

ABSTRACT OF THE DISCUSSION
HELD BY THE FACULTY OF ACTUARIES

The President (Mr J. S. R. Ritchie, O.B.E., F.F.A.): The subject of the meeting is variable annuities, and we have a group of authors led by Mr Ledlie.

Mr Ledlie is chief risk officer and group chief actuary at Standard Life. As such, he is responsible for the risk management, compliance and actuarial functions across the Standard Life group. Mr Finkelstein is a principal and the European practice leader of the financial risk management practice at Milliman. He has been leading Milliman's European service offerings, involving new products and asset liability management, including, in particular, hedging work. Mr Ritchie joined Standard Life in 1999, and he has worked in a number of roles across the company. He now leads its guaranteed income project, and also the design of various tools to support advisers in giving holistic retirement advice. Mr Su is a pricing actuary with Standard Life, focusing on the pricing of life and pension products with financial guarantees. Mr Wilson is a senior consultant at the Edinburgh-based specialist financial risk consultancy Barry and Hibbert. There he leads the work on the modelling and the management of risk for annuity and with-profits business. He has been the Chairman of the Actuarial Profession's Finance, Investment and Risk Management Board. Mr Corry is managing director of Life Strategies, a firm of actuarial consultants based in Dublin, and has advised a number of companies which sell variable annuities throughout Europe.

Mr M. C. Ledlie, F.F.A. (presenting the paper): I previously made a presentation on this subject in September 2007 at a seminar, entitled 'The Next Big Thing'. That title was, I think, an expectation of the people participating in that event that variable annuities would be a very significant development within the United Kingdom. It was seen as a product line which bridges the gap left by the decline of with-profits business and defined benefit pension schemes. We have seen a remarkable growth in the product in the United States of America and in Japan, and that is set out in the paper. We have also seen a large number of product launches in the U.K. and throughout Europe. Many companies have been using variable annuities as a product design and as a platform to expand throughout multiple countries, with a broadly consistent product design and methodology.

The authors certainly think that the prospects for the product in the U.K. and, indeed, in the rest of Europe are very significant. This could be a massive growth area for many life assurance companies, and it is an exciting product in which actuaries have an important role to play.

Within the paper we have looked at a sample product design. There are many different applications of the techniques which are used to produce a variable annuity. In many ways you could view the topic of the paper as a toolkit which actuaries and life companies can use to produce a wide range of different guarantees.

We decided to focus on one specific product area, because we felt that it was the one most likely to have significant growth in the U.K., and demonstrated many of the attractive features which could be generated through the use of sophisticated hedging techniques.

The product at which we looked was for guaranteed minimum withdrawal benefits. This product, which would be a single premium to a pension product, such as a SIPP, would provide, for example at age 65, a guaranteed 5% income for life.

Within the product design we have modelled some features which are common in a number of the launches which have occurred so far, such as annual step-up options, whereby the guarantee increases, if the investment performance has justified it in the initial ten-year period, by up to 15% per annum.

The product which we modelled has an equity backing ratio of 60%. Clearly, when products are launched, in practice they may well have a different range of options available to the customer. Having modelled the expected economic cost of the guarantee which we have

described, we have produced a product where the charge offered to the customer has a cost of 0.75% per annum.

We then looked (in Section 6) at the outcomes for the customer, and tried to assess the degree to which we felt that this might be an attractive product. We looked at a number of different scenarios, which are described within the paper. Particularly, we drew out two simulations which, if you look at the distribution of potential returns, sit at the tenth and the 90th percentiles.

Figure 6.2.4a is clearly an adverse scenario, where fund performance is poor and where customers are withdrawing funds from their products on a regular basis. Under both income drawdown and a variable annuity product the fund is exhausted by between ages 80 and 85, illustrating some of the dangers in a product without guarantees. In this very adverse scenario the product has the potential to give a substantially better outcome than, for example, an unprotected income drawdown product.

Clearly, the position would be somewhat different if economic returns were much more favourable, as is shown in Figure 6.2.4b. In this product, at the 90th percentile in the distribution, we see the outcome of very good returns. The drawdown fund does better than the variable annuity fund, through the application of the regular charges to the product, and, at the start of the projection period, there is some increase in the guaranteed base, demonstrating that the product delivers an increase in income in its early years.

We then looked at the range of potential outcomes, by looking at the full distribution of stochastic outcomes produced by our model. Through the income drawdown product, given in Figure 6.3.3b, there is a range of potential outcomes, but most notable is that, at the more adverse points in the distribution, there is a real risk that the income to the customer will fall sharply. You can see that, potentially, the expectations and the needs of that customer are not being met in those scenarios.

By contrast, the variable annuity product, shown in Figure 6.3.3a, does provide a guarantee to the income, and a much more confined range of potential outcomes. Clearly, the top level of outcomes is less good than for the unguaranteed product, but we have managed, through the product design, to remove the most adverse potential outcomes for the customer.

We see a mean line and a median line of income which will be expected, on average, to increase from the initial level, and, therefore, provide potentially attractive returns for the customer, giving a guaranteed income, but also giving some potential for upside return, should the equity performance and the underlying portfolio do well.

We have looked at the product, at the pricing of the guarantee, and at the time when we started the modelling, and based on the various economic factors in the middle of 2007, the assessed cost was 0.49% per annum for the guarantee charge. Clearly, most offices, on top of that, would add an additional margin, and, hence, we have modelled the 0.75% total charge to the customer for the actual guarantee.

We have shown some sensitivities in the product: to falling interest rates, so far as the price is concerned; to changes in equity volatility; and to different longevity assumptions. Clearly, the price will vary quite substantially, according to different economic circumstances.

We then tried to look, as given later in the paper, at the stresses and the economic cost of the guarantees. From Table 10.8.4a, we can stress that, on the unhedged basis, there is a substantial potential loss to a life office offering this product through a number of scenarios: a figure of the order of 2,000 in the 100,000 guaranteed products; and, in a combined worst case scenario, 6,000 is the loss. Through various different types of hedging mechanism this can be reduced substantially. We have demonstrated, through a delta-rho-vega hedging, that the potential losses, while not totally eliminated through our modelling, are very substantially reduced. Hence, the office can offer these valuable guarantees with much reduced risk.

We have also looked at the distribution of profit and loss over time, which is another way of looking at the risk on the product. Again, in Figure 10.9.5a, we see a substantial variation, over time, of the potential outcome for the office in offering this type of product. Again, not surprisingly, if we put hedging in place, then the outcomes will be through a much finer distribution than in the unhedged scenario, as seen in Figure 10.9.5c.

We summarised, in the paper, the potential capital requirements of the product, and make no apology for the answer being different under two different methodologies. Inevitably, the model used and the type of approach adopted will lead to differing results. It does indicate that, with an unhedged position, the potential losses which an office will experience are very substantial, and that, through sophisticated hedging, there is the opportunity to reduce those to much more acceptable levels for the life office.

We then, in Section 11, also looked at some of the regulatory constraints in the products. We have, I think, formed a view, as authors, that the product offers very substantial benefits for a consumer, but there are complexities, within the U.K., which make the adoption of the product perhaps more challenging than in the U.S.A. or in Japan, where it has seen such phenomenal success. In particular, we have drawn out a couple of examples within the paper where the application of the Government Actuary's Department's (GAD's) maximum and minimum limits starts to constrain the outcome of the product, and really starts to cause issues with what should be a relatively simple product, forcing, potentially, a more complex design for the product.

For example, if there were poor investment returns and customers withdraw income from the product, then it could be that the GAD maximum falls below the guaranteed income, which could constrain the pension. Alternatively, the GAD minimum level could increase to above the guaranteed income, forcing payments higher than the guaranteed level, and, ultimately, through the product design, forcing the guaranteed level to fall — again not desirable features for the product.

