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# An executive's handbook for understanding and risk managing unit linked guarantees

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## Abstract of the Edinburgh discussion

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### Contact

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This abstract relates to the following paper: Maher, J., Corrigan, J., Bentley, A. and Diffey, W. An executive's handbook for understanding and risk managing unit linked guarantees. *British Actuarial Journal*, doi: 10.1017/S1357321712000013

**The President (Mr R. S. Bowie, F.F.A.):** The paper tonight is the product of a small group of members of the Profession with an interest in this subject. I am pleased that two of the authors, James Maher and Anthony Bentley, are here with us tonight to present the paper.

James is a Fellow of the Society of Actuaries in Ireland, a member of the Council there, and has been a member of our Profession for over 20 years. James has a keen interest in the subject of risk management and the mitigation of the risks associated with variable annuities. He has recently moved into consulting with the aim of developing the Irish practice at Ernst and Young.

Anthony is the group risk actuary at HSBC Insurance, where he has worked for the last three years. There he is responsible for the development and implementation of risk strategy and policy at a global level. He has scanned the world for the pros and cons of variable annuities. Before he joined HSBC, Anthony was in the life insurance actuarial team at KPMG.

**Mr J. A. Maher, F.F.A.:** Thank you, President. It is a pleasure to be back in Scotland. I started here back in 1989 with Standard Life.

It feels like I have been giving this presentation, or forms or parts of this presentation, for about three years – the three year history of the crisis. We have had an opportunity to explore the management of market risk at a level we had not anticipated.

This paper consolidates the various sub-themes that have been reviewed at the Life Convention or at FIRM over the last three years. We look at everything from the derivative element to product management – all elements of risk management and unit linked guarantees.

Our target audience is executives. In our post-Walker Review world, it is essential that executives are familiar with even the most complex risks on the balance sheet; and not just the executives but also the non-executive directors.

It has been a challenge to write a paper that we feel has the optimum level of detail for an educated audience – an audience familiar with insurance and with investment. We have taken a descriptive and linguistic approach. We have tried not to be dogmatic.

To aid understanding we have an accessible bibliography in the paper. In the on-line version of the paper, there are links to all the sub-papers. Many of the sub-papers are those that members and the authors of the paper have written over the years. So you can do more research into residual risks or liquidity in option prices, for example. There is plenty of detail for the interest of the actuary. The aim is to cover the whole range of risks at a sufficiently detailed level for the executive.

The paper has been written within the Variable Annuity Member Interest Group. We had a busy year last year and managed to issue newsletters on a monthly basis. We addressed a couple of consultations, particularly one in Dublin, where the regulator is introducing special rules or requirements for variable annuities. It has been a little quieter this year so far.

The other authors are Josh Corrigan, Anthony Bentley and William Diffey. We were aiming for a balanced team: I was with an investment bank when the paper started; Josh Corrigan came at it from the dynamic replication point of view; Anthony Bentley came at it from a group risk perspective and William Diffey from a financial reporting one.

I am now going to hand you over to Mr Bentley, who will give us an overview of the paper.

**Mr A. K. Bentley, F.I.A.:** Thank you, President, for your introduction, and thank you all for being here. I look forward to a lively and good discussion about our paper later.

As Mr Maher and the President both mentioned, I am a risk manager in group risk at HSBC. I approve many of the more complex products that we manufacture around the world. I felt that, as I am seeing more variable annuity type products being manufactured in our group, it was necessary that I understand the risks of the products and how our businesses should go about managing those risks. If we are managing those risks, we should also understand what the key considerations are and the secondary risks that might come from them.

I will aim to touch on most parts of the paper, pulling out the key themes and highlighting the interesting findings and key concepts. The paper covers some areas in technical detail. We think that, if you are going to write products this complex, there needs to be some understanding at the executive level and, indeed, the non-executive level, of where the risks arise, how the hedging platforms are working, what assumptions they are based upon, and any further risks arising from those assumptions.

*Mr Bentley then presented an overview of the paper, with the aid of slides.*

**The President:** There are no restrictions on the questions. Who would like to go first?

**Mr R. R. Ainslie, F.F.A.:** Sorry if this is a question that is slightly off the topic. You have discussed the risks associated with the product. What would the rewards look like for participants? Companies have to have a profit motive for writing the product line. If you can make a return on capital of 12% per annum on a normal portfolio of insurance type products, then what sort of returns would companies seek from this type of product?

