ABSTRACT OF THE DISCUSSION

Mr R. J. Chapman, F.I.A. (introducing the paper)**:** Of the words of the title of this paper, we understand pensions and funding probably better than anybody, but what about risk? Risk is hard, and it is made harder because there are many possible definitions of risk clouding the picture.

For a particular pension scheme, suppose I ask: "What is the chance that, if I continue with my current investment policy, my pension scheme will be less than 100% funded at the end of next year?" That sounds like a reasonable question to connect the words pensions, funding and risk, and questions like this are the basis of much of the current style of asset/liability modelling in pensions.

However, stating risks in such probabilistic terms has two big drawbacks:

(1) Even if we knew that there was, say, a 10% chance of our pension scheme being underfunded at the end of next year, we would not know the size of the bet that we were taking. In other words, if we wanted to cover ourselves against falling below 100% funded, how much would it cost us? Would it cost us £1 million, or £10 million, or £100 million? So, there is an issue here of quantifying risk in monetary terms.

(2) Even then, we do not know anything about the effect of the bet on anybody other than the trustees and the members. For example, the pension scheme might be very large in relation to the company. If so, we might find that there was a 50% chance that continuing the current funding and investment policy could flip the sponsoring company into insolvency. So, there is an issue here about the scope of risks.

We embarked on our paper to address these drawbacks. We started by trying to identify and to measure the interests of all the parties to a pension scheme. This led us to the link between pensions and shareholder value; and that is what this paper is really about.

Shareholder value is a surprisingly actuarial concept. What we do is to track the cash flows within an enterprise, and discount them to produce a present day value. 'Projecting cash flows' and 'discounting them'; what could be more actuarial? On the insurance side of the profession, they are already some way down the road with their development of fair value measures, but it is a connection that pension actuaries have been slow to make.

How then does the tracking of components of shareholder value help us to measure risks in pensions? The answer is that, by looking at the volatility of the cash flows and at the correlation between them, we can assess how strategic decisions shift value amongst all the parties to the pension scheme. Examples in relation to a pension scheme might be: "What is the effect of slowing the pace of funding?"; or: "Who gains from a change in investment policy?"

To measure the shifts of value, we have built a stochastic projection model which combines the finances of a pension scheme and its sponsor. The creation of shareholder value models could be a topic in itself, so we hope that the discussion will concentrate less on the details of the model and more on the central theme of the paper — that the insights from linking the finances of a pension scheme with those of its sponsor will be part of our consulting advice in the future.

In our model we use deflators for discounting stochastic cash flows. Deflators are going to be an increasingly important technique for actuaries, and we suggest that they should become a technique that differentiates our profession from others. You can read about deflators in the paper Jarvis, Southall & Varnell (2001), but the essence is that a separate deflator operates for each generated scenario. When you average the results of the projections, the important consequence is that the resulting values retain their economic coherence. If the model were not coherent in this sense, it would be possible to create value out of thin air. Creating value spuriously is not useful if our main aim is to account completely for all transfers of value.

The concept of 'economic coherence' is closely allied to the concept of 'transparency'. If you are trying to make decisions or to advise people with decisions to make, it is important to

understand the full picture. Incomplete information can lead to the spurious creation of value, by leaving some losers out of account.

In contrast, transparent information gives the full picture about the effects of decisions on all parties. If we track cash flows across all parties to pensions transactions, we are going to be much better placed to advise our clients, even if this may sometimes give rise to conflicts of interest, which have to be addressed.

Both transparency of information and duty of care to particular parties are matters raised by the recent Myners review and the Government's response. We think that some of the concepts in the paper will be useful in thinking through the issues that flow from the review.

I end by emphasising the opportunity that is before us in looking at pensions and shareholder value. We have conceded a lot of ground to other professions in the modelling of corporate enterprises. Let us now start to claw back some of that ground in an area where our skills should be second to none.

Reference

Jarvis, S.J., Southall, F.E. & Varnell, E.M. (2001). Modern valuation techniques. Paper presented to the Staple Inn Actuarial Society, 6 February 2001.

Mr C. A. Cowling, F.I.A. (opening the discussion)**:** This paper is a valuable contribution to the evolution of modern actuarial thinking. In particular, its embracing of financial economic theory (continuing a trend established in some notable earlier Institute papers) is especially welcome. I do, however, have some concerns.

This paper is all about applying the concept of shareholder value to pension schemes. In recent years, companies have struggled to embrace the growing fashion for a shareholder value-based approach to corporate management. Along the way there have been critics of the shareholder value bandwagon, who have complained that the analytical tools developed to measure shareholder value are far too complicated and unwieldy. It is deeply ironic that, as is demonstrated in this paper, pension schemes are one of the few areas of corporate life where it is relatively easy to apply a shareholder value approach, but it is also the area most neglected in the shareholder value revolution.

The paper makes a good case for a critical and fundamental review of the use of asset/liability modelling (ALM) in Sections 2.5 and 2.6. It is remarkable that a typical ALM completely ignores events that are less than 5% likely to occur. If we applied the same principles to the management of our own assets, such as our homes, we would never purchase any insurance. Is trustee reliance on ALM really the action of a 'prudent man'?

I hope that there is nobody here who still believes that a traditional ALM gives any true insight. As the paper indicates, there are no 'free lunches'. Any apparent win-win situation for companies or trustees is just a charade, made possible by the non-transparent ALM methodology and the shortcomings of the present accounting standards.

ALM may have a role as a 'qualitative method for explaining risks' (¶2.5.2), or for providing 'scheme-centric insights into pension developments' (¶2.6.12), but there are surely more straightforward (and cheaper) ways of achieving the same results.

The subject of agency costs (Section 2.7) is extremely important, and probably worthy of more than the few paragraphs that it receives in the paper. Indeed, it probably merits an Institute paper and sessional meeting all of its own. After all, it is the main reason why there has been such reluctance to apply shareholder value ideas to pension schemes.

It is in the core of our nature to behave in a selfish way. I do not ascribe any moral connotations to the word selfish, rather, I mean it in the way used by Richard Dawkins in his excellent book *The Selfish Gene*. Behaviour in this context is 'selfish' if it serves to improve the welfare, or we might call it the utility, of the individual.

That champion of shareholders' interests — Warren Buffet, has frequently exhorted company management to have greater regard to the creation of value for shareholders, for example, by championing the cause of transparent accounting standards. However, whilst he has often

criticised company management for not embracing shareholders' interests and reducing agency costs, he has rarely admitted that it is perfectly natural for company management to behave 'selfishly' and want to increase, rather than to reduce, agency costs. This is one of the big challenges facing those who set executive remuneration packages — how to align managements' interests with shareholders' interests. The issue of agency costs is important, not only in helping us to think about how we should advise our clients (both companies and trustees), but also in anticipating how clients will react to that advice. It is also important to note that we, along with other advisers, form part of those agency costs. In broaching the issue of agency costs, it is logical to anticipate 'selfish' behaviour. It is natural, therefore, to expect resistance to the changes suggested in this paper.

The comments in the paper on valuation methodology are notable, particularly the reference to McLeish & Stewart's (1987) work on the defined accrued benefit method (DABM). Indeed, given that tonight's paper was presumably written before the publication of the recent Myners report and the Government's proposals on the security of occupational pensions, it shows some prescient understanding of Government thinking.

The Government's proposals, if implemented — and maybe that is a big 'if' — are likely to increase the focus on a pension scheme's solvency position, not only at the valuation date, but also how it is likely to develop in the future, given an agreed contribution/investment strategy. Indeed, just increasing the requirement to disclose solvency will change behaviour. Hence, a fully market-consistent version of the DABM has to make a lot of sense, and may even be essential for future actuarial valuations.