It is worth noting that the last nine months have been very volatile in the markets, and the last few days have seen further examples. As we started our modelling, the FTSE index was sitting at 6,600. A few days ago it was 5,700. I believe that it has fallen further today. Certainly, that equity market volatility emphasises the advantage which a guaranteed product offers to the end customer.

We have, however, also seen very high volatility and falling bond yields. To illustrate the price of our sample product design, if we were pricing it on 7 March 2008, the economic price for the guarantee would have moved to 0.96% — almost 1% — nearly double what it would have been previously.

What topics might we want to encourage today in the discussion? As I have said, the authors are extremely optimistic about the prospects for the product. We believe that there will be further launches of this product design within the U.K. and, potentially, throughout Europe. Is our optimism justified? What are the views from the floor in terms of where the product will go? What designs will feature within the U.K. and beyond? Is there a genuine consumer benefit from these products? The authors believe that there is. We hope that we have demonstrated that the outcomes from the product are quite attractive for a wide range of consumers, that they will add to the toolkit which will be available to consumers and to advisers developing products within the U.K.

Will the domestic companies in the U.K. succeed in this market? The product requires some very sophisticated hedging techniques, which have been used extensively in overseas markets, like the U.S.A. A number of companies which have entered the U.K. market have come from the U.S.A., and have used this as their platform for developing propositions. Will these companies be successful, or will the established companies be able to develop the techniques sufficiently robustly, and with sufficient volume, to be able to succeed in this market?

Will hedging techniques perform as they are intended in extreme market conditions? Inevitably, as we model the results from the product, they come through by demonstrating a good performance of the guarantees; but, as we have seen in the last nine months, markets can do unexpected things. Will there be extreme conditions, perhaps the seizing up of derivatives markets, for example, causing real difficulties for those offering these products, thus making it difficult for hedging still to remain effective, and exposing companies to unintended risk and, potentially, loss?

We have highlighted the potential constraints of legislation on the product design, and, again, will be very interested in thoughts from those here. Is this really a constraint on those who are looking to develop products in this area? Are there practical suggestions which would

help overcome those other changes to legislation which would support the product more effectively?

Finally, we have made some fairly bold statements that actuaries, having a wide range of skills, are perhaps better suited than many other professionals to develop these products, with their knowledge of mortality, of persistency risk, of market risk; and to use these skills to look holistically at all the risks against which this product is trying to protect the consumer.

Are we sufficiently well equipped or are we falling behind in some of the modern techniques which are needed to develop this product?

Mrs R. Barrett, F.F.A. (opening the discussion): The authors have provided an introduction to the product followed by a description of the international markets, and the current state and prospects for the U.K. and wider Europe. They start by looking at the international term 'variable annuity', which is a term which can create confusion in the U.K., being neither variable, nor an annuity. (I, however, prefer it in simpler language; for example, a guaranteed product.) They go on to explain the terminology for typical classes of guarantees. The U.K. market is considered in Section 3, and why the time is right for such guarantees. Throughout the paper the authors focus on the pensions decumulation phase, looking at a 'third way' between annuities and income drawdown. As is mentioned in ¶3.4.2, there could be significant potential in other areas, such as group personal pensions and single premium bonds, and for other guarantees, such as death benefits or capital guarantees.

The authors identify key challenges to the market as:

- ensuring that designs meet customers' needs, subject to legislation;
- demonstrating value for money; and
- balancing simplicity with the desire to compete with the most attractive features.

In terms of value for money, there has been much said to date on whether the price of guarantees is too high, and, if variable annuities are to succeed, then their values must be demonstrated. Analysis of customer preferences could help to tailor guarantees, and to identify those which have the highest perceived value.

Small mistakes by commentators analysing the value of such products can cause a lot of damage, particularly where there is no stochastic modelling involved in the analysis.

A barrier for the traditional insurer will be the sales challenge where there are a range of products. If the variable annuity is harder to explain, and not a 'one visit' sale, then sales people are, perhaps, more inclined to go back to products which they know well, as it is an easier sale for them.

In Section 4 the authors describe how variable annuities have developed in a number of international markets, focusing predominantly on the U.S.A. and on Japan, which have the largest variable annuity markets. In considering whether there will be a similar success in the U.K. and in other parts of Europe, it is interesting to compare the situation with those drivers in the U.S.A. and in Japan — certainly we have the same concerns about ageing populations and state benefits.

The authors then go on to create a simplified product by describing the design and basis. This simple product is a very useful tool in explaining the features of variable annuities.

In Section 6 the authors compare the variable annuity contract with a comparable income drawdown contract for both a 'good' and a 'bad' economic scenario, and also by looking at probability distributions for both products. They thus demonstrate the removal of downside risk, and also the benefit of some upside risk with the guaranteed product.

In Section 6.5 the Financial Services Authority's (FSA's) requirements to Treat Customers Fairly (TCF) and the support which will be required for distributors are considered. In ¶6.5.8 the authors make the point that the full training of advisers and the development of advice tools will be required before the advice system can handle the full complexity of product features confidently. I think that this will be a real challenge to the providers, and there is a risk that, with guarantees varying between companies, distributors will struggle to make valid comparisons between the features and the prices.

In Section 7 the authors consider pricing methods. They use a market-consistent valuation, and discuss assumptions, including a dynamic lapse assumption. The lack of credible policyholder behaviour data for lapses and other behaviours is a challenge, and I am sure that there will be much more analysis in this area in the future.

Another challenge with variable annuities is the setting of the price, as described in Section 7.6. Because of the dependence of profit on economic conditions, fairly infrequent price changes will lead to volatile new business profit. Suggested ways to combat such volatility are loading a risk premium into the price and pre-hedging market risk exposures. I would be interested to know the extent to which these methods have been used, whether they had success in other markets, and whether the authors envisage a situation with more frequent pricing reviews in the future.

In Section 8 the authors give a useful coverage of the U.K. and the Irish reserve requirements for the product, and give an overview of accounting considerations. Variable annuities see insurers take on a much wider range of risks in a single product line than has been seen recently.

Market risk, which is covered in Section 10, is complex, and the authors provide a detailed study of the risk management issues which is clear and easy to read. The dynamic versus static hedge versus combination hedge arguments are thought provoking, and the numerical examples demonstrate the substantial benefits of hedging on risk capital.

Given recent market events, the point about considering extreme market and financial conditions is well made, and further research in this area would be welcomed.

Section 11 looks at pensions legislation, and the extent to which existing regulations on GAD rates and death benefits constrain current variable annuity proposals for pensions products. I echo the authors' comments on a desire to study ways in which legislation could be developed to work for all of the parties.

Turning to the conclusions, I agree that variable annuities offer valuable guarantees which meet real customer needs. They provide the customers with both control over their investments and certainty from the underlying guarantees. Variable annuities are a complex product category, with many areas of challenge, where I also agree that actuaries are well placed to play key roles. We, traditionally, have expertise in managing longevity and behavioural risks, and the available computing power means that more effective risk management techniques, such as dynamic hedging, are now possible.

Mr P. C. Shallis, F.I.A.: As someone who has been involved with variable annuity products, both from the perspective of a provider and in giving advice to providers, I think that this is an extremely helpful and timely paper, which I hope will be the start of authoritative work on this subject in the U.K.

I have to express a certain amount of surprise that the authors have not chosen to take the opportunity to introduce some U.K.-centric terminology to this debate, instead opting to use their own definition of 'variable annuity' to make this label more meaningful in a U.K. context. I would argue that it is neither the 'variability' nor the 'annuitisation' aspects which define this type of business — it is both the guarantees and the way in which those guarantees are being delivered which provide the key to defining this business.