**Mr Maher:** Before you set out you need to understand your organisation as that will inform what you are going to do and why.

It is not so much that you have a choice but that you will have an end or a purpose in mind. If my purpose is to be an asset gatherer I might say: 'I am going to write a guarantee because it will enable me to acquire assets I may not otherwise have. I may be able to move assets out of lower risk funds into higher risk funds – and not so much higher risk funds but alpha generating funds – and with that I will have the opportunity to charge a much higher management fee.'

What we are talking about here is how we increase the embedded value of the entire company having regard to the market constraints. With that in mind, you are going to say: 'We tried writing a variable annuity guarantee and alpha generating funds, and we had a mapping exercise. We thought we could come up with a future replication that gives a zero basis risk hedging mechanism, using liquid futures.' However, basis risk manifests itself and, in particular, if you are going out to try and sell something that is alpha generating, something with idiosyncratic return, you are not going to be able to hedge that with your beta type hedging arguments. If you want to make money and you are an asset gatherer, you are going to have to become smarter about how you hedge and structure your products.

We talk about flexibility and cost sharing: in order to have a sufficiently marketable guarantee cost in this environment, you are going to have to take either risk or cost out of the system.

As an asset manager, you charge for the creation of units – an asset management fee. You do that through your asset management arm. Then you use your hedging arm to take away all the performance. It is all alpha generating, so you will have to buy total return swaps, and you will have to pay somebody a fortune to take all those units away.

As an asset manager, is there some way we can link together the performance generation side, the asset management side, and the hedging side by using total return swaps between the hedging side and the asset management side? Or, shall we say, is there a way to recognise the stock lending fee I am earning on the asset management side? The stock lending fee is effectively another name for repo costs on the hedging side.

So, in order to make money on the asset gathering side, you are going to have to wrap together the profit you make on your asset management and on your hedging. There is a product there once you put them together. What you would not be able to make is a product that is marketable and makes a full margin on the asset management side and on the hedging side.

You will need to leverage what you are good at, which is asset management; you need to integrate your asset management and your hedging.

Consider an insurance company. How does it generate a product that makes money and fits in? The policyholder is the centre of my business strategy. I am setting out to provide protection type solutions. I used to sell annuities but I recognise now that there is a risk of selling annuities in a Solvency II world with all the credit charges and the disappearance of the liquidity premium. So how do I continue to offer decumulation products to give people some degree of inflation linking? If we can put them into a drawdown fund and offer them some sort of an overlay, it might be attractive.

In this case, I do not need to offer high asset performance – just beta or index level type performance. If I provide a product that is based on cheap market performance generation using exchange traded funds – lowest cost generation of replication – I have a virtuous cycle because, not

only is it a low cost and a low drag on the fund, it also links perfectly into my hedging strategy with low risk highly liquid replication mechanisms.

Depending on your company's structure and aims, you will build a product that is consistent with your market, but there is no 'one size fits all' solution.

There was an element of alchemy in the early days of variable annuities with promises that you can have all the fund performance and we will guarantee it all. It does not really work like that. It is an insurance product and the concept of insurance is that you have to pay more to transfer the risk than the cost of the risk itself. So how can we provide a product that meets a customer need? It might be that partial risk sharing is more than enough for the particular policyholder segment. So CPPI structures are fine once you know you're splitting the risk between you and the policyholder. Variable annuities or unit linked guarantees have more risk transfer than some other products.

If you want to try and make money selling alpha, you have to become smart at asset management and link it with your hedging directly.

If you put in your mind the idea of an offset bank account, where you have a lending and a savings component, you will see it physically at the front end as two loans, but there is some offsetting at the back. This is what we are talking about in terms of integrated hedging in the future.

It is about taking costs out of the system and trying to break down the idea that variable annuities are not 'the next big thing', but that they do have a place on the product shelf. The one thing that I think will be important to increasing sales is to try to deter people from the idea that it is some sort of an asset arbitrage and to start looking at it as more of a protection product.

It is a mass market product. If you are competent as an asset manager there is money to be made, but you have to understand what the true costs are, so you should design your products with risk management in mind.