The paper then goes on to create a model of the economic system within which pension schemes operate. I am very nervous about economic modelling, and the model used in this paper does not dispel my nervousness. The problem with this sort of modelling is that, inevitably, sweeping assumptions have to be made to simplify the model to manageable proportions. Then, equally inevitable, there is the temptation to query some of the assumptions, and to use the doubt that this creates to question the whole basis of the model. As an example, it is dangerous to make simplistic assumptions about surplus distribution. In reality, this is a complex game, played out with opaque actuarial assumptions and subjective judgement, rather than with any formulae.

The fact is that most, if not all, of the conclusions arrived at by the modelling could be reached by applying the basic economic principles outlined earlier in the paper. Where the model is helpful is in illustrating some of the potential outcomes and the impact of changing scenarios on different elements of the economic system. To this end, I find that the use of deflators is intellectually appealing. However, I fear that they will not find much acceptance outside the confines of meetings such as this, as the ability of most of our clients to comprehend such concepts is limited. We will be accused of rebuilding our ivory towers.

What I like about the model is the way in which it highlights the risks inherent in a pension scheme, and how these risks vary under different scenarios and between the different stakeholders; also, how the rewards for taking risk are not shared equitably between the stakeholders. In this respect, I would like to have seen more consideration given to separating out the different classes of members. For example, I think that it would be very interesting to consider the question of whether trustees should target rewards where there is greatest risk — should surplus be distributed to pensioners if their benefit is fully guaranteed, whilst other benefits are at risk? I would also like to have seen the inclusion of agency costs in the model.

Like others, I yield to the temptation to query some of the elements of the modelling, and focus on the example that is likely to draw the most attention from this and other audiences — the impact of investment strategy and, in particular, the impact of a move to a bond strategy.

Firstly, I am not convinced by the tax outcomes — the assumptions underlying the model seem a bit too simplistic on the taxation of shareholders. For example, I am not sure that the model allows for capital gains tax paid by shareholders on pension fund gains passing through into share prices. Aside, also, from the tax effectiveness of equities versus bonds, there is even the

fundamental question of whether pension funds really represent a tax shelter — an issue considered in a paper on tax presented to last year's investment conference (Armitage & Exley, 2000). However, the impact of taxation is notoriously difficult to model, and the authors admit, in ¶5.6.3, that they have not attempted to model all cash flows in this respect.

Then, there is the bigger problem of secondary considerations. For example, a simple economic model might conclude that a pay rise for employees benefits employees at the expense of shareholders. Clearly, it would be nonsensical to argue against the assertion that pay rises reduce shareholder value. In a similar vein, the paper considers the value to shareholders of the option to default on pension promises, and how the value of this option changes under different scenarios. Whilst this option clearly does have real (and changing) value, it is questionable whether it can be openly exploited by shareholders. If there is full and frank disclosure, any change to the value of the pension guarantee is a change to the value of the remuneration package, and should be viewed as such by employees, and, hence, its impact should, in theory, be similar to a change in pay.

However, to quibble too much about the model misses the greater value of the paper, which is in the concepts that it espouses. I largely agree with the conclusions reached at the end of the paper, particularly the suggestions about disclosure. However, I have concerns about the suggestion that pensions actuaries should extend the scope of their advice to encompass all parties — not that this is not a laudable objective — but, as this paper illustrates, there are clearly huge potential conflicts around. Hence, trying to advise all parties is going to give rise to some serious professional issues for a Scheme Actuary. However, I am sure that, as a profession, we will rise to meet this challenge.

Reference

Armitage, S. & Exley. C.J. (2000). Personal tax and the cost of equity with applications for investment and pensions actuaries. Paper presented to the joint Institute and Faculty of Actuaries Investment Conference, 2000.

The President (Mr P. N. S. Clark, F.I.A.): This is a topic which, I am sure, could produce a lot of heat. It certainly has done so in the past. I do not wish to douse heat, but I certainly hope that we should also get a considerable amount of light from this discussion.

During my predecessor's term of office we constructed the Vision and Values for the profession. I feel that this paper is assisting in that, particularly in the role of broadening the profession and looking at the wider role that actuaries can have, as it says, not looking at just the one stakeholder in this operation. In that it is undoubtedly to be applauded.

Also, taking my own presidential theme of communication, I am acutely aware of a significant need for much better communication in the pensions arena.

As this paper, and others, underline, there is a considerable lack of knowledge of the risks being undertaken and the actual position of members of a pension scheme. I certainly believe that the actuarial profession is very well placed to take that communication process forward. It is a challenge which I believe that we, as a profession, should be rising to with enthusiasm. Having said that, I recognise that it is a difficult challenge. So, I give my thanks to the authors, for taking this process forward.

Mr A. J. Wise, F.I.A.: The view that asset allocation in a pension fund does not affect shareholder value is oversimplified for a number of reasons, not least the obvious point that the way in which shareholder value develops in future years will depend, crucially, on how the pension fund is invested. It is good that the authors have brought out the real-world impact of investment policy and other factors on stakeholder interests.

However, when consulting to clients on these issues, I feel that the authors' model of stakeholder interests is needlessly obscure. I have a simpler transparent model, which works directly in terms of option pricing rather than of deflators. Pension funding can be placed into the framework of option pricing from these observations, in that:

(1) the commitment of a company to meet future funding deficits is a written put option;
(2) the ability of a company to recoup future surplus via contribution offset is a call option;
(3) the shareholder interest in the company pension position is the value of the call option less the value of the put option; and
(4) the shareholder valuation of the pension liabilities is the value of the fund less the shareholder interest in the pension position.

When I opened the discussion on the Exley, Mehta & Smith (1997) paper, I referred to the option pricing approach. In effect, the authors are pointing out that, in a complex realistic situation, deflators are a suitable way to calculate these option prices reasonably accurately.

Pension liabilities, especially those of final salary pension schemes, present what I would call the fundamental actuarial problem of incomplete markets. An incomplete market is where you do not have enough traded assets to hedge exactly the asset or liability profile in question. The best example of this is the residual risk that salary increases will not exactly equal the assumed price inflation plus 2% p.a., or whatever. Not only do we not know the future average rate of increase, we do not know precisely how long members will remain in service to collect such increases. We have an incomplete market, which means that the basic pricing method of finance theory — namely hedging and the law of one price — does not work.

In ¶4.3.3 the authors say that deflators can be generalised to incomplete markets. This is true, and, indeed, they show a way of doing this in Appendix C, where they use a time series model for earnings growth to calibrate their deflator model. However, this is just a piece of modelling, like any other that actuaries have done over the years. If we are truly looking for a market pricing perspective on final salary pensions, we need to think about what the market price would be of a suitable bond which is indexed to salary increases. The authors have used a time series model which is conditioned by the past history of real salary increases. Using this, they can imply the market price of a salary-indexed bond in today's conditions, but how do they know that their imputed market price is correct? Suppose a market in salary-indexed bonds were suddenly to be created. The authors might find that their model gives the wrong price. The market pricing mechanism is the clearing house for worldwide investor opinion. There might be some newly developing trend in remuneration policies which alters the parameters for the future, and which the authors' model does not pick up. There might be supply and demand imbalances for salary-indexed bonds which push the price away from what might normally be expected.

What does up-to-date financial theory tell us about valuation in incomplete markets? It tells us, unequivocally, that 'law of one price' arguments fail. Old finance theory does not tell us how to price residuals, such as the residual of real salary increases relative to prices plus 2% p.a. For example, a new book (Cochrane, 2001) demonstrates a theorem which says that these residuals could have almost any price. So, this paper is a bit disingenuous in saying that deflators can be generalised to incomplete markets, and then giving an example to prove it. What the authors have forgotten to say is that their solution is not unique. Far from it — we are free to conjure up all manner of different solutions for the deflators, all of which could be correctly calibrated to today's traded market prices, but which would generate a whole range of different answers for the valuation of a final salary pension liability.

