of required economic capital, or product designs which are not robust and subject to unacceptable levels of risk.

The DPB models for early guaranteed lapse / surrender do not expect policyholders to react in a fully economically rational way.

Policyholder's expected level of economic rationality out of 10



Companies were asked to estimate the extent to which their models assume policyholders would act in an economically rational way, on a scale from 0 to 10, 10 being fully rational.

The average reported level of rationality is 6.0.

Some companies expect the level of rationality to vary depending on factors such as customer type (institutional, retail), product type and case size.

Observations

- Whilst this is a very subjective measure, the responses point to interesting conclusions. In particular, they suggest that ignoring DPB altogether is not a prudent approach.
- It should be borne in mind that policyholders could become more rational over time, and that more extreme scenarios could drive higher levels of rationality.
- Sensitivity of results to different levels of rationality should be considered.

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The most common driver in DPB models for guaranteed annuity options (GAO) is market interest rates

Only 9 companies (out of 29 who have this product feature) model DPB for GAOs.

Respondents generally gave a market interest rate as the driver (e.g. Government bond yields or swap yields for 10 or 20 years). Some specifically mentioned taking the difference between such a market rate and the guaranteed rate or profit sharing rate paid.

One company considers the difference between the guaranteed rate for new annuities and that underlying the GAOs, and said that the take-up rate was 100% if this was negative, and 0% if this was positive.

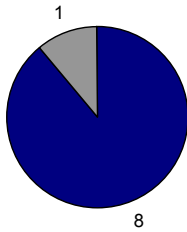
Other factors mentioned by companies included product type, distribution channel, gender and tax considerations.

Observations

- The authors feel that more attention should be given to the modelling of GAOs. Even if current take up rates are low, this does not necessarily mean this will always be the case in the future, particularly in extreme scenarios. In particular GAOs can be more transparent than other types of options if it is possible to compare GAO annuity rates with those available in the market.
- When considering DPB the total cost of the GAO should be considered, which may require consideration of any underlying guaranteed mortality rates compared with current best estimate mortality projections, as well as the guaranteed interest rate.
- Where GAOs allow profit sharing to be paid this should also be factored into the cost of the GAO.

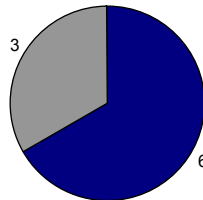
Impacts of DPB allowed by the models for guaranteed annuity option

Impacts of DPB allowed by the model



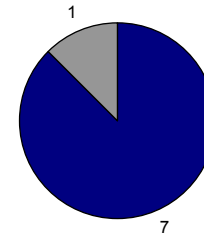
■ Increased and reduced take-up rate
 □ Increased take-up rate only

Impacts of DPB allowed by the model



■ Cap on take-up rate □ No cap on take-up rate

Impacts of DPB allowed by the model



■ Floor on take-up rate □ No floor on take-up rate

Observations

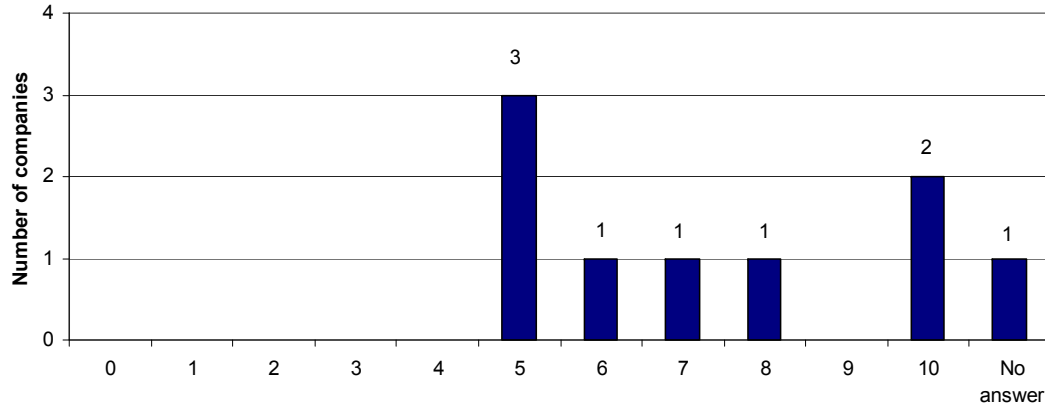
- Generally we would expect the major risk to come from increased take-up of this option.
- However both increased and reduced take-up should be considered to ensure that the average take-up rate over the full range of stochastic scenarios is consistent with the deterministic take-up rate assumption.