**The President:** Mr Maher, I was wondering when we would come to the answer to Mr Ainslie's question, which is: what kind of return from these products are people looking to achieve? The risks sound frightfully complex. Presumably they are targeting a pretty big return to make it worth their while to go through all this aggravation, even if the institution is big enough and persistent enough to have a go.

**Mr Maher:** Historically, the insurance sector has under-priced these products because of risks they have not recognised. Many legacy books are underpriced. Now, the question you have asked is: why does the price from an investment bank tend to be higher than the market value that you are holding on your books?

The investment bank is writing it to achieve a decent return. It is a tough one but you need to move one of two ways. You need to have integrated hedging or cheap beta replication in index products. But the main challenge is to get the base price right.

**Mr K. A. Miller, F.F.A.:** I am coming from a similar position to Mr Ainslie. I think the paper is a useful guide to the management of these guarantees, and the large amount of effort involved in management of risk is apparent.

The complexity of the risk management does not encourage me to provide these products. The authors helpfully set out the seven principles at the end of the paper, which emphasise the complexity.

My experience of products with guarantees in the UK has been with-profits bonds with guarantees from five years onwards. This gave no encouragement that customers appreciate the true cost of guarantees. Generally, the customer research I have seen indicates that customers are not willing to pay for these guarantees. What they are willing to pay does not cover the cost of providing them.

So how can you charge enough to cover the cost of guarantees? I am interested in the experience of the Japanese and US markets and what they have managed to do. Have they managed to make money on these products? I would suspect it is hard to charge enough to cover the guarantees.

**Mr Maher:** Those two disparate markets have come at the product space from two different angles.

In North America it is a distribution-driven market. You assume high levels of withdrawal. Whether you are going to make money or not depends on the assumption of this behavioural aspect of the product. It is asset-led.

Are people making money in North America? There is much run-off business but there is no one willing to buy the books of business. There is much re-pricing and a movement towards lower-risk products.

But, in North America, there is questionable profitability. North America went through a few phases. The first phase of the variable annuity guarantee was at the start of the decade. That was heavily reinsured, particularly the GMDB type product. It was not hedged; it was written and held on an insurance basis.

After the crisis we had at the start of this decade, many reinsurers suffered, for example, AXA. Then we thought we had it sorted out through dynamic hedging. We hedged delta. But when we came to the next crisis, the same issue arose again.

We are only now ready to understand the limitations of hedging and the true cost of replication. I am not sure of the value and the profitability of the legacy books in North America. There is evidence now that demand has returned in North America. The volumes are starting to flow again. Prices have gone up; risk has come down.

In some ways, the industry is only now ready to write variable annuities. We have learnt much more about risk management. It is only now you could say that we probably know enough to start writing them in volumes.

But, in North America, the business is asset-led and heavily dependent on the behavioural assumptions.

It is more of a mass market product in Japan than you might see here in Europe. There are basically four fund choices underlying every guarantee: the domestic bond, the domestic equity, a world bond fund and a world equity index.

The product provider is nothing to do with the asset performance. It is guarantee performance. So in a low interest rate environment the products are predominantly guaranteed minimum accumulation

type benefits. The way they compete against each other is through the guarantee and there were a number of products that were difficult to hedge.

But the Japanese market has razor-thin margins. At the moment, the appetite is to reinsure the business. There is much reinsurance occurring in Japan and there has been since about 2005–06. Many new reinsurers came into the market off the back of external platforms, for example, Milliman. Reinsurance companies like White Mountains came into the market. Many reinsurers that did not hedge are pretty much out of the market. The investment banks are also interested in the Japanese market.

The Japanese market has a low behavioural risk. It has a very low lapse rate and simple assets but a complex enough payout pattern. There are razor-thin margins yet profitable business in the Japanese market place.

The UK is perhaps a little more like North American in style – more of an asset perspective – whereas continental Europe has more of a protection type market. The continental model is more like Japan's, and the UK market is more like North America's.

**The President:** Does that mean that Japan priced it better in the first instance?

**Mr Maher:** There was less to go wrong, shall we say? It was more replicable and you could make money in Japan. For regulatory reasons, much was reinsured.