I mentioned that pension funding can be put into the framework of option pricing. An important current area of research is establishing upper and lower bounds to option prices in incomplete markets. This is the same point expressed differently — in the pension context we do not have precise market pricing, we have a fuzzy range of values. We should be following the lead of the economists and be trying to establish upper and lower bounds for the liability. Whether you approach the valuation by option pricing or by deflators, you cannot ignore the fundamental actuarial problem that there is an incomplete market.

Actuaries can rightly continue to advise their clients, in relation to funding issues, on a basis other than one which is purely objective and driven by the bond markets. Artificial valuation bases, which are based on a pure bond discount rate, or a bond rate plus a fixed premium, cannot be equated to shareholder valuation other than as an act of dogmatic faith in the unknown.

This is demonstrable from a theorem in modern economics! Papers like Exley, Mehta & Smith (1997) and the present one are based on old finance theory, developed up to the 1970s, and written up in text books in the 1980s. We all need to tap into the latest academic work, and we should not be too quick to throw out the old actuarial toolkits. Some of the new work is converging on some of the traditional actuarial thinking. We should be looking to use the best of the old and the new ideas.

A funding basis is not the same as a shareholder valuation. Despite the title of the paper, I do not think that the authors have really explored the feasible relationships between the two. It is important that we do explore this issue in the light of the fact that shareholder valuation is actually a fuzzy range, not a pinpoint number.

Nevertheless, despite these comments and others which I could have made, I do thank the authors for their bold foray into new territory. Their ideas are worth building upon.

Reference

Cochrane, J. (2001). *Asset pricing*. Princeton.

Mr S. A. Carne, F.I.A.: I am delighted with the objective behind this paper — to examine the respective interests of the various stakeholders in a pension fund. I am, however, troubled by one aspect of it — risk — which will not go down well with economists. I focus my comments on that one point.

The authors have somehow got it into their collective heads that the risk premium on equities can be ignored when calculating the cost of future pension promises; but, worse than having the idea in their heads, the idea appears in their paper — no fewer than four times. This is a mistake — every time — and needs to be corrected.

I begin with their statement, in ¶4.4.2, that: "a defined benefit promise is effectively a debt ... upon which a value may be placed. Recognising this [the authors say], we can identify debt instruments traded on financial markets that are closest to replicating the pension promise in cash flow terms." If the authors can find a traded debt instrument which matches a final salary pension promise, they are welcome to use the price of the debt to value the pension, but I am willing to bet a small sum of money that they will not find a debt instrument (traded or otherwise) which is linked to future salaries. I am willing to bet a much larger sum of money that, if they ever do find such an instrument, the return on it will be rather higher than the risk free rate. In fact, the return would likely be closer to the return on equities, because salaries are generally linked to the economic performance of companies. That is why, if I were still in the business of valuing pension promises, I would use a discount rate with a risk premium in it.

In ¶3.2.2 the authors claim the support of Brealey & Myers (1996), a well-recognised corporate finance textbook, and one not to be discounted lightly — except at very high risk, but anyone who knows Brealey & Myers knows that risk-adjusted discount rates are central to their teaching. Mr Chapman has directed me to Chapter 20 of Brealey & Myers, which introduces the 'risk neutral' method of valuation, a method which does, indeed, use the risk free rate of return — for valuing financial options.

The key point is that a pension fund is not a financial option, and cannot be valued as if it were one. I agree with the authors that there is, within a pension fund, the option to discontinue, and I accept that such an option might be valued using the risk neutral method, but the option to discontinue the pension fund is not the same as the pension fund itself.

If the authors turn to Chapter 21 of Brealey & Myers, they will find an example of a project with a discontinuance option. Brealey & Myers do, indeed, value that option using the risk free rate, but only after they have valued the project itself using the risk adjusted cost of capital. I recommend the authors to do likewise with their pension funds.

Mr J. Ralfe (a visitor)**:** I am responsible for managing the liabilities of The Boots Company. Since the company has pension liabilities of over £2 billion, by far the biggest liability, I spend quite a lot of time thinking about pensions.

I make one general point, and one specific point. The general point is that there is a huge gulf between the approach taken to corporate finance issues, the sort of things that I and corporate treasurers and banks do every day, and the approach taken to company pensions. I believe that actuaries have to view their approach to pensions, not necessarily as a subset of corporate finance, but having much more in common with corporate finance than actuaries have traditionally thought.

So, I am glad that the Institute of Actuaries is looking at pensions as part of the company, and whether one agrees entirely with this paper or not, I think that it is very good that you are looking at the impact on the company rather than just looking at the pension fund in isolation. It is very easy to see pensions as something floating in the ether, and having only a tangential connection with the sponsoring company.

Pension promises, so far as I am concerned, are a set of committed cash flows which can be modelled and valued like any other committed cash flows, and, in particular, we have seen the sort of modelling that is possible illustrated in the paper.

The specific point that I make is to take on the bet offered by Mr Carne — and I am not a betting man. The most important thing that comes out from this paper — and I think in the discussion so far — is the fallacy that pensions are all about future salary growth.

When I first stumbled into pensions three or four years ago, I had a conversation with our then fund actuary, who has since retired. I asked what the difference is between the current unit and the projected unit method of pension valuation? He did not give me a very good explanation. Since that time I have asked various people, and have not found any better explanation. In common sense terms, salary growth is not a liability. What do I mean by that? In my company's report and accounts, and on our balance sheet and the balance sheet of any other company, no attempt is made to capture the future salary growth of any employee. Future salary growth is not a liability. The only liability of the company is the liability to pay the current salaries and those for the notice periods that each employee has to have. It seems to me that, if salary growth is not a liability, then the increase in pension (even though we expect to have salary growth) which arises from it is simply not a liability.

The paper makes a very good case for using the current unit, or discontinuance, method. The discontinuance method, as far as I am concerned, is not only intellectually correct and consistent with everything else that companies are trying to do, it also has a large number of pragmatic advantages. It is much more transparent; it is much clearer; it is much cleaner. It probably means that there is less opportunity for actuaries and the companies and the trustees that they are working with to fudge the issue. I think that that is a good thing.

I would encourage the Institute to concentrate on the discontinuance method of valuing liabilities. As far as I am concerned, a defined benefit pension scheme is a set of annuities and deferred annuities, and that set can be priced very precisely, and, indeed, is priced by life insurance companies every day of the week.

Trying to capture the impact of future salary growth has led to a large amount of woolly thinking, and, without being too rude to the previous two speakers, this is illustrated by their remarks.

Mr D. J. Parsons, F.I.A.: When the paper McLeish & Stewart (1987) was presented, I asked a senior partner at my then employer why we did not use the DABM. He said that the method was not appropriate for an ongoing scheme, it understated the true cost of providing the benefits, the contribution rate would be unstable, and he could not envisage any circumstances when he would even consider using it. How times change.

The authors of this paper could face the same closed minds, not because they advocate the use of DABM, but because their ideas seem to be appropriate only for large companies.

How could a Scheme Actuary to a scheme with assets, not of the £267 million in ¶5.2.2, but of £267,000, whose services are only retained as a Scheme Actuary, and whose fees are met out of the scheme's annual policy charge, even start to take these modelling ideas into account?

The vast majority of defined benefit schemes are small. This should be borne in mind when

new disclosure regulations and new accounting standards are being created. Otherwise, the cost of the additional paperwork could turn out to be yet another nail in the coffin of such schemes. These schemes are worth retaining and nurturing. It would be sad if the main reason for their demise was the cost of complying with additional bureaucracy.

The modelling ideas in the paper could cast serious doubts on our predecessors' credibility (or even on our own) if they are introduced 15 or 25 years after a scheme was set up. It would be easy to draw conclusions from these models, with the benefit of hindsight, that indicated that the advice given at the inception of a scheme was flawed. We must be careful. What we say now could appear to be equally flawed to our successors when they look back in 15 or 25 years' time.