For me, it is useful to compare these fundamental guarantees with other guarantees which, historically, have been provided in the U.K. Whilst this is something of a generalisation, in the U.K. we have tended to see guarantees provided through simple investment management techniques. Whether we are looking at with-profits business or at any other type of product with guarantees, the starting point is to match guarantees with fixed-interest investments, thereby providing certainty that the issuer of the guarantee will find itself, ultimately, holding assets which will honour the guarantee. The result can often be that the investors do not get the equity exposure which they thought they were going to get.

That is where the difference lies with this business, and it is a fundamental distinction — the customers get the exposure which they choose, and they pay an explicit charge in order to provide the guarantees. This could be regarded as the 'insurance route' to providing investment guarantees.

The authors have chosen to focus on the pensions market. This is understandable, given the natural link between guarantees and retirement income, as well as allowing a consideration of the unique challenges which the U.K. pension system provides, but it would be wrong to discount the non-pension savings market too lightly. After all, half of the first six products, offering these types of guarantee, launched in the U.K. have been investment bonds, and there are clear signs that this market is in need of new forms of investment guarantees. During the heyday of with-profits bonds, the vast majority of all investment bonds sold had some form of guarantee. In 2007, the proportion of investment bonds sold with some form of guarantee sat at around 15%. This certainly suggests the lack of the right product to satisfy the demand for investment guarantees.

Paragraph 3.3.2 rightly highlights the challenge of communicating value for money for these guarantees — a task made all the more difficult by this fundamental difference in the way in which guarantees are provided. Another feature of more traditional guarantees has been the lack of transparency over the charge which the customer is paying for the guarantee — often obscured by the fact that the true cost is not an explicit charge, but is the loss of potential investment performance through it not being invested in equity assets.

Promoting guarantees which have an explicit charge to consumers and, perhaps more importantly, to advisers, therefore, presents two issues: the existence of the explicit charge and the magnitude of it. The paper provides an excellent analogy for this situation in ¶9.1.1. If U.S. providers, in 2000 to 2002, wrongly perceived that the risk which they were facing through being unhedged was negligible, is it any wonder that consumers and advisers in the U.K. often consider that the explicit guarantee charges are higher than their own perceived values of those guarantees?

Paragraph 4.2.8 highlights research, suggesting that one of the reasons for the popularity of this business in the U.S.A. is ‘transparency and flexibility’. Our U.K. experience, to date, would appear to question whether the ‘transparency’ angle has made its way over here successfully.

Section 6 provides a very interesting and detailed analysis of the potential benefits of the sample product from the consumer’s perspective. If we need stochastic projections in order to understand how the product would operate across the range of likely scenarios, I wonder what this says about consumers’ and advisers’ abilities to understand fully the detailed operation of the product? We should bear in mind that this is, deliberately, a ‘simple’ product, and, not only have more complex product features been omitted, but so has the interaction with the pensions framework. It is probably unsurprising that stochastic model-based illustration and advice tools have already been developed for some of these products, and it is a clear indicator that this area needs some careful consideration.

Finally I make an observation on Section 11.6, concerning death benefits. I do not believe that the existence of, or the ability to provide, a guaranteed death benefit after the age of 75 is, in itself, a credible argument for changing such an entrenched Government position on the inheritability of pension funds. Variable annuities are not, after all, the only retirement income vehicle which would, or could, be constructed to have a payment on death. However, I would wish the authors luck in trying to pursue this!

Mr C. Barnard, F.I.A. (in a written contribution which was read to the meeting): I would like to touch on three topics: pricing and profit testing of variable annuities, hedging platforms, and economic risk capital.

It is very important that actuaries who carry out pricing and profit testing have appropriate and up-to-date experience about: local markets, pricing techniques, what is important to model and what is not, the effects of hedging, and insurance company accounting. We also need to consider the sensitivity of profits to market parameters, including dynamic policyholder behaviour, and an understanding of how the product will be marketed and sold, so that we know what type of policyholder behaviour to expect. Furthermore, the strength and the impact of management levers also need to be considered. For example, what ability does the company have to adjust fees, fund allocation options, etc., and what is the company’s philosophy on using these levers?

Turning to hedging platforms, once again the experience of the members of the team designing and managing the platform are critical. They require expert capital market experience, trading knowledge and expertise, and an understanding of insurance company accounting. The platform should be flexible enough to incorporate new benefits, hedge instruments and hedging strategies, and have the flexibility to trade or not to trade, depending on exposures, etc. Hedge effectiveness reporting should be integral, and the platform should incorporate agreed risk limits automatically.

Calculation efficiency and system capabilities should be considered well in advance. Dynamic hedging requires millions of calculations per day, which must be performed quickly enough, so that your information is not stale by the time you adjust your hedge positions. The platform should also be market consistent. You have to consider the frequency and the method for calibrating assumptions, such as volatility surfaces, risk-free rates, correlations, etc.

Any platform should be mock tested, e.g. the ability to try out a new strategy or hedge programme before actually implementing it live. As mentioned, we also need ongoing, independent hedge efficiency reporting, which compares predicted results with actual results; for instance, given what happened, what did the hedge programme predict would be the outcome, and how close was that to actuality? Additional testing would include, for example, testing scenarios which have not happened yet, or using the model to price market observable securities. Finally, back-ups and controls should be pre-planned against, for example, redundancy in personnel and systems.

Regarding economic risk capital, the main components of risk capital are financial risks (equity, interest rate and credit) and non-financial risks (mortality, policyholder behaviour and business and operational risks). Shocks to these should be tested in aggregate and individually. An analysis and a reflection of hedge efficiency (given a chosen hedging strategy and track record, if any) should also be included.

Beyond the technical aspects of these calculations, there is an important point regarding modelling. Often the brute force method (calculating scenarios with scenarios inside them for every product, age, gender, benefit and fund allocation combination) is not possible, given the system, data and time constraints. Therefore, modelling techniques which capture the important components of the risk capital calculation, but not necessarily using the brute force approach, can be invaluable.

Mr R. K. Sloan, F.F.A.: Impressed as I genuinely am by the high-tech nature of the mathematical modelling used in the sensitivity analysis of the various elements of such new variable annuity products, I thought that it might be helpful to offer a few comments from the viewpoint of an actuary who has, for many years, provided quite a lot of advice to individuals on the decumulation process. As such, and since I do not fall within the category of 'provider', I suppose that I must be included in what is called, for the purpose of the FSA's TCF guidance, the 'distributors' category.

However, as this category will typically consist mainly of independent financial advisers (IFAs), I was particularly struck by the question posed at ¶6.5.5 as to whether the information given by the provider to such distributors is likely to enable them to understand it enough to give suitable advice — and further, at ¶6.5.8, where it is suggested that the training of advisers and the development of advice tools may be required before IFAs can handle the full complexity of all the product features confidently. I suspect that this is a considerable understatement, as the opener mentioned.

The point is that the majority of IFAs do not fully understand even the simplest of such products, which have existed for 12 to 15 years, such as income drawdown and unitised annuities, the latter of which includes both investment-linked and with-profits annuities. I believe that, if IFAs were to have a better understanding, then there might be rather less need to develop some of the more complicated products which are now appearing on the market.

While stochastic modelling, using an esoteric economic scenario generator (ESG), may be fine, and necessary for actuaries on the product development and management side of providers,

one needs to adopt a rather simpler approach in providing advice to individual clients — for instance, an array of possible outcomes based on a suitably chosen range of deterministic assumptions — in other words, the answers to a range of ‘what-if’ questions.