**Mr S. Manson, F.F.A.:** You said that the prices of guarantees are sensitive to the assumptions used for policyholder behaviour. My understanding is that if you were to assume financially rational behaviour, the price of a guarantee is going to go beyond a point that anyone is going to pay for it. To what extent do providers assume non-rational behaviour when pricing? And is that sustainable in a world where policyholders may become more financially sophisticated over time, or where a secondary market may emerge?

**Mr Maher:** There are two important dimensions to this. The first question is: how rational are policyholders? There will always be some attrition for reasons other than rationality. Then the second question is: to what extent can we observe whether or not there is value in an option price? For GMAB contracts it might be a little more transparent, whereas for GMWB, it is quite opaque sometimes.

A completely rational model probably will not work in pricing, so you will not have a completely rational model, but we can talk about 'broadly' rational behaviour.

It is a requirement in Solvency II and a requirement by most companies now to have some regard to the level of rationality. It might be modelled by assuming there is a window in which there is insufficient precise information to enable a policyholder to make a decision and a trading range under which a policyholder is unlikely to act.

It is still early days. This is an area where expert judgement would be required from a Solvency II perspective. There would not be any statistical quality test from an internal model point of view.

Back in the time when there was money to borrow there was talk of funds being set up to invest in the secondary market and to exploit the guarantees. Markets have been a little inefficient recently because there has not been much money around to exploit these inefficiencies. That said, a letter

from the regulator in Ireland at the moment states that we have to have regard to the prospect of the secondary market that will enforce rationality.

From the Solvency II perspective we might have standard tests which cause you to push up and down the level of lapses. Maybe you want to think about rational behaviour. The degree of rationality or otherwise is an additional internal model test you might need to bring in. But there is judgement around the degree of rationality. You will not have perfect rationality. You can probably overstate the threat of a secondary market to exploit these. At this point in the market, where the cost of funding is too high to support it, I would be less concerned by it.

**Mr Bentley:** You can control the behavioural risks effectively by changing the design of your policy so long as you do it early enough. If you discover the behaviour of your policyholders some way down the line, there is not much you can do about it. However, if you think about it up front, there are ways that you can manage it out.

**Mr Maher:** Again, this is why reinsurers and investment banks have a slightly different relationship with variable annuities than an insurance company. There are trade-offs between the performance of the fund and the guarantee.

For example, increased persistency is bad for the guarantee if you have low lapses, but good for asset management fees.

You have some natural hedging if you are holding the rider and the fund together. If you are the investment bank you are going to say: 'You control to the extent that you can. You can influence persistency much better than I. You have a natural compensator on your balance sheet. There is no way I am taking on your persistency or behavioural risk.' That is a rational comment.

**Mr C. Selfridge, F.F.A.:** My question is this. When it comes to pricing these products, much rests on volatility, interest rates, and so on. How do you have a sustainable product that is available for 12 months or 6 months at a time? Maybe the market is not mature enough yet. People do not want to see their charges changing every two weeks.

**Mr Maher:** There are two dimensions on charging. If you work in the Lloyd's market there are, for example, risk attaching and risk occurring.

The first thing is uncertainty of the cost of replication. When you are using dynamic hedging you have your cost of replication, which would be priced in the market on the day you are hedging. The risk from a hedging perspective is that you are underwriting the cost of future charges, and costs might be variable in the future.

If I price this on today's market rates, are the parameters fixed for the term of my contract? The answer is "No". So, when you are doing your pricing, you must have regard to the likely future market state and what likely future hedging may be. When you write the option, then you must make an assumption in regard to future market liquidity, knowing that your liquidity costs are going to go up when the markets fall.

In respect of the future market, the future-proofing of your product, or the stability of your product, is a management decision.

You have a trade-off. If you keep changing your prices, you are going to confuse the distribution network and it is going to cost a fortune in paper. But if you do not do it, what is the cost?

Perhaps the frequency of your re-pricing is a management decision, but you should at least know what the cost is, the embedded value of the product at any point in time. You cannot write the product without knowing if every policy has a positive or negative present value of future profits when you write it. A management decision is when to re-price, but you need this management information, so make sure you have your management metrics.

Can you hedge forward? Of course you can. You know what the key drivers are likely to be. You could purchase some hedges, but you are going to do so according to the likely condition of the market and at some cost. You may or may not make money depending on whether the volumes materialise or not.