Considering hindsight further, it is interesting to see that Scheme Actuaries are reverting to a market-based approach of valuing pension schemes. As I recall, this was a common approach before the inflationary bubble of the 1970s. What some people fail to appreciate is that this inflationary bubble created other long-lasting inflationary expectations, particularly amongst actuaries and other financial advisers, including an expectation of economic certainty that underlies the MFR basis. Neither politicians nor actuaries can create economic certainty. The MFR assumptions have, predictably, failed the durability test. They never really stood a chance.

I remember well an actuary telling me, in 1980, that he did not believe that interest rates could fall below 9% in his working lifetime. Economic circumstances have changed on a permanent basis, he said. Another insisted that gross dividend yields on United Kingdom ordinary shares could never fall below 4% for more than a few months. When the reverse yield gap first appeared, it was not explained away as an inflationary phenomenon. Will it reverse again?

My point is that it can be a mistake to rely too much on the events of the last 30 years when you are trying to make financial sense of the future.

Mr J. P. Ryan, F.I.A.: This very interesting paper is helpful, in that it demonstrates that there is a common strand in many areas of the profession at the moment, which shows the advantage of our being part of a larger profession. The concept of shareholder value, risk and returns has been presented now in three major papers, almost one after the other, dealing with life, general insurance, and now pensions. This is to be welcomed. This is something that we should build on as a profession. We can all learn from different activities elsewhere in the profession. I say that because some of the theories and techniques that are being developed in the life and general insurance areas can be used to supplement some of the ideas that are proposed in this paper.

I think that the authors understate what they have actually achieved by over-emphasising shareholder value. I think that they have done more by looking at economic value as well as at shareholder value. In this day and age of corporate financiers and high merchant banking salaries and bonuses, we obviously have to mention the words shareholder value, but I think that the paper has a much broader perspective. The concept of coherent economic values that the authors develop is an important aspect in exploring that. Some speakers have talked about the difficulties in doing so, and there have been some minor criticisms, but I think that there is much insight that arises out of the work that the authors have done.

However, it is not just coherent economic values that are important. Another area of growth of actuarial work is coherent risk measures. This is an area which is important in evaluating the risk for different people. Again, this goes back to much work that was done originally in the 1960s, but which is now surfacing again in actuarial circles. We can now do the computations in a way that we could not have done 20 or 30 years ago. Probabilities of ruin are not coherent risk measures, and therefore rank risks in the wrong order. Some of the conclusions that the authors come to arise from the fact that they are not using coherent risk measures, they are looking purely at the economic values. This is less of a criticism of the paper, because, clearly, we need to learn to walk before we can run. We are certainly starting in the right direction. It is simply a point of where we should be going in the future.

One of the reasons why coherent risk measures are important is because the different stakeholders have very different risk profiles. Most finance theory — certainly the finance theory that Mr Wise has been slightly critical about — does depend on markets being available, relatively efficient markets, and the existence of relatively efficient markets requires the ability for short sellers to operate, as well as people just making a market. With a pension fund, clearly the shareholders in the company can buy and sell their shares, although they may not be able to arbitrage the various subsets of it. Consequently, if they do not like a company's share pension plan, they can sell that company's shares. They may not get the benefit of the growth in the rise in profit in the shops, but they, at least, have a market, and can short sell.

The employees cannot do that. They can change their jobs, but there is a large frictional element. Therefore, for a large and significant stakeholder there is no market. Thus, the market price, to the extent that it exists for pension fund liabilities, misses the short sale of the employees.

In order to counter that, we need to introduce risk measures, and, in particular, coherent risk measures, to take the theory forward. This is important, because it changes some of the simplifying assumptions under finance theory. The idea that you cannot increase the value of the firm does not apply when you consider the value of stakeholders. This is an idea that is being developed in both the life and the general insurance fields as to the returns that the shareholders want on the capital, and the returns that the policyholders want. It also means that Modigliani & Miller (1958) does not apply when you start considering the impact of employees. For example, because a bondholder will have a very different risk profile to an equity shareholder or employee, putting in extra bond investment into the financing of a pension fund, and the bondholder taking some of that risk, will produce ways of optimising which are not picked up in a pure market price approach, because the employees cannot short sell.

This leads to some interesting developments that the actuarial profession can add to corporate finance and capital. There is an extra dimension in financial institutions and pension funds, because of the importance of stakeholders, that does not apply to much of the pure theory, when looked at from a narrow shareholder perspective. So, in a sense, this brings me to a full circle, to the point where I began. This is something that I think that we, in the profession, can all learn, not just those involved in the pensions field, but those involved in other areas. It also ties in to the point that Mr Wise made, that many of the ideas that were in traditional actuarial thought are now being utilised by modern finance theory. Simplifications were made in the 1960s and 1970s, because we did not have the computational power that we have today. This means that we can go back and revisit some of those ideas, to the benefit of many areas of the profession, as well as to the wider field.

Mr P. Lofthouse, F.I.A.: A profession must constantly renew and reconsider its thinking. I think that this paper shows that process in action, and I welcome it wholeheartedly. It proposes a method for determining what the interests in a pension scheme of a wide group of stakeholders are, and how they would be affected by changes that might be proposed; and it gives an excellent demonstration of how that method might work in practice. Actuarial methods, however, have to look to the community which the profession serves. The community has to understand and to accept those methods. 'Just trust us' is not a motto which a modern profession can adopt. The outside world, when faced with an actuarial technique, just as if faced with a new and exciting surgical technique, will say: "What does it do? What are its limitations? In what circumstances might it go wrong? What alternative techniques exist?"

Any method that claims to put an objective value on stakeholders' interests must clearly be prepared to stand up to the scrutiny of those being given the advice. We must expect that scrutiny, and our duty, as a profession, is to help those to whom we give the advice to check and to test it.

When we look at the method being proposed, we see that it does have limitations. We see that it is incomplete, in that, for example, the effect of pension scheme changes on employee productivity, and hence on stakeholders' interests, is not taken into account, nor are the effects on the cost of raising capital of the various actions concerned. There are also other factors which

are not considered. These effects cannot be dismissed as being of minor importance, even if they are difficult to quantify objectively. The authors seem to agree that further research needs to be done in this area.

We see other limitations. The results are dependent on the model used and the predictions which that model makes about what the market price of salary-related liabilities would be if there was a market in them, which there is not. The model chosen might be found to be inaccurate, and the choice of model can change the answers significantly.

Other techniques exist. Option pricing has already been mentioned by Mr Wise, as being a significant and useful alternative. These other techniques have similar flaws; the fact that they cannot produce a unique answer. However, moving to a deflator technique produces no truly material advantages, and option pricing has a significant advantage over a deflator approach, which has already been mentioned several times, in that the option pricing concept is far more likely to be understood by our audience, and I would not willingly discard that advantage without a much better replacement technique. Having said that, deflators can, and will, be used on the backs of our envelopes or in our backrooms as a useful tool in pricing options, but logic insists that we should not introduce unnecessary complexity in our advice and into any proposed solution to a problem.

The certainty which the authors' method appears to give is, I think, illusory. Actuaries must be very careful of giving precise figures for stakeholder interests, effectively calculating their market prices when those market prices do not exist. The danger with this, as with any other method trying to price these things, is prematurely announcing to an excited world that we have found the 'Philosopher's Stone'. We have a lot more work to do, and we have to make our audience aware that this additional work exists. The fuzziness remains.

Actuaries seeking to give advice have a duty to explain the thinking behind that advice in terms that the audience can understand and can grasp, and, more difficult, that actuaries can readily explain. The deflator methodology, compared with the alternative option pricing approach, is much less readily grasped by those we advise, while bringing no significantly greater reliability to the answers which it produces.

Mr A. D. Smith: This paper represents a major step forward, because it provides greater realism in modelling tricky issues, such as the interaction between a pension scheme and the sponsoring employer. In Exley, Mehta & Smith (1997) we made a number of assertions on this matter, based on general reasoning. It is very heartening to see that detailed analysis quantifies and confirms many of the effects that we predicted. The opener asked: "Why bother?" Mr Wise recalls being the opener at the discussion of our paper, and I ask you to have a look at that contribution in order to answer the opener's question. In it Mr Wise asked: "Without a complete and trusted model, how far can we trust any practical application of [Exley, Mehta & Smith's] theoretical arguments in the complex area of pensions?" So, now we have the model.