Observations

- Unless there are particular constraints on the take-up of GAOs, we feel that, in some scenarios, a take-up rate of 100% on GAOs should be considered (i.e. no cap). This is particularly the case if an annuity must be taken at maturity (such as on certain pensions contracts), and the only other option is to buy an annuity in the market. The value of this option can be very transparent to policyholders and assuming less than full rationality could be an imprudent assumption.
- In certain scenarios a take-up rate of 0% could also be reasonable (i.e. no floor) if the GAO is far out of the money.
- In some situations and markets a take-up rate of 100% when the GAO is in the money and 0% when it is out of the money could be appropriate. One company mentioned this approach.

The DPB models assume a higher level of economic rationality for guaranteed annuity option than for early guaranteed lapse / surrender

Policyholder's expected level of economic rationality out of 10



Policyholder's average expected level of rationality is 7.0 out of 10.

Observations

- As discussed previously, this higher level of rationality for GAOs is what is to be expected.

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Additional premiums / extended term on guaranteed terms / other options

Despite significant numbers of companies reporting the possibility to pay additional premiums or extend the original policy on guaranteed terms (21 and 17 respectively), only one company is modelling additional premiums as DPB. No companies are modelling the extension of the original term as DPB.

The company modelling additional premiums reported that statistical analysis showed no real correlation between the take-up rate of this option and market conditions or the guaranteed rate.

One company mentioned modelling the taking of a lump sum rather than annuity as an option modelled as DPB. This is similar to GAOs.

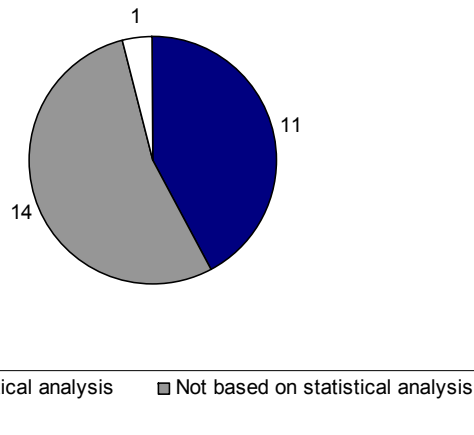
Observations

- The authors feel that companies should consider these options, in particular the payment of additional premiums as it can represent an “open ended” guarantee. Even if past experience shows no correlation between exercise of the option and financial conditions this may not hold in more extreme conditions.

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The derivation of the DPB models is based on a statistical analysis in less than half of the companies.

Derivation of DPB model



Of the companies who did not carry out a statistical analysis various approaches were described :

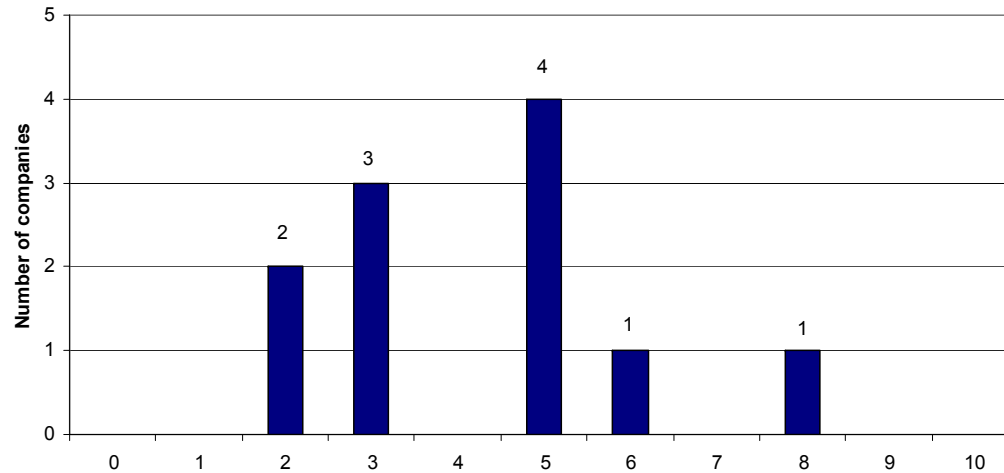
- benchmark of other companies' practice
- external expert opinion
- opinion of business units / customisation by business unit of studies carried out at Group level
- theoretical model / approach based on the assumption of a fully or partially rational behaviour
- sensitivity analysis
- assumptions derived to maximise the cost of guarantees

Observations

- For various reasons analysis of historic data for this purpose can be difficult to use for the setting of DPB models. These include: lack of credible data, past experience not covering a full range of scenarios, interactions and correlations between different risk factors, one-off factors distorting the data (such as a change of distributor relationship).
- However, even if such an analysis is only partially used in the setting of models it can be informative to carry out such an analysis in indicating key risk factors which are driving DPB. There are also tools available to assist in such an analyses.