By way of a practical example, I generally describe an annuity as being a combination of investment and longevity insurance, whereas, under drawdown, the client has to underwrite his own longevity — well, up until age 75 at any rate. I have also found that a useful way of illustrating the concept of ‘mortality drag’ under drawdown is to show the cumulative cost to ages up to 75 of providing death benefit cover, which ends up being wasted, which I call ‘the cost of not dying’.

Many IFAs, and likewise their clients, tend to regard annuities as rather a swindle, especially in the event of early death, when the insurance company ‘pockets the lot’. However, it is a relatively easy matter to remedy this — without the need for some of the complicated new products — by the simple device of combining a guarantee period with a spouse’s pension arranged on a ‘with overlap’ basis — that is one which commences simultaneously with any unexpired part of the guarantee period, rather than deferred until the end. By that means, if a ten-year guarantee is chosen, plus a two-thirds spouse’s pension with overlap, then, assuming that the spouse will survive for at least ten years from the outset, there is, immediately, a virtually guaranteed minimum return of around 17 times the annual annuity.

Another obsession of many IFAs, and hence their clients, is their over-emphasis, under drawdown, on the need to avoid inheritance tax (IHT) on the fund remaining at death — which has led to ever more complex layers of legislation to stamp out actual, or perceived, abuse. However, it is often the case that the purchase of an annuity to provide a core income for life, and which involves no IHT on death, can provide the necessary long-term financial security to enable the client to gift significant other assets to children and/or to grandchildren, which, on survival for more than seven years, can result in significant and legitimate IHT savings.

So, my message is, instead of, or as well as, designing ever more complex new products, it may be at least as cost effective to develop new ways of explaining and marketing the simpler existing products, many of which can, in fact, provide fairly similar results. In that category I include the well-proven with-profits annuity, via which at least one actuary in this room hopes to take substantial personal financial advantage of the expected continuing longevity improvement of his cohort!

Mr A. D. Smith: I shall make a few comments on hedging, particularly the figures in Section 10.

Those of you who have been working in this industry longer than I have may remember the guaranteed products of the 1970s, and, indeed, the report of the Maturity Guarantees Working Party (1980). The effect of the report was to introduce onerous reserving requirements which more or less killed off the products. So, we have to ask: “What has changed?”

I think that what has changed is that, just as the 1980 Working Party repudiated the effectiveness of hedging and delta hedging in particular, this paper, I am pleased to say, embraces it fully. However, today there is the advantage of simulations, which, I assume, were not so easily available in the 1970s. So, for example, Figure 10.9.5 shows the dramatic improvements in risk management from implementing some fairly simple hedging strategies.

Looking at Figure 10.9.5, to me the improvements in the variability look too good to be true, and are very much more effective than I have seen in any back testing as a result of trades which have been done and subsequently analysed. I think that the contribution of Mr Barnard made this point about the need to back test. We need to understand exactly why it is that the variability looks so slight in Figure 10.9.5 compared to back testing experience.

I think that there are two reasons. One is that you do not know how many policyholders will take advantage of that guarantee. So, you are always shooting at a moving target. When you come to hedge how you thought policyholders would behave and the way in which they actually behave, then these are different, so that your hedge does not work as well as you thought. That may explain one aspect of why the hedging appears so effective in this model, perhaps more effective than you see in real life.

Secondly, what seems to have happened is that the authors have constructed a model where

volatility surfaces move in parallel, and then they investigate this rho hedge — rho being defined as the sensitivity to a parallel move in volatility surfaces.

So, to me it seems that it is a foregone conclusion that that ought to work. What the authors have tested is their ability to differentiate an option price both numerically and analytically, and to get more or less the same answer. I am pleased that the authors can do that, but we need to be sure that we recognise that that is what the figure is demonstrating, and not, for example, any suggestion that the hedge would be quite that effective.

There is one more point which I would like to make. At the end of ¶10.9.13 the authors suggest a detailed study to look at the trade-off between hedging frequently, which reduces the requirement for economic capital, but then to hedge less frequently in order to reduce transaction costs. I think that that is a splendid idea. In fact, it would have been quite a good idea to have included that in the section on profit testing, since these are elements of costs which need to be taken into account.

A paper on variable annuities was presented to the Staple Inn Actuarial Society in October 2007 (Abbey & Henshall, 2007). That paper gave quite a bit of detail as to how those calculations should be carried out, or could be carried out, both in terms of the cost of the risk capital and also in terms of the transactions cost. I recommend that we all read that paper.

REFERENCE

ABBAY, T.J. & HENSHALL, C.E. (2007). Variable annuities. Paper presented to the Staple Inn Actuarial Society.

Mr R. P. Knowles, F.F.A.: Mr Ledlie asked for comments as to the marketability of the product. I think that you have to look at the two basic elements of how those who invest money look at their products, which are greed and fear. I think that what you are doing is that you are matching the greed element very well, and, as the market goes up, the benefit is there. Also, to a certain extent you are matching the fear element as well, in that, when the market goes down, your income is protected under your withdrawals scheme.

In my opinion, the one fear which a pensioner has, and it is easy to forget in the current environment, but in the past it has been highly relevant, is inflation. If inflation were to take off to, say, 10% to 15%, and the stock market were to come right back down, the product does not meet that requirement to provide protection at all. I admit that many people, in the present environment, would say: "Oh, well, inflation has been cured", or whatever, and: "Inflation is no longer a problem." However, I can see that, at some time in the future, this product will be seen not to have met the genuine needs of the pensioner market.

The second point which I make is regarding hedging. The one thing about this product is that, with a guarantee, you are always going to sell much more of it after the market has been very poor, because the fear element is there. Arguably, after the market has fallen a long way, the guarantee is far less important to the investor, but he does not see it that way. Likewise, when the market has gone soaring up, which is exactly the time when you want a guarantee, people tend not to bother to take out the product.

The potential, therefore, is there for you to sell a great deal of this business when the market has come right down and is very low. As I understand it, you are going to be delta hedging through the use of futures. It seems to me that you could end up by buying a large volume of short futures, and then the market would suddenly increase in price quite rapidly. First, you do not need them, and, second, the potential has been seen in the past for this to cause cash flow problems if the amount of this business which you have taken on is a significant proportion of the new business.

I think, in these circumstances, when the market is very low, the use of future hedging has potential drawbacks, of which you should certainly be aware.

Mr A. J. Ritchie, F.F.A.: Thank you for the points which have been made so far, which have been very helpful for all the authors. There is one point which I would like to make, on inflation,

which I think is a very valid one, and it is also an important point when it comes to talking about why people would buy these guarantees in the first place, and how we show the marketability of these products. It is that the guarantee allows you to invest more in equities and in property than you would otherwise, as these are assets which, traditionally, will rise in value as inflation rises.

I am not sure that this completely answers Mr Knowles' point, but the fact that you have the guarantee should allow you to invest in assets which increase more in line with inflation.

The subsequent point is that, because these guarantees, unlike with-profits annuities and those about which Mr Sloan was talking, are flexible, you can turn them off as well as turning them on. This means that, if the markets go up and inflation is very high, and equities, and so on, deliver very well, but you decide: "Hold on! Stop the bus! I want to buy something which is going to protect me against inflation in the future and give me that longevity protection, etc., in the form of an annuity," then you can do that. You can turn off the guarantee and then buy that annuity at that stage.

So, I think, from a marketability point of view, what I would say is that these guarantees give you a bit more flexibility than some of the products which we have had in the past. They give you a higher exposure to equities, with the same comfort which you might have had with a lower exposure to equities without the guarantee, and therefore, it is hoped, help to meet some of these points.