The paper is especially topical, because it follows some important trends in corporate valuation. Where traditional analysts focused only on discounting cash flows, many modern analysts focus, instead, on the notion of competitive advantage. In what activities can a company earn a return exceeding its cost of capital? The competitive advantage concept provides an important reconciliation to reality, because not all competitors can enjoy the same competitive advantage. The resulting calibrated parameters are, therefore, more robust, and less subject to management bias.

You might think of three areas where companies with pension funds could have competitive advantage. In decreasing order of plausibility, they are: manufacturing, marketing and distributing its core product; employing people; investing in capital markets. In the past, actuarial pension valuations have taken credit for a supposed competitive advantage in investment. We fell into the trap of an apples to oranges comparison of equities and bond returns. However, after allowing for the cost of capital, the competitive question is not whether equities are expected to outperform bonds, but whether one scheme can achieve better returns from equity investment than other investors can. This might be achieved, for example, by bulk buyers of investment

management services who can use their muscle to reduce fees. These cost savings are usually small, and well below the kind of free lunches that, I think, Mr Carne would like us to take credit for. Instead, this paper turns accepted wisdom on its head, by suggesting that pensions should be run so as to leverage other areas of competitive advantage in product or labour markets.

Traditional asset/liability models argue that investment in risky assets provides the worthwhile upside, provided that the probability of failure is small. However, according to the paper, where investment competitive advantage is small relative to product competitive advantage, it is unwise to take investment risks which jeopardise the ongoing core business.

In a recent paper to the Casualty Actuarial Society, a colleague and I have applied similar ideas to insurance business (Christofides & Smith, 2001). Here, relative competitive advantages in risk bearing are manifested in different structures of frictional costs and agency costs. Our way of treating these is very closely related to the coherent risk measures that Mr Ryan mentions. Incidentally, I think that he is mistaken to claim that economic value is inconsistent with coherent risk measures. The diversity of different stakeholders, for example, is very well handled by the deflator approach, and does not need additional arbitrary risk loading to make it work. However, coherence is an extremely useful property in narrowing down possible frictional cost functions for measuring agency costs, and that is where we found the technique to be useful.

I now consider market completeness, and this is slightly technical. Mr Wise and others have correctly raised the issue that, when markets are incomplete, we do not directly observe a market price for salary inflation, although Mr Ralfe also correctly observed that the effect is immaterial, because of the irrelevance of salary increases to the current liability. Nevertheless, there is an important point here that needs to be explained, and I think that it may have been confused. As Mr Wise points out, the law of one price does not apply — or, to be more correct, it does apply, but it does not give you a unique price when markets are incomplete. When Mr Wise refers to the book Cochrane (2001), what he quotes is all that the author has found. He has found that, if you use the law of one price as your only way of choosing prices, you end up with a very wide range. This is not surprising or new; it has actually been known for 30 years.

However, Mr Wise then regards any choosing of any point within that range as: "dogmatic faith in the unknown". Here, I think that he is wrong. He seems not to be aware of recent equilibrium work, starting with Cox, Ingersoll & Ross (1985) and Duffie (1996) which help to produce prices in an incomplete market. Although there is a wide range which could be consistent with the law of one price, once you look at investors' realistic preferences, that narrows down the range very considerably. I think that the authors have done well to spot that the deflator technique captures that far better than option pricing does. Given the importance of incomplete markets to actuarial work, it is vital that actuaries start to understand these new techniques.

I now consider complexity. Some speakers have suggested that the model is too complex; although others have suggested that it is too simplistic. Although you might regard it as a starting point, it does have considerable complexity embedded within it. The mathematical complexity is necessary to ensure consistency. It does not, as some have suggested, require a barrage of additional unwarranted assumptions. Indeed, it is the simpler discounted cash flow models where the assumptions are often harder to appreciate, because they are less explicit. For example, the penny has only recently dropped in the actuarial profession that the use of equity risk premiums to discount final salary liabilities can only be justified either by reference to wholly implausible correlations that are in equities and salaries, as Mr Carne seems to be advocating, or by equally implausible assumptions regarding investment competitive advantage. How much better it is to make explicit correlation and competition assumptions, and to follow them through consistently. I congratulate the authors for having done that.

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Mr B. H. Davies, F.I.A.: I have one query and one more fundamental problem with this excellent and interesting paper. My query relates to ¶2.2.3, where the authors say: "Valuation reports are also not required to provide:

— indications of how the funding position will change in the future, given the recommended contribution rate and the scheme's investment strategy".

In ¶3.6.2 of GN9 it states that the report should: "address the issue of the expected future course of a scheme's contribution rates in the longer term on current methodology and assumptions." I find it difficult to see how you can say something about the contribution rate without, at least, alluding to the funding position. Whether people writing valuation reports comply with this requirement is a separate matter. However, it is in GN9.

My concern with the paper arises in this way. As one does, you have a quick flick through initially, and you look at the figures. I looked at all the figures, and I found that it is nearly always the members who lose out. In the great majority of the examples of the changes that the authors chose in order to illustrate their approach, we discover that it is the employees who suffer losses. Where, in one or two cases, they do gain something, it is very much smaller than the losses that they are incurring in the majority, where they incur a loss.

This worries me. I like to think that I approach these matters from the point of view of the members, and the approach adopted in the paper is certainly not how members think about the nature of the pension promise. I think that most members will be concerned if decisions outside their control can reduce significantly the value of their future pension expectations, and they would, if they knew that this was the situation, begin to look at the pension scheme in a somewhat different light.

To get to the root of how this has come about, we look at ¶4.6.1, where the authors model the employees' stake. The first sentence reads: "The remuneration received by the employee, excluding pension provision, is modelled as the benefits received in excess of the market rate for labour in the relevant industry." I do not totally understand what they are getting at here. It appears to imply that the pension promise, at least in part, is in excess of the market rate. I find difficulty in understanding this concept of people being paid something which is in excess of the market rate. I can only understand it if that extra is something that can be taken away, in which case it is not part of their earnings.

The authors go on to discuss the possibility that, if members knew that part of their pay was being taken away, they would seek to regain it by other means. They suggest — I think correctly — that they do not do so mainly because they do not know that it is happening. If they knew that it was happening, they would, perhaps, take a more active role in defending their market rate.

I found this part of the paper unsatisfactory. I do not think that it provides a true picture of how members sell their labour to an employer and receive money in return. I had always thought of the pension scheme as being part of the return to labour. If we are being told that part of the pension scheme is not the return to labour and, in practice, still belongs to the employer, which is why the employer can manipulate the value of their rights, this causes me all sorts of concern.

I do not have an answer to this at the moment, but I think that it raises many questions that it would be interesting to pursue.

Mr C. A. Long, F.I.A.: My comments relate to valuation methods and bases, a subject which I think most people here will be able to relate more easily to than some of the modelling.

Valuation methods

The authors make some valuable comments, in Section 3, on funding methods, referring, in particular, to the projected unit method (PUM) and the DABM. They make a good case for the DABM in some schemes, but it is only good where scheme discontinuance is a real issue. The actuary needs to decide to what extent the sponsor is funding for ongoing benefits and to what extent for discontinuance. I do not think that one method will do for both.

DABM recognises the stronger requirements of windup benefits, and, to this extent, it may be considered more realistic where these are an issue, but only if it allows, in the short term, for projected investment returns and other out-turns on a realistic basis. This includes forecasts of short-term equity returns if equities are held, which may be tricky! There is a risk of disappointment here to the audience that the actuary is talking to unless DABM is presented very carefully — the authors' claim, in ¶3.6.2, that DABM: "ensures that the discontinuance position is covered'', will certainly not do.