Companies which perform a statistical analysis actually use the statistical data in only a limited way in setting up the model

Actual level of use of the statistical analysis in setting the DPB model / assumptions out of 10



Companies were asked to comment on the extent to which the data analysis was actually used in the setting of the model on a scale of 0-10 (10 being the highest). The average score was 4.3.

Some companies specifically noted that the data was sparse or difficult to interpret.

Observations

- We are not surprised at the limited use made of historical data analysis. However, we feel that, whilst not providing the whole picture, such analyses can be improved to help identify risk factors and, over time, will become increasingly more useful as historic data builds up.
- It does not seem advisable to base assumptions entirely on past experience as this ignores the possibility that policyholder awareness of the value of options may increase over time. This could be driven by external factors such as regulatory requirements to keep policyholders more informed, information provided by journalists or the development of a secondary market.

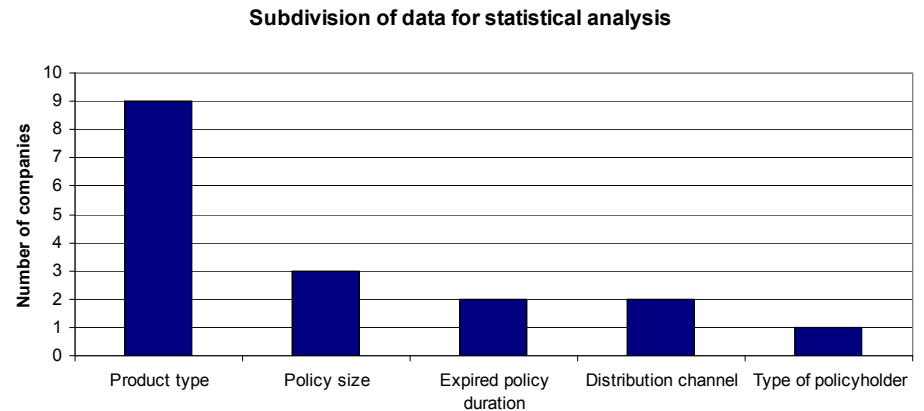
Statistical data collected for the analysis

Some companies analysed data based on numbers (e.g. numbers of lapses), some based on amounts (e.g. sums assured lapsing) and some considered both. The observation period ranged from 3 to 12 years.

Only 5 companies specifically mentioned subdividing the data by calendar year.

The graph shows other subdivisions of the data considered by companies.

2 companies combined industry experience with their own data analysis.



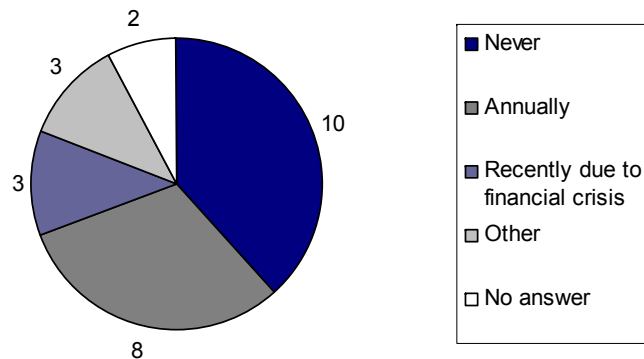
Observations

- It is certainly necessary to split the data by calendar year and to consider how experience varies with the economic “driver” for DPB.
- It is important to use a knowledge of external and internal factors (e.g. tax changes, new product launches, changes in distributor relations) which will have influenced past behaviour in order to interpret the observed past experience
- The initial analysis of the data should be split by a large number of potential risk factors (such as case size) to evaluate which of these have a significant impact on DPB. Data can be re-combined later if a particular factor is deemed not to be significant or if the amount of data available in each data “cell” is too small.