Mr Knowles: Not always.

Mr Ritchie: Yes, I agree. I am not saying that it is a perfect scenario, but I think that it helps to mitigate a lot of the risk.

Mr G. S. Finkelstein, F.I.A.: There is always the possibility of putting inflation-linked gilts in the underlying assets and inflation swaps in the hedge assets. In other words, among the funds in which the policyholder can choose to invest are funds which can include real assets. Of course, the price of the guarantee will vary, depending on the underlying fund.

The other point about the use of futures in rising markets is a valid one. If the markets start rising very rapidly, and you have been hedging with futures, what happens is that the value of the guaranteed liability becomes less valuable because the markets have risen, and your short position in futures also becomes less valuable.

If you get to a situation where the value of the guaranteed liability is negative, and by that I mean that the value of the future charges is greater than the value of the future guarantee claims, the advantage of a dynamic hedging approach is that you can modify the extent of your hedging dynamically. The modifications can be designed to reduce the risk of high lapses after markets have risen and to close out a negative futures position (and also to reduce the cash flow strains which can occur with margin calls).

Mr Ritchie: Another interesting way to look at these guarantees is from the point of view of the provider, in terms of sales. Mr Knowles mentioned that, perhaps, customers will buy these guarantees more when markets have fallen. It is interesting that this is exactly the time when sales for traditional savings and pensions products would fall for a provider. So, the fact that you have this kind of extra product feature, or product option, from a provider's point of view, should be a real benefit to sales at times when, otherwise, you might see a drop in sales, and therefore it might be a nice feature from the company's point of view, as well as from the individual's point of view.

Ms C. E. Henshall, F.I.A.: I have a few practical comments. I have been working in continental Europe and in the U.K. Insurers from Europe are looking at this paper to see what is going on in the U.K.

We are well placed in the U.K. in terms of how we are already set up with reserving and in terms of reserving, capital and individual capital assessments (ICAs), and with what we are

already doing in terms of stochastic modelling. That does give us many skills in terms of how we can manage the risks for variable annuities, as we set assumptions and as we do the reserving.

From a practical point of view, more than one insurer is using bespoke hedging solutions. They would enter into a contract with an investment bank, which, basically, takes all of the market risk off their books for a particular tranche of policies. That might be an alternative solution. It maybe does not come out in the paper, but it is being looked at and used by insurers.

Some companies have found that IT is one of their biggest challenges with variable annuities. I think that, as a profession, we can be involved in the IT, be involved in testing, and, as actuaries monitoring these programs, be aware of what is going on in IT, and the real practical challenges which are there.

As a suggestion, maybe we can proactively offer something in the whole area of marketing these products. Maybe, instead of waiting around to be asked to come up with something, we can be thinking about communicating, and how the industry can be communicating, these products to consumers.

Dr D. J. P. Hare, F.F.A.: I have a question about some of the numbers. In Table 4.2.6, which lists the variable annuity writers in the U.S.A. and their assets under management, what is given is that, at the end of 2005, there were about \$1.2 trillion assets under management. I compared that number with what I was expecting to see, based on what is in ¶4.2.3: "in 2000 variable annuity assets under management exceeded \$1 trillion." Using Figure 4.2.2, I saw that sales were \$120 billion a year or more, and so I was expecting to see about \$1.6 trillion or something, by the end of 2005. So, where did the \$400 billion go? Were the figures from different sources, and so you cannot really compare them?

What I am interested in is this: "Is there something else happening in the U.S.A. which these numbers suggest may be something about policyholder behaviour?"

This leads me to my next point. According to the analysis, which I think seems well founded, these products are very popular, and the amount of assets under management which have these guarantees is growing rapidly across the world. What proportion of the derivatives market are we now assuming that the variable annuity market will be buying up?

If you have one and a bit trillion dollars in the U.S.A. from several years ago, and then it grows rapidly in Japan and it grows rapidly in Europe, presumably you end up, in a few years, with trillions and trillions of dollars, all being secured by various derivatives and futures bought from a number of investment banks throughout the world.

I wonder whether there is a natural ceiling, and what the views of the authors are. Is there a limit on capacity or is the worldwide capacity so much greater that it is not an issue? We have seen, in the U.K., at least one financial institution which built a business model on, effectively, buying wholesale and then selling on retail, accused of following a reckless strategy when the wholesale market did not do what it was meant to do. What is the risk that the financial markets will not do what they are meant to do, just at the time when many institutions are depending on them? Will they all be reckless, with hindsight, or is that something which is so far into the tail that we do not need to worry about it?

Mr Finkelstein: In reply, I think that there are two important themes coming out in the discussion. One is whether the guarantees have a very valuable customer proposition. If that is the case, then, clearly, by selling guarantees one introduces risk to the insurance company. Is it not the insurance company's *raison d'être* to sell risk, professionally, to manage the risk which it sells, and then profit from being in the risk protection business? If that is the case, then should we not embrace the most modern risk management techniques?

Now to answer your question directly, the question about how the capital markets operate and whether there is a natural ceiling. There is a great variety of ways in which you can risk manage these through using exchange traded futures, which are collateralised through the margining system in the exchange; through using interest rate swaps, where liquidity is huge;

going over the counter (OTC); or reinsuring. When you go off the exchange, i.e. either OTC or to a reinsurer, you translate the problem to a credit risk exposure with your counterparty, who, in turn, is exposed to the capital markets.

When you trade in the exchange, the credit risk is managed through the margining system of the exchange. So, at the end of the day, credit risk management in your own portfolio and within the capital markets is a key component to the proper functioning of the overall system. We did not include, in the paper, a description of the operation of the capital markets and how one can get comfortable with the operation of the capital markets in running such a modern risk management programme. Suffice to say that, if you have only a limited faith in the operation of the capital markets, then modern risk protection involving the use of the capital markets is not for you — or, at least, it needs to be limited.

Also, credit risk management is going to be a key component of running these risk management programmes, and this will involve monitoring your collateral requirements using futures, swaps or individual credit counterparty exposures, if using options. In this way, bank risk management techniques are essentially being brought into the insurance industry in order to be able to provide these attractive financial risk protection products.

Mr Ledlie: If I may add a comment from a chief risk officer (CRO) perspective, you have to think the unthinkable and start thinking what will happen if certain elements of the market stopped functioning in the way in which we are using them. What is the worst that could happen to us? How bad would that be for my institution?

Today, if we have a small amount of variable annuities on the book, it is probably not a lot. If in ten or 15 years' time our in-force book is dominated by variable annuities, all heavily dependent on the continued existence of active liquid markets, then I think that I have to start thinking what happens if those instruments, upon which I am dependent, are not available in the way in which I have been used to them, and could I live through that? Have I enough diversity in the range of products which I am offering to survive that? Also, is there this one killer scenario which, perhaps, was the case which Mr Finkelstein highlighted? That was a case where there was a killer scenario which hit that institution.

Any institution has to think through its range of exposures, to make sure that it is not so exposed to one particular segment of the market.

Mr E. G. Munro, F.F.A.: I am not afraid of capital markets. It is a minority interest, but I am closely watching the Japanese swap market at the moment; and there may be some lessons to be learned. Mr Smith said that back testing is going to be important. Looking forward at how this product, if it becomes big, might affect the markets being used to hedge may be equally critical. In recent days, the Japanese swap market has pivoted around the middle of the government bond yield curve. Now, the 30-year part of the Japanese swap market is yielding 30 basis points less than Japanese government bonds.