PUM has the advantage, in an ongoing scheme, that it usually results in a fairly stable contribution rate, which is useful to an employer who wants to price his products on a stable and realistic view of what the pension commitment will be.

Valuation bases

The authors claim, in Section 6.3, that to use an equity risk premium (ERP) in the discount rate is to double count the premium, because it is already reflected in the price as a compensation for risk. I think that this argument is wrong. I agree with Mr Carne here, and disagree with Mr Smith. The first point is that I do not believe that the equity market is so efficient that it can accurately look forward for the long period of years that a pension fund might hold the equities, to assess the return or the risk. It is common to see fluctuations in some share values at a much greater rate than new information comes in, which suggests that the market continually changes its mind. Just think of 'Dotcoms' in recent times.

There are various kinds of risk associated with equities, which people ordinarily might think of as the uncertainty of future profits and of the market's valuation of those profits. Many of these uncertainties, though not all, can be absorbed easily by a pension fund when considering an ongoing funding valuation for contribution purposes, because, in this scenario, the underlying assumption is that it will not be a forced seller, and can absorb fluctuations. If it is a DABM valuation that is looking at discontinuance within ten years, the position may be different. Again, it comes down to the actuary deciding what he is funding for.

The employer will not want to support a scheme if it will be funded on a basis substantially greater than is likely to be required, because this will only to lead to either contribution cutbacks or unplanned benefits at a later stage. So, he will want us to model real contributions as far as possible, not some abstract interpretation called 'economic value'. That means including some allowance for ERP when an extra return is expected, though the extent of it will certainly vary according to the level of market prices. We do well to remember that we are looking for the amount required to be invested at the valuation date to provide the benefits, in the future, that have accrued to date.

Mr M. Capleton (a visitor)**:** I am not an actuary, but a bond strategist. My job is to try to make some sense of these issues for my audience, which is a bond investor base. So, I do have a bond bias.

One of the things that comes out of this discussion and from everything that I read about defined benefit schemes is the sheer complexity of the liabilities for sponsor companies. This makes them undesirable risks for sponsors, and means that they are a source of interference in the workings of the labour market, damaging mobility. It is no great surprise that these schemes are on the way out, and so we may be presiding over the last rites of this source of employee remuneration.

I am very much in favour of the treatment here of using a discontinuance basis. I think that that is a cut and dried case. Scheme members regard the pension promise as just that — a contract — and if you can, conversely, make a going concern assumption about a firm, then you do not need a pension fund; it primarily exists for the eventuality that a company cannot meet entitlements out of operating revenues. So, really all that we are interested in is what assets there are in the event of default. Even if that is not the best way of looking at the issue, that is likely to be how banks will look at it when assessing sponsor creditworthiness, particularly if, as is proposed, we move to a situation where any pension scheme shortfall in the event of insolvency becomes a prior debt on a company.

In terms of the discussion about whether salaries are more closely correlated with corporate performance, inflation, or some other measure that you choose, I would say that the closest matching asset is certainly the (small) index-linked bond government market. It offers returns of a similar level as real earnings growth, with lower tracking volatility than other assets. I also think that company shares, perhaps, do not reflect the behaviour of aggregate corporate profits in the economy, as a whole, for very long periods of time (which are certainly an influence on wage growth). There are issues of operational gearing, standard debt leverage within companies, and general leverage to the cycle, as well as changes to the discount rate applied to future earnings. All these things and others make the link between wages and share performance extremely loose. The economic leverage is one of the key areas of concern that I have with pension funds holding predominantly equities. As many have said, it is undesirable for companies to have to increase contributions in an economic downturn, which damages the market. If the aim of a pension fund is to separate the fortunes of the member from the fortunes of the sponsor company, it should be remembered that the fortunes of the company are correlated with the fortunes of other companies.

In terms of this whole issue of the salary link, it is, in some ways, irrelevant, in the sense that if you look at the asset allocation distributions of pension funds, you see, on average, perhaps 15% in sterling bonds, whereas, if you look at the last NAPF survey, you find that something like 70% of defined benefit scheme members are actually mature liabilities, and those liabilities are no longer salary liabilities, they are LPI liabilities — a hybrid mixture of nominal and index-linked bond liabilities.

We need to be careful about the view that equities are a better investment because they pay a risk premium, and I am firmly in agreement with the view that this creates a double counting problem. If the market is in equilibrium, any expected future outperformance by equities is *required* compensation for their extra risk. If pension funds buy equities to earn the risk premium, that implies that they are less risk averse than the average investor in the market. If, for instance, we think that there is some arbitrary risk premium in the market of, say, 2%, then there are presumably some investors who are risk neutral, who have a required risk premium of zero, and there are some very risk averse investors out there who must expect to be paid something like 4% over and above the returns available from bonds. I have to ask you, as those who know about these things, that, if pension funds are, by implication, risk neutral, then who are the investors who are so very risk averse that compensate, to ensure that a risk premium still persists in the marketplace? I would expect pension funds to be amongst the *most* risk-averse investors, perhaps requiring a greater risk premium than the market-clearing premium. I suspect that, if pension funds are not risk averse, and can happily clock up this risk premium as part of expected returns rather than something that is required compensation for the risks that they run, then there is really nobody left out there demanding a risk premium. That would suggest that the risk premium has disappeared! Indeed, perhaps, part of the massive outperformance of equities that we have seen over the last 20 years is about just that — returns have been enhanced by the prospective risk premium dwindling.

Mr D. R. Linnell, F.I.A.: I find it interesting that a life office actuary, confronted with guaranteed with-profits liabilities, is expected to value those guarantees on a bond based basis, and only if there are sufficient extra assets above that value is the life office allowed to invest in equities. I then contrast that with a pension fund, where pensions actuaries say: "We have these guaranteed liabilities on winding up, but we will not provide the whole of them, because we can get away with it by investing in equities and using a higher discount rate." I have been both a pensions actuary and a life actuary in my time.

I find it interesting that pension fund trustees are prepared to run a pension fund on assets equal to 80%-90% of the winding up liabilities, and to rely upon a promise from an employer that, if things go 'pear shaped', the company will foot the bill. We have had various comments that, for an ongoing scheme, we can look forward to infinity, and, if we do that, then everyone will always get their benefits, because the deficit on winding up never catches up with us. As an

actuary who has wound up several pension funds, I have some difficulties with that approach. I have some difficulties with it, too, as someone who has been a trustee of a pension fund. It is not true, as the authors (as a simplification) suggest, that if a company promises to top up its pension fund, and the scheme then winds up, either because the company itself winds up or because the scheme winds up for other reasons, that the company actually has to provide that money. The current regulations on debts on the employer on winding up can fall well short of giving all the members their full benefits. It remains to be seen whether the replacement to MFR, and the conditions proposed by the Government after the Myners report, can actually deliver that. If they could, then I suggest that it would probably solve the funding problem, because most companies would want to know how much they might be called upon to provide in the unfortunate circumstances that their schemes had to wind up.

I welcome the paper, because I think that it gives the profession, scheme trustees and companies some extra tools to understand the effects of decisions on strategy. When I was advising trustees, or acting as a trustee, 20 or more years ago, we had to take such decisions without this sort of informed analysis of the financial effects on the various parties.

Mr M. H. Teeger, F.I.A.: I think that the best way of looking at a pension scheme is as a collateralised bond obligation. It seems to me that we focus only on the word 'bond' too much of the time. The word 'obligation' is important, because, in the event of a corporate default, the members of the pension scheme only get a share of the assets. So, the value of the pension scheme promise is clearly dependent on the credit quality of the company promise, and changes as the corporation's credit quality changes.

So, to focus on credit first, from what I understand from the paper, there is some cancelling out of cost of capital and, perhaps, credit effects on liability discount rates. I think that there is more to credit implications than just that. On the corporate side, there is the corporate funding policy. How does this company raise money? That clearly depends on the state of credit markets and on the state of the swaps market. On the discount rate assumption for the valuation of pension liabilities, there is certainly a move to discount at AA rates or an average corporate spread. So, there is a need, in the future, to look at credit markets in more detail. That is something that I think the actuarial profession has been a bit reluctant to do.