You basically take a business decision, which might be to offer products for the next 12 months. You know you do not want to re-price more than twice in that period unless the present value of future profit goes to -3%, say. You would have a risk appetite for the volumes you are going to write and for the amount of negative profit you are going to take on. You cannot squeeze out that risk. What you can do is make sure you have the right information and the right controls. If you are cautious and are confident about your volumes, you might do some future hedging.

**Mr Selfridge:** In markets like Korea, and other places where this is more established, have you not seen a variable annuity market where people are more attuned to the fact that you have to be flexible with pricing?

**Mr Maher:** It is a tough enough sell as it is. These are management choices and you are trying to optimise in many dimensions.

Returning to my original comment on distribution, the distributor just wants to make sure he has an explainable product that meets the needs of his customer; that his guarantee is going to be available and it is going to change as little as possible.

It is like the joke about the pig and the chicken and their relationship at breakfast. If you are the risk taker, you are the pig in the breakfast. You are the sausages and rashers if you are selling the guarantees. If you are the distributor, you provide eggs for breakfast but you are not completely committed.

**Mr H. R. D. Taylor, F.F.A.:** I thought the paper was very good. I liked the diagrams, the way it was written and your introduction. Congratulations to all the authors.

I am interested in innovation. Unit linked products with guarantees or variable annuities are certainly ripe for innovation and commercialisation. I have a couple of questions and suggested answers.

First, is there a market in the UK and if so where is it likely to grow fast? Second, what are the potential barriers to growth?

In answer to the first question, I refer to Figure 1 in the paper, showing 'Risk Transfer from Customer to Financial Institution by Product Type'.



This set me thinking: why does the customer have risks that they would want to push onto a financial institution? One major source is the massive shift underway in the UK from defined benefit to defined contribution pensions resulting in the State and employers transferring both investment and longevity risk to individual customers.

So logically it seems there is a market with growth potential in defined contribution pensions.

Turning to the second question about growth barriers, the UK is unlike some other European and North American markets where variable annuities have already become established. The past is not necessarily a guide to the future in the UK for commercialisation of these innovative products. There are several technical issues to be resolved in order to develop a profitable and marketable proposition that meets customer needs. For example, a feature of the UK defined contribution pension marketplace is an increasing focus on cost efficiency driven by stakeholder charging and NEST combined with a transparent charging environment driven by the FSA. There is little hiding place for bundled costs, which may be a structural aspect that does not exist in other market places. So these could be barriers to growth.

I am convinced, however, that there is a market for this innovative type of product which will sit alongside other methods to help customers manage their long term investment and longevity risks.

Do the authors agree?

**Mr Maher:** In terms of future trends and the McKinsey analysis, I agree. Approaching retirement is where somebody's financial capital is overtaking their human capital – their ability to produce income. If that financial capital is in the policyholder's own hands, as opposed to in a pension scheme, they are going to need some degree of risk management, risk mitigation, of it. In defined contribution pensions, as more and more people have responsibility for managing their financial capital, their need for different degrees and grades of guarantee or risk protection are relevant. So that is a target market where these products make most sense.

In terms of getting it right, I still think we need to work out the whole sales proposition. It has to move away from an asset proposition towards a policyholder centred risk management proposition.

**Mr Bentley:** In the markets in the East, our customers seem to not want to buy any product without the word "guarantee" in it. But they also want some growth opportunity; they want some upside. Things may be a bit different in the UK – either you are a risk-taker or you are risk-averse. There is not the mindset of being somewhere in the middle which we are seeing in Asia where people want to be risk-takers but they do not want to lose all their money – they also want guarantees.

**The President:** I now ask Gordon Wood to draw the threads of this discussion together.

**Mr G. C. Wood, F.F.A. (closing the discussion):** As closer, I am given three instructions. The first one is to give a complete and coherent overview of the paper today. The second one is to take ten minutes to do it. The third one is to finish by 7 o'clock! I am afraid we are aiming for a maximum of two out of three. I will try to be brief.

First of all, thanks to the authors for a polished presentation and a timely paper. You do not need me to talk about the volatility in the financial markets. We have seen the economic uncertainty that we

are still facing, and the paradox that guarantees are now probably more necessary for policyholders, although they are less willing than ever to pay for them.