The variable annuity product involves an unfunded reach for duration, i.e. you are physically investing your money in funds such as U.K. or international equities, and you are using the derivatives market separately to protect yourself against adverse moves in long-term interest rates. If, this is done in scale, and no-one has an economic reason to do the opposite, the market will move to make sure that swap spreads are very big on short-dated swaps and small or negative on long-dated swaps. This appears to be happening in Japan, where variable annuities are a sizeable product.

Therefore, I think that the balance of this product among other products, and the supply and demand in the derivatives market, need to be thought about very carefully in modelling these risks.

The other thing which is important is that, for good reasons, this paper looks at variable annuities, and the way to deal with the risks which they create, in a sort of hermetically sealed box. However, there are very few insurance companies which do not already have some exposure to adverse moves in stock markets, long-term interest rates, inflation, and so on. I would be interested in the views of the authors as to how this should be managed within the context of a

life company balance sheet, which is running a variety of different products, with many of these same risks. Do you think that variable annuities should have their own separate workshop which does this risk management process, or should the risks be handled alongside the risks presented by other products?

Mr Ledlie: My impression is that many companies have looked at this almost as a sealed box, and have tried to set up hedging programmes which focus on the individual product lines.

The point is well made that you could take a very different approach, and could look at it more holistically in terms of all the risks. The approach of looking at it by product line does have the advantage of simplicity, in some sense, in that you can focus on a business line. The product line can demonstrate its own viability and its own profitability. You can set up a hedging programme which is focused on that business line.

It becomes more complex when you mingle this with other types of risk. In a sense, you probably need to start demonstrating the benefit from that wider approach. Can you demonstrate that it will be giving you synergies, perhaps on the trading which you need to put in place across a wider book?

I suspect that some companies will be looking across territories, for example, and looking at managing a variable annuity portfolio globally.

Mr Finkelstein: I would add to that that I agree with the comment about the importance of back testing. Before one implements this and goes live with a hedging programme, among the scenarios which you investigate are historic scenarios, among all sorts of other scenarios.

Also, even after you have implemented this, there is the importance of monitoring the performance and the effectiveness of the hedge as it evolves. That is, essentially, back testing live as well. You are always back testing, even in the week after you have actually made the transaction. It is a key part of both the market and the operational risk management.

I am not keen to get too involved in the Japanese experience, other than to say that the general experience of hedging programmes globally, in the past six to nine months, has been relatively volatile. We have seen all sorts of interesting market conditions.

Generally, the hedging programmes have been behaving as expected. For example, companies which have deliberately, or otherwise, chosen not to hedge volatility positions fully will not be doing as well, in the last six to nine months, as companies which are very tightly vega hedged. That does not mean to say that those which are very tightly vega hedged are still up over the five years' experience, where realised volatility in the previous four years was lighter than the market implied. Similar observations can be made with long-term rho interest rate protection.

The key point is to match assets and liabilities, and the risk measures of the assets with the risk measures of the liabilities. Thus, if interest rates (or some other risk variable) move in a way which is unfavourable to the hedge assets, causing the hedge assets to fall in value, the move would also cause the hedge liabilities to fall in value. It is the difference in these hedge asset and liability movements which is the source of profit or loss — in a perfect match the profit would be exactly zero. Also, the profit or loss which occurs would be different in a hedged portfolio compared with what would have occurred in an unhedged portfolio. This is not specific to Japan, it applies generally.

Mr I. A. Naismith, F.F.A.: I want to pick up on Mr Sloan's comment about distributor understanding. That is a big issue with this product. We all accept that we cannot expect distributors to understand the mechanics of how the guarantee works, so we are looking really at how we explain outcomes to distributors and then how they pass these on to their clients.

The starting point for that, I think, has to be an annuity. The FSA will expect, if we are offering a product which is not fully guaranteed, that we will make a comparison with the product which is guaranteed, the conventional annuity.

The authors point out in the paper that there are differences, for example, in the death benefits, although I think that, with the current tax structure beyond age 75 on death benefits,

these are relatively small in the U.K. Death benefits beyond age 75 outside an annuity have punitive taxation, and therefore provide relatively little advantage.

If we take the product as it was modelled, the way in which it is structured is that, when you get to age 75, your guaranteed income is fixed for life. Starting at age 65, you have, therefore, ten years of potential growth in your income. Over that ten years, in order to catch up with a level annuity, it has to gain around 40% to get from £5,000 to £7,000 per annum. Add to that the 5% income, 2% plus in charges, and you are looking at a yearly return of around 11% to catch up with the level of income which you are guaranteed with an annuity.

This seems to be fairly optimistic. It certainly will only happen in a minority of circumstances. I think that that affects the marketing of the product. It has to be made clear that, if the customers stay with the product, then, in most cases, they will have significantly lower incomes than they would have with annuities.

Mr Ritchie made the point that you would not necessarily stay with this product. If you made some investment gains, then it makes perfect sense to annuitise, perhaps at age 75, or perhaps a little later on. In that case, perhaps the comparison then becomes a more straightforward one with income drawdown, and what are the chances of beating that?

Using the modelling in the paper, it looks, at age 75, as if there is something like a 10% chance of being better off at age 75 with the variable annuity than with income drawdown. Again, the chances are that you are going to lose out slightly compared with going into drawdown.

The comparison with the annuity, where it is difficult to match income if you stay with the product, and the comparison with drawdown if you do decide to buy an annuity, perhaps at age 75, or a little later, presents quite a strong marketing challenge.

How can we position this? I would be interested, particularly, in the views of the authors on this, and how they would explain to distributors at what kind of customer this product is aimed?

Mr Ritchie: As a potential provider of this product, these are exactly the challenges which we will face in the market. Thank you for raising them — these are the questions which we should be asking ourselves.

How do we explain the outcome versus an annuity? I realise that there are pros and cons, but I will stick to the pros at this stage. The pros relate to the fact that, versus an annuity, so many people buy an annuity now aged 60 or 65, yet they are going to live for, we now think, another 25 or 30 years on average.

People are living so much longer. Annuities invest in fixed-interest assets. As actuaries, how often would we tend to advise somebody to invest in fixed-interest assets for a 30-year period? Normally, we would suggest, for such a long period, unless you are very risk averse, some equity investment, in order to try to get that upside potential. Yes, the product design will have to make sense, in terms of a product where you are very unlikely ever to see that upside potential, and it will not be a very effective risk as an annuity. So, the product has to give you that potential upside.

However, I think that that is where the key versus an annuity lies. It is to do with that potential upside. Yes, the death benefit is mainly before the age of age 75. I think that annuity purchase should be deferred until about age 75, where there is not such a long period left to live. This product could enable you to invest in equities for longer, while still having some protection if things do go very badly wrong. That is some of the argument which I would put forward against an annuity.

Against drawdown, an interesting point which I think is probably true is that you are only better off versus drawdown in 10% of the cases with the same equity mix. So, then you have an argument about whether you buy fire insurance or house insurance, and you are not upset if your house does not burn down. You are glad that you have protection in case it does. That is what all insurance products are like. You are paying a premium to protect yourself against the unlikely event.

Having said that, the real strength of the message comes when you start to talk about being

able to invest more in equities because you can afford to take more risk. If you are in drawdown as a 65-year old, and you are relying on that income every year to pay your bills, then, arguably, even a fairly risky customer would want to keep an awful lot of money in fixed interest or in cash, whereas, if you knew for certain that you would never get a lower amount of income than the amount which you have guaranteed, perhaps that would allow you to invest more in equities, and, therefore, you have more chance of benefiting from the upside about which Mr Naismith spoke.

So, versus drawdown, we should not be comparing, necessarily, drawdown with or without guarantees in the same asset mix, we should be comparing drawdown without guarantees in a more conservative asset mix versus drawdown with guarantees in a more aggressive asset mix. That is when we can start to see the real value for money for the customer.