Moving to the asset allocation side, credit risk is just another form of taking risk, and it seems strange that everybody is happy to take equity risk, whereas there is not a willingness to take credit risk. So much for credit.

The next point is the 'collateral'. In the event of corporate default, the members of the pension scheme have the right to collateral. Where that is equity based, it is clearly very important how we model equity behaviour, and, in particular, where only considering equities and bonds, the link between equities and bonds is going to be important.

It is very nice to see a model structure being published alongside a paper, and I understand that the modelling of equities as a risk premium over cash is to do with an assertion on the nature of efficient markets. However, I think that there are some quite widely held beliefs that equity markets and long bond yields have some relationship, and I think that structural links can add more to an analysis of the equity bond split than a mere correlation in residual terms.

Another impact is on this word 'correlation', and thoughts of the economic cycle. Many of these characteristics are going to be linked: an equity market fall; a credit crunch in which a bond portfolio will fall; corporate funding will become harder; corporate default will become more likely; and even Government risk-free yields are changing, depending on the state of the economic cycle. There are stylised behaviours that economists recognise. The fact that these things are likely to occur at the same time clearly changes the risk profile. I think that this paper is a very good start at assessing the integration of risk in the pension scheme and the corporate. I think that there is further work to do on looking at the tail of the risk, and in linking the different markets.

Pension schemes and insurance companies — life insurance companies, in particular — are some of the few investors which really have the opportunity to diversify their risk over time,

whether it is liability risk or asset investment risk. (Presumably the authors have recognised this implicitly, in coming to these economic values.) That is one of the real options (rather than financial options) that pension schemes and insurance companies have. It is quite important to recognise this real option, both in terms of investing equities and also in investing other assets, particularly credit, where we have not invested very much, certainly for pension schemes. Alternative assets (hedge funds, private equities and gearing up on credit, collateralised bond obligations, collateralised debt obligations) are investments that clearly can add value, just because you are diversifying your exposure to risky assets, rather than only investing in the equity market, even if it is a global equity market.

Mr A. Evans (a visitor; Chairman, Pensions Sub-Committee, Institute of Chartered Accountants of England and Wales)**:** I speak here as an accountant. My involvement is in pension scheme auditing. To me it is second nature that, as an auditor, I should look at the position regarding the sponsoring employer. I see it as second nature to take into account the risks within the pension arrangements, and also to take account of shareholder value in thinking about the advice that is given to the trustees. I think that it is important that they understand that as well.

Concerning the asset/liability studies in ¶7.2.1, a comment was made earlier that, if asset/liability studies show the economic interests of all shareholders, that may give rise to some difficulties and some conflicts. My concern is that, if it does not show the economic interests of all shareholders, there is a big risk that trustees are making decisions really rather oblivious of the interests of the other stakeholders, and, in particular, of the corporate entity. I see that as a positive action, albeit one that will need to be managed carefully.

Another area, topical at the moment, is the winding up of defined benefit schemes and the opening up of defined contribution arrangements. Here I see a role for the actuary, in looking at the shareholder value consequences of such an important decision as that. Not many companies have somebody like Mr Ralfe, to be able to understand and to evaluate these consequences. I am quite surprised how frequently, in the pensions area, such an important decision as that is not looked at at the time from a shareholder value concept. Perhaps that is a further role for actuaries.

I support strongly the views for further increased disclosure of the position on the solvency of a pension scheme. I think that that is useful information that adds to transparency in the marketplace, and gives users of actuarial statements, accounts, etc., a better understanding of what is going on within the economics of the pension arrangements of the company.

With a paper such as this, I can see the actuarial profession catching up, perhaps, on where the accountants are!

Mr I. P. McKeever, F.I.A.: The employer is the final guarantor of most pension schemes, looking at the risks of the employees not getting their benefits. I am very pleased to see that we are now looking at the employer and the pension scheme as one entity.

One of the things that has concerned me a great deal with this concentration on equity investment is that the trouble with equity investment is that, when equities fall, it is likely to reflect economic conditions. These are likely to be unfavourable, not only to the companies whose equities have been quoted, but also to the employers. The problem is going to be that the guarantee is likely to be called in at a time when the employer is least able to meet that guarantee. We are now in a position where people are asking what the solvency position on discontinuance of a pension scheme is on a fairly regular basis. If the scheme is going to have to disclose poor discontinuance solvency, just because of fluctuations in investment conditions, the employers are going to find it very uncomfortable, because they are going to find themselves having to meet this short-fall at just the time when they can least afford to do so, even if they do not actually have to be wound up themselves.

Mr A. Cook (a visitor; Technical Director, Accounting Standards Board)**:** I have been provoked by some of the things that have been said; firstly by the remarks of Mr Ralfe on the subject of the

discontinuance method. He was supported by Mr Capleton, who explained that the banks would be happier looking at an assessment based on discontinuance rather than on the projected final pay. It is certainly true that banks sometimes do look at the companies to whom they loan, on the basis of break-up values rather than going concern values. However, if we are looking at the long-term implications of the financial position or performance of a company, then it is not sufficient just to look at break-up value.

The way that accounting standards bodies — and it is not just our own — have looked at the issue of whether they should base the pensions liability on a discontinuance or on a going concern basis, is that they have said that pensions are a form of deferred pay; that is pay for the current service of these employees. They have concluded that there is an essential difference between making a promise to your employee to pay him on the basis of his pay today or to pay him on the basis of his final pay at the date of retirement.

I acknowledge that, arithmetically, you can choose to recognise that increase in the liability only as the employee gains further salary increases, but, insofar as you are viewing it as deferred pay for service today, I think that you should value it on the basis of the promise made — projected final pay — rather than at a discontinuance valuation, reflecting only current pay.

Mr Parsons made a plea that we should be careful not to make excess demands for disclosures for small schemes. I have no particular message for small schemes, as such, but the Accounting Standards Board, at the moment, is looking at how it should apply the pensions standards to small companies. We are considering relieving them of most of the disclosure requirements of FRS 17.

I think that welcoming the paper does not necessarily mean that one accepts all of its conclusions. Surely, the benefit of a model is far greater than the conclusion that you draw from it in relation to any particular set of inputs. What is important is that we have a model, and we try to use models to think about these very important questions.

Quite often it was put to me, at the Accounting Standards Board, that the effect of FRS 17 would be to drive yet another nail into the coffin of defined benefits schemes. I hope that that will not be the case.

I think that defined benefits schemes have achieved great things for their members, and they still have a lot going for them, even though I happen to be one who has suffered under the system by having switched companies in mid-career. Nevertheless, the case for them needs to be argued out on the basis of clear and unambiguous facts. It is only if public discussion can be engendered, starting off at what I call the scientific level of a discussion such as this, then moving on more into the more general arena of talking to employees and trustees, that the improved information and understanding will take place which will help us all to find appropriate solutions.

Mr M. H. D. Kemp, F.I.A.: I think that the paper is a good one, containing many interesting ideas. I am sure that, in due course, the presentation of the ideas contained in it will be refined, and the point about communication, which the President raised earlier, will be more fully met in the fullness of time.

I have a challenge for you. When I look at the figures, they always seem to show winners and losers coming out in balance. I want to ask the profession to try to figure out ways in which, in aggregate, there can be more gains than losses. I know that this arises because of an assumption that is built into the methodology, but there is a wider point here which I wish to make. I work for an (active) investment manager. We aim to add value for our clients. You who work as consultants; you, too, presumably, aim to do something that is of some benefit and actually accrues some value to people. If we believe that what we do generates no net gain, in aggregate, then, presumably, we should just close down our businesses and our clients should close down their pension schemes. So, please find ways in which you can add value and make the gains greater than the losses.