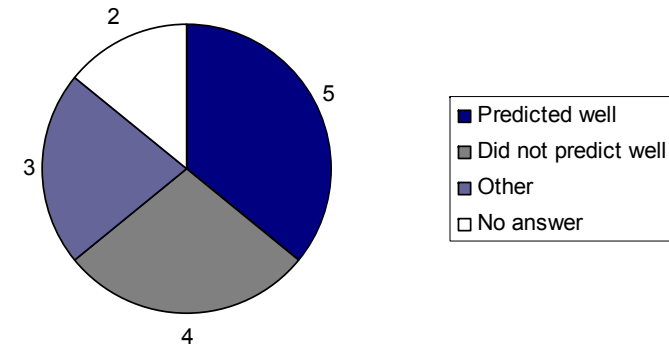
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A majority of companies do not monitor actual experience against that predicted by models on a regular basis. The models predict experience well for less than half of those who do.

Monitoring of actual experience against that predicted by models



Monitoring of actual experience against that predicted by models



Observations

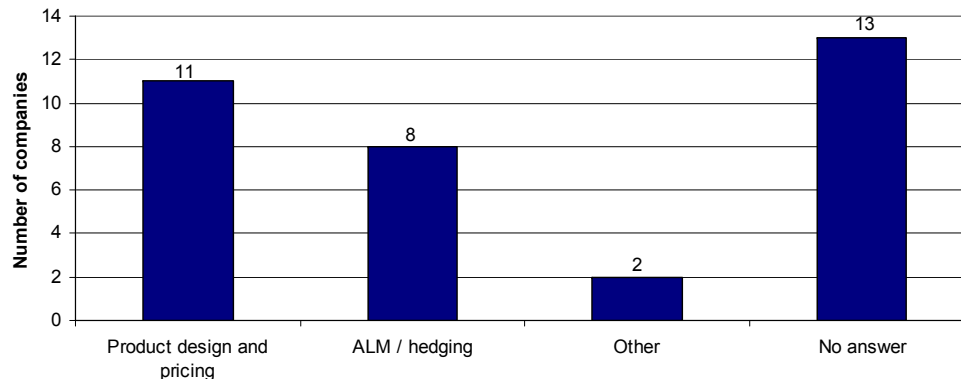
• We feel that regular monitoring of the model against experience is an important exercise and should be part of the actuarial control cycle. The recent financial crisis has given an ideal opportunity to see how well the model performs in relatively extreme market conditions.

Observations

• It is interesting to see the proportion of companies who believe their models have predicted experience well. It is important to continue regular monitoring, however, to ensure this situation continues. Past experience should be used to refine assumptions for the future.

Product design and pricing and ALM / hedging are the key actions to mitigate the impact of DPB

Steps to mitigate DPB risks



* 13 companies answered this question. Multiple answers possible.

Only half the companies have taken actions to mitigate the impact of DPB.

11 companies have attempted to mitigate DPB risk through product design. Product changes mentioned included the introduction of terminal bonus and revision of policy contracts.

8 companies have used ALM / hedging to mitigate DPB risk.

Other actions mentioned were an analysis of client type at policy issue and an improved monitoring process to update the DPB model parameters regularly.

Observations

- DPB is potentially a key risk, with significant uncertainty. Therefore companies should consider ways of mitigating it.
- In particular it is important that new products are designed to be robust to different DPB assumptions. This should be a key part of sensitivity testing. Discussion of DPB should involve other departments (e.g. distribution and marketing) involved in new product development rather than being seen as a purely actuarial issue.

Further developments planned

Of the 8 companies which do not currently model DPB, one has plans to develop a DPB model in the run up to Solvency II while one states not to have any plans to develop a DPB model (6 did not answer this question).

Of the companies which do model DPB, 13 plan to further develop their DPB model. This includes more detailed analysis of historic data, refining methodology and assumptions, extending the DPB model to other options or business lines and enhancing the use of DPB modelling for management actions (e.g. product pricing).

Observations

- The authors believe that all companies should consider DPB modelling. Failure to do so can result in an underestimate of the risks inherent in the business and ultimately in financial loss. As noted previously both the MCEV Principles and the latest Solvency II proposals require consideration of DPB.
- The impact of varying DPB experience should always be borne in mind during product design and ALM.
- Companies are currently at the early stages of DPB modelling. We would expect them to be refining and expanding the scope of their DPB modelling in the coming years and integrating it further into their management decisions.

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 - Derivation of DPB models
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