Perhaps that is the challenge for the industry, to try to explain that to advisers and to say that we need to compare like with like. One of the other challenges is that the industry is very price focused. The opener said that the challenge will be to get people to be value focused. What is the value for money of paying this extra charge for this guarantee?

The value for money becomes much clearer if you can assume that you can take more investment risk, because you have that guarantee backing.

The President (Mr J. S. R. Ritchie, O.B.E., F.F.A.): I think that my question is continuing along the lines of the previous question and comment: "We have compared this variable annuity with a conventional annuity; we have compared it with income drawdown; what if we compare it with a mixture of conventional annuity and income drawdown? Is it equally as clear in those circumstances? If someone, for example, were to start their retirement with a modest level of conventional annuity, but with the majority of their pot in drawdown, and, as time went by, if things happened in the way in which they wanted, they might gradually increase the proportion which was conventional annuity out of the drawdown, how does that compare, in terms of the value and the cost, with a variable annuity?"

Mr Ritchie: That is a good question. It is another way of trying to achieve the same sort of outcomes where you say that you want to take some risk, you want the benefit of some of the potential upside from equities, but you also want some of the money absolutely guaranteed. Let us simplify the example: "Why do you not spend half of your money on the annuity and half of your money on traditional drawdown?" You could do that.

I guess that what we are arguing in the paper is that it is a more efficient way to take your risk by investing in the type of product which we are proposing, on the basis that, if you take only half the investment risk, you get only half the potential upside. If you spend half your money on an annuity, you get half the death benefit which you would get otherwise, in terms of what is coming from the drawdown. There is an argument there that this is another way to do it.

What we are proposing, as authors — and I think that I can speak on behalf of us all — is that this is, perhaps, a more efficient way to take that same level of risk.

Mr Ledlie: As an additional comment, unlike some of the authors who are spending most of their day jobs working in this sort of area, I look at it from something of a distance. One of the challenges, often, when you get into the detail, is that it suddenly starts to feel very complex. At the simplest level, this is a very simple product. It does exactly what I want a product to do when I am looking at my retirement. It lets me have control of the pot of money, and it provides an income which protects me against adverse markets, and it protects me against living too long and running out of funds. In that sense, at the very simplest level, there is a very simple and clear communication which you can give to the customer, albeit, at times, when we get into the detailed dialogue with distributors we start comparing one product with another, and we lose the simplicity of what the product is trying to achieve, which is a simple benefit for the end consumer.

Mr Sloan: Responding to a couple of points which Mr Ritchie made, 'the house not burning

down' is an old analogy. My point was that the life cover which you effectively pay for is not actually needed; it is an obsession with IFAs. They prey on people's fears that the insurance company is going to pocket the lot, and other myths. When you do the sums, and I have a programme which does it, by the time you reach age 75 you can have paid hundreds of thousands of pounds on this life cover, but for what?

We need life cover if we are buying houses, and to protect families, and so on. It is not a given that annuitants actually need the life cover. That is why I used the term 'wasted life cover'. It is partly wasted because they have not died, but it is also wasted because it was never really needed.

Regarding the other point which Mr Ritchie made about waiting until age 75 before buying an annuity, I was, of course, that annuitised actuary in my earlier comment. My point is that, unless you are in poor health, the sooner you buy the annuity and get the longevity guarantee, the better. It does not help if you wait, particularly in retrospect. Look at what has happened to longevity projections, forecasts, and so on, in the last ten years.

The term 'conventional drawdown' was used. That is partly the problem. I see nothing conventional about drawdown at all. It seems very odd to me. Although I am not using it, I did have clients who did, because they wanted to be flexible while easing into retirement.

Regarding the President's suggestion of 50/50 conventional annuity and drawdown: his product had a 60% equity backing ratio (EBR), whereas my with-profits annuity has a 75% EBR on the whole contract, as well as longevity guarantee insurance, plus a minimum income level below which it cannot fall.

All I am saying is that you can argue about minor details of the structure of guarantees, and so on, but some of the existing products can meet a variety of the needs. So, if life companies want to sell annuity products, they do not need, necessarily, to invent new ones if they have good existing ones which could be better and more flexibly marketed.

Mr Ritchie: Those are good points. Indeed, these products will not be suitable for everybody. Everybody will have their own views on what they want to buy. Some people will want to buy traditional annuities or with-profits annuities, should they still be marketed.

One of the difficulties which we have, as providers, about selling with-profits annuities these days, is the name which with profits has, and the transparency issues around with profits. In with profits you invest in the product. You are relying on the company to invest your money well, and in the way in which you expect. The company has discretion over the way in which it will invest in the future. It could change the EBR of the with-profits fund from 75% to 25%, or it could put it up to 100%, should it wish, subject to the principles and practices of financial management.

There is a real demand from advisers and customers — and this will not be for everyone — to be able to invest in a range of funds, and still have a guarantee to be able to choose their own funds, funds which, perhaps, they would choose if they were in income drawdown without guarantees. So, choose the funds which they like anyway, with the guarantee on top of that, and have complete control over their investments within that, rather than have something which they see as not as transparent as the new products would be.

There are pros and cons. I am not saying that this will be the right answer for everybody. I think that there are advantages over traditional with-profits annuities, as well as disadvantages.

Mr S. Paterson (a visitor; Intelligent Pensions): As a non-actuary and an IFA, I feel, probably, that some comments on the question of equity exposure and the inclusion of guarantees in retirement income products might be useful.

Speaking of our experience, which has been fairly widespread, in this market, those people who find income drawdown a useful alternative are people who have significant personal resources outwith their pension arrangements. They tend to be people who are naturally 'risk takers'. I have some concern about whether those people would be willing to pay the extra cost of the insurance, given the low overall impact which that may have on their financial positions.

I should also like to take up the point which has been made about the combination of annuity

and income drawdown. Giving an example where half the fund was used to buy an annuity and the other half was used for income drawdown oversimplifies the options which are available.

We have an expression in our business which we call PIDSAP. That stands for 'phased income drawdown with selective annuity purchases'. The point about this is, opportunistically, to take advantage of market gains throughout the retirement period to convert part of the profits into a guaranteed income for life. If that is done systematically in a portfolio with an equity overlay, which itself has reduced progressively as clients move through retirement, then significantly better outcomes may be achieved with that ongoing monitoring process. I think that the difficulty which many IFAs have is not having a systems capability to enable them to do that. Given that it appears to be accepted that, with the same equity exposure, an income drawdown plan should produce better returns, then a more active monitoring and management process should provide the best outcome for those clients for whom income drawdown was suitable in the first place.

Mr I. MacGowan, F.F.A. (closing the discussion): The paper starts by reminding us that the concept of guarantees underpinning unit-linked business has been with us since the 1970s. That leads me to my first question: "Why now?"

The history of with profits has been mentioned on several occasions in the discussion. This has been the principal mechanism in the last couple of decades for providing guarantees on unit-linked style policies. With profits, as we know, has declined in popularity. It is less transparent than customers now expect, and there is a perception that recent returns have been disappointing.

There is also the question of modelling. Mr Smith gave us something of a history lesson on this subject. We are in a much better position now. Variable annuities are tough in terms of risk management and of modelling. We have made some great progress, but that progress has been very recent.

Variable annuities are a recent addition to the U.K. market. This means that what I have seen from practical experience of variable annuities remains very limited in the U.K. Actuarial Profession. I am not aware of many actuaries who have got to grips with the broad range of issues presented in the paper. However, Ms Henshall commented that actuaries in Europe are very much looking to the U.K. for experience, and to help with that experience.