Mr C. Patel, F.I.A.: Mr Long asserted that the DABM is, perhaps, the right solution if discontinuance is an issue. That is the kind of statement that we tend to hear quite frequently

from actuaries these days. Let us just think about it. How do I, as an actuary, decide whether discontinuance is an issue? I could think about it in three parts. The first is to do with employer insolvency. I might just find — I do not know, I have not come across the situation yet — somebody giving me all sorts of statistics and assurances in respect of one of my big plc clients, and I might just be convinced that the risk of insolvency is zero. In that case, I might be persuaded to ignore the risk of discontinuance following insolvency, but somebody mentioned earlier that, if that is the case, then why fund at all? In the language of the authors, why not transfer all the value to the shareholders and leave nothing for the employees?

The second situation also involves employer insolvency — a very small risk of insolvency — perhaps something of the order of 2% to 5%, as modelled by the authors. That might be presented as an acceptable risk; but acceptable to whom? To us, as a group of people? Possibly 'yes', but is it acceptable to you and to me as individuals? What if you or I are members in the scheme that winds up this way?

A good analogy here is that we do not need to insure our houses against fire. The risk is very small. So why do we not, as a group of stakeholders, decide to stop insuring altogether? Again, in the language of the authors, the insurance company shareholders and employees, and the winners would be all of us collectively. However, is that really true for you and for me individually? After all, we do not know which one of us is going back home to a burning house. So, this is a real risk which we may not want to ignore at the individual level.

The third situation — and here I take issue with Mr Long — is voluntary discontinuance, nothing to do with employer insolvency. The employer always has the option to pull the plug at any time. When that happens, his commitment is rather limited, and this is when Mr Cook's concept of pension as deferred pay acquires a new meaning. The accrued benefits would only attract statutory revaluation, and not full earnings revaluation, and, in practice, members' rights might be further constrained by the state of the scheme's funding. Voluntary discontinuance in the current environment is what we are facing with many schemes — that is the real risk.

Therefore, to my mind, discontinuance is not something that can be dismissed so readily. We really need to go back to basics, and to consider the fundamental question of what we are funding for, before we can make any further progress on how to use some of the concepts that the authors have developed.

Mr C. G. Lewin, F.I.A. (closing the discussion)**:** This paper has been universally welcomed. I am particularly pleased that several guests contributed to the discussion. This symbolises the need of actuaries to work increasingly closely with members of other professions, not just in this field, but in many others.

The paper provides some useful insights into the relationship between a company and its defined benefit pension scheme, in the normal situation where the company guarantees the solvency of the scheme. These insights, in turn, may lead to discussions of greater depth, following actuarial valuations and asset/liability studies, about the effects of various courses of action on the company and its shareholders, as well as on the fund.

We are presented here with a mathematical model which simulates that relationship on a stochastic basis, using some simplifying assumptions. Even if we do not wholly accept the methods and models used — and some speakers did not — we can still be interested in the results obtained, whilst recognising that, in real life, the numbers might come out differently.

In particular, we must not assume that human beings (even *en masse*) necessarily behave rationally, as the builders of mathematical models would wish. In the short term, stock market values, for example, may be a very inaccurate guide to true value. This is because market values on a particular day are no more or less than the prices at which marginal stocks are traded on that day. These prices may be affected by a variety of non-rational factors, including an emotional response to the latest news, particularly if it comes as a surprise or shock. Mr Long added to that by saying that the market continually changes its mind, even if there is no news.

There is another reason, too, why market values on a particular day can be a misleading indication of true value. A short-term investor in a bull market may believe that stocks are

overvalued, and that, in a year's time, they may well be worth less than they are today. It is still logical to buy them, however, if he or she believes that there is a high probability of a gain in value over the next two or three months, so that they can be sold at a profit. If the market is dominated by short-term investors, most of whom have this same belief, then the market price will be sustained, in the short term, above the figure which most people believe is the true long-term value.

These are some of the reasons why many actuaries do not accept that FRS 17, the new accounting standard for pension funds, referred to in ¶2.1.3, represents a step forward in assessing the value to a company of its net liability to its pension scheme. The accounting standard prescribes that the pension scheme assets will be included in the company's balance sheet at their market value on a particular day, which is clearly likely to be misleading from a longer-term perspective, and could give rise to excessive volatility from one year to another.

This is not to say that market values should be ignored altogether, however. As long as one smooths out recent fluctuations, the trend of market values over a period can lead to a useful estimate of what market values would be today, if it were not for the short-term distortions to which I have referred. These 'trend' market values can, I suggest, produce useful insights into the values which the market, as a whole, is placing on companies. It will normally be sensible for the actuary to adopt these 'trend' market values as a cornerstone of his own thinking about an appropriate pension valuation basis at any time, even if his valuation results are actually presented entirely differently to the client.

Turning now to the results obtained in the paper, we see, from Table 6.1, that a reduction in the pace of funding will result in a worsening of the employees' position, since they would get reduced benefits if the pension scheme were wound up, and an improvement in the shareholders' position, since there would be more money available for distribution to them and a lesser chance of company insolvency. These conclusions accord with common sense, and the main interest here lies in the magnitude of the results obtained from the model.

Figure 6.6 shows the impact on the various stakeholders of moving from equities to bonds. This change in investment policy leads to greater stability of the scheme's funding position and to lower expected surpluses. According to the paper, the shareholders gain and the employees lose. However, it is not quite clear to me why the shareholders do gain from lower surpluses, when, according to the model, they get 80% of all surpluses. As someone who runs a mature scheme, I was especially interested in the comparison between Figure 6.6, which shows the effects of moving to a bond strategy for a less mature scheme, and Figure 6.14, which shows the corresponding effects for a more mature scheme. I agree that it is surprising that the results should be so similar, both in magnitude and direction. It would be useful for that to be investigated further.

Section 7 contains some useful conclusions, though I do not think that I accept, in real life, that the investment policy of the scheme has no significant effect on the combined stakes of the shareholders and the employees, as stated in the second point of ¶7.1.1. In fact, Mr Kemp said that we want more winners than losers, and, perhaps, investment policy may help to achieve that.

If one looks back over the last 20 years, for example, any company whose defined benefit scheme did not invest in equities would have suffered severely, and so would its employees, if they would have benefited from surpluses. This does not mean, of course, that equities are necessarily the best investment for the future from now on. They might be. I think that many scheme trustees will feel more comfortable with equities, which should enable their pension schemes to participate in worldwide underlying economic activity and technological improvement, than with bonds, which will not — provided, of course, that the equities are not vastly overpriced.

Some of the paper's more valuable conclusions are on the suggestions about disclosure. Mr Clark called for much better communication in the pensions area. Now that the MFR is going to be abandoned, it is more important than ever that information about the true windup position should be given, as a matter of routine, at the scheme's triennial actuarial valuations. This would

enable scheme members to assess whether they need to retain other savings as a contingency reserve. It would also enable them to bring pressure on their employer, if necessary, to improve the scheme's funding position. I would not go as far as the paper when it recommends publishing the information to members in their benefit statements, but I certainly think that it should be made available to members once every three years, when the valuation results are explained to them.

I now pick a few points in the discussion which struck me as significant. The opener said that it is the core of our nature to behave in a selfish way to improve our own utility. I think that there are many examples from history which prove that statement to be false. Many companies, for example, have given pension increases which they did not need to give to their existing pensioners. This was a true recognition of the contributions which those pensioners had made to the company. The company would have been able to get away without giving those pension increases, and I believe that companies are often doing things which are not selfish.

I was encouraged that Mr Wise said that some of the modern thinking on financial economics was converging to the old-fashioned actuarial techniques. On the other hand, Mr Ralfe said that there is a huge gap between the corporate finance approach and the actuarial approach to pensions. Clearly, there are two different points of view there.

Mr Ryan said that different stakeholders have very different risk profiles. I think that more might been done in the paper to try to bring that out — the degree of tolerance which the different stakeholders might have