As actuaries, surely one of our unique selling points is to understand the risks, and then design the appropriate pricing, hedging and reserving techniques. So, from that point of view, this is a timely paper with its attendant bibliography, and a good read for the majority of life assurance actuaries.

Key themes in the paper are conservation of risk and capacity.

But for me, the abiding theme, coming through loud and clear, is that we need clarity. This is a complex topic. We need clarity of the risks we think we are running, the risks we want to run and what a risk management programme needs to look like.

There was brief talk about conservation of risk. Clearly, it is a closed system. The paper goes straight on to transformation of risk, which is a key point. In terms of your own hedging programme, you suddenly have material liquidity risks or reinvestment risks.

The other key area, that I was slightly surprised was not touched on more, was the amount of capital required for the lower grade of counterparties. A key additional risk you are running is the counterparty risk to any provider, for example, a reinsurer. The level of collateralisation, the frequency of collateralisation, and the amount of 'gap' risk are material additional risks that you will be running as a result of entering into a typical reinsurance programme. All of these areas need to be considered carefully.

There is a useful exposition from the authors about the need to consider the issues from the trader's point of view and not just to become engrossed in the market-consistent world that we know and love. If you have a dynamic hedging programme, then it is the robustness of that programme through time, and the allowance for future rebalancing costs and other aspects, which will not be appearing in your market consistent numbers. Again, all that is crucial. All that comes back to clarity of purpose, understanding the risks that are being run and the hedging you need to put in place to remove them.

The trade-offs again came through loud and clear in the paper. There is a useful slide talking about the need to balance, for example, less frequent re-balancing with lower costs, against the greater 'gap' risks that are run by the organisation.

In terms of managing the risks, again, there is a good figure from the authors, although there are one or two issues not covered. Basis risk was mentioned in passing, but it is probably worth mentioning more. Consider the basis risk in, for example, the difference between a reference index of the FTSE 100 index, and the actual fund performance, which might be the benchmark index for the fund manager (say FTSE All-Share) plus or minus the fund manager's skill. If you calculate the numbers in practice then the actual capital needed for this risk can be a surprisingly large component of the prime equity risk that you think you have managed to remove. You need to calculate the numbers and think carefully about residual risks still remaining.

One interesting issue is raised about changing terms and conditions. This is quite difficult territory. We can run into Unfair Contract Terms issues, for example. There is an interesting philosophical point about when a charge for guarantees is not a guaranteed charge.

We have had a couple of interesting comments from the audience. Mr Ainslie was asking about rewards. I am not quite sure what the authors' response was apart from: 'If we stop them being negative, then it is fine'.

Seriously, we are talking here about guarantees as part of a wider product portfolio. I think part of the answer was not necessarily to make extra return on the guarantees themselves but to help generate extra volume, for example, on the asset gathering side. So the upshot seems to be to use the product with care, as part of a sensible product spectrum rather than to use it as a product that will make a huge amount of money.

We heard from Mr Taylor about the complexity of the risk management. I think that is clear from the presentation.

There was an interesting point about behavioural risks from Mr Manson. Again, it is almost impossible to get statistics on this. Some of these risks are inherently unhedgeable. As we move into the Solvency II world, there will be some interesting solvency capital requirement and risk margin calculations.

The last thing I will pick up on is a scarcity point. There is, of course, the capacity point in terms of reinsurance and investment banks. But the scarcity of human capital is much more interesting. This is a technical area which I think, as actuaries, we need to know much more about. I think this paper is a good start and I commend the authors.

**The President:** At the Life Conference last week I was struck by how much of the conference was given over to risk management and reserving, Solvency II, and all the associated issues. I think for the reasons that a number of people have given, together with the inevitable increase in defined contribution schemes, the population needs to learn to become savers again. The members of the Actuarial Profession, sooner rather than later, need to turn their attention not just to reserving for the products that are already there, but playing a full part in designing products that the population is going to need for the next couple of decades.

As for any work which is published in instalments, my feeling is that the audience are now looking forward to volume 2 in which, having found out in Volume 1 where the risks lie, we learn how to make profits in the long term. If the authors would be prepared to turn their minds to that second instalment over the course of the next couple of years, I think that would guarantee another large and interested audience next time.

So can I ask you all in the audience to join me in thanking the authors here tonight?