The paper is very helpful in that regard, in bringing us up to speed. It starts the journey for many of us. For that reason, I should like to thank the authors for the paper, and also for clarifying for us that these are not annuities, and, of course, that they are not always variable.

The authors take a very practical approach in the paper. The case study at which they looked is one which Mr Knowles described as a combination of greed and fear. People are looking for an upside on their investments, but want to have a floor on their level of income withdrawal, and are happy to pay a price for it.

My view is that this is the most likely, and most common, application of these types of guarantees. However, for most people, the benchmark remains an annuity. Mr Naismith talked through some of the mathematics of how annuities work and how variable annuities compare. I wonder whether the authors assumed that the annuity would remain as the benchmark for most people for the foreseeable future. After all, they compare variable annuities in the paper primarily to income drawdown, rather than to annuities. I believe that, for the mass market, this will, indeed, be the case. I suspect that the trade-off, a lower level of starting income — Mr Naismith did the sums — for an uncertain future upside will be a difficult one for people with modest pension pots.

At the other end of the spectrum we have income drawdown. The conventional wisdom on drawdown says that investment returns have to be greater than the mortality drag plus the effect of charges. Again, that will be challenging for variable annuities, particularly if the charges under these contracts are high, when including the cost of guarantees. Also, generally, there has to be a minimum of, say, 30% to 40% of the fund in fixed-interest investments — and that restricts potential returns.

Mr Paterson referred to an example of that based on an experience with some of his clients. As has been mentioned, drawdown has been used in a much more flexible manner since A-Day — for clients looking for death benefits and tax advantages, for example, through building up their retirement incomes from tax-free cash and income withdrawals. If customers are looking for drawdown to provide flexibility rather than simply to beat an annuity, I see a place for this type of product.

The positioning of all of this is subtle and important. We have more to do to show the IFA community and customers where variable annuities work, and, just as importantly, where they do not work. We have had a great deal of discussion on that here.

So, why have variable annuities been slow to take off in the U.K. compared to other countries? I have mentioned that annuities are still widely regarded as offering poor value in many cases. Actually, they are a very effective solution for many people. That is something about which Mr Sloan spoke.

IFAs do not understand where variable annuities fit in. Mr Sloan suggested that some examples might help. The industry has more to do here, and maybe we should ask Mr Sloan for some guidance on it.

The pension system in the U.K. also makes life very difficult for us. The authors do not hide the fact that, in the paper, their example does not work with the constraint of the U.K. pensions regulatory framework. I understand why they have taken that approach. It avoids us getting bogged down in a great deal of detail which could divert us from the main purpose of the paper. I think that it was the right approach to take. So, it is left for those of us who enjoy the challenge of product development to fit these concepts into quite a tight regulatory constraint. All that just adds to the fun!

The paper goes on, in its later sections, to talk about sophisticated risk management techniques and accounting considerations. The latter part of the paper is a bit more complicated and a bit more detailed. It introduces us to a whole army of Greeks. I always feel that, as soon as I have understood these Greeks, a whole lot more of them come over the hill! Mr Munro and Dr Hare added some colour through some practical examples of how risk management might be used, and the sort of risks which we ought to be considering before embarking on variable annuity business, at least in any volume.

So, let me end by thanking the authors. It has been a tremendous paper and there have been many good contributions to the discussion. Variable annuities are here to stay. They have a part to play, even if not all of us have yet figured it out. For me, it is a matter of when, rather than whether, they become an accepted part of the retirement planning landscape in the U.K.

Mr D. C. E. Wilson, F.I.A. (replying): We have had many very helpful comments and questions in this discussion. My apologies if I do not answer them all. We will certainly take them away and think about what you have all said when we present this paper to the Institute in a couple of weeks' time, and also for future reference.

The comments which we have had fall into two main areas. One concerns the scope of the proposition for customers, and the advice which we need to give to customers in order to help them to understand the proposition and to judge it against alternatives. The second, on which we had less discussion, but it was an important discussion, was around how the insurance company would manage the risk which it was taking on in writing such business.

Starting with the first of these, I think that it was interesting that, at the beginning of the discussion, we had several people talking about the definition of a variable annuity. It is where we started with the paper, and there were obviously some differences of opinion, although the focus of discussion was on its role within the retirement income market.

Again, we had some differences of opinion as to how the product would compare against alternatives which are available at present. Something which did not come into the discussion, which may be worth thinking about, is asking whether or not people actually have the product which best meets their needs and handles their risks, at present.

The vast majority of those who take out conventional annuities take out fixed annuities.

There is no income inflation protection in that product, so no inflation protection in that product at all, over the length of a potentially very long retirement.

If you look at the comparison between an inflation-linked annuity at retirement and a fixed annuity, probably you can work out that you need to live at least 20 years if inflation turns out to be as expected before the income which you will have from the inflation-linked product matches what you could have had each year for the previous 20 years.

Does that mean that an inflation-linked annuity is not a good product for someone to take out? There may not be a very high chance of getting a better total income from your inflation-linked annuity, but you are certainly managing the risk of inflation turning out to be higher than expected. So, there is an angle of thinking about risk management from the perspective of the individual customer, and not just about a particular probability of one product out-performing another one.

That is my summary of where the discussion went on the proposition itself. What about the question of how we explain the actual advice to the customer? It is clear that this is a very real challenge which the whole industry faces. I suggest that this is really analogous to the challenge which already exists with some of the products which Mr Sloan mentioned. Incidentally, I share his views about the attractions of the with-profits annuity product and, potentially, the unit-linked annuity product as well. However, the reality is that they have proved very difficult to sell in the U.K. market, partly because the advice is difficult to give. They include the words 'with-profits', which, as has been said, is something which means that there is discretion on the part of the company, and which, potentially, means that customers are going to be suspicious of that.

There is no doubt that we have a big challenge in presenting to customers exactly what they are getting and how that stacks up against alternatives.

That said, it seems to me that there will be people for whom this is an attractive proposition when they do understand it, that it has the right sort of combinations of guarantees and potential upside. It is certainly a useful addition to the armoury of products which can be offered. We need to be giving advice, and it probably needs to include some stochastic modelling — it is not just the number of scenarios at which we can look.

I know that the whole question of stochastic advice is something at which the FSA looked several years ago now, and it continues to look at it from time to time, but it has drawn back from coming up with any proposals, because of the very difficult nature of accepting what it is which customers will and will not understand.

On the question of the hedging of risks present in these products, again, we had a number of very useful contributions. I think that we should, perhaps, bear in mind that, to some extent, the risks are not new to insurance companies. This matches what Mr Munro said. Insurers already have these types of exposures within their businesses. From that perspective, I do not think that they should be managed any differently from the way in which some existing with-profits business looks, certainly from how it looks from the shareholders' perspective or the perspective of the owners of the business. The same sort of risk management should be taking place. In many cases it is not. That is why this is being looked at as a separate line of business. Those sorts of considerations, and the ones thinking about the whole capacity of the market, what it means at a macro level as well as a micro level, are certainly points which are very well made.

I now summarise how I see that the discussion has gone. There are two different angles. They both come down to being able to understand and to explain where these products work and where they do not work, both from the perspective of the customers, so that they can understand the proposition and see whether it is something which they want, and from the perspective of the insurance company.

As Ms Henshall said, what is the killer scenario? Is there a situation here where our management of this product is beyond the capabilities of the risk management of the business, or which exceeds the capital capacity of the business?

The President (Mr J. S. R. Ritchie, O.B.E., F.F.A.): Thank you very much, Mr Wilson. We have had a very interesting and wide-ranging discussion. That, in itself, is a very good sign of the quality of the paper. I should like you to join me in thanking all of the authors for the paper which they have presented this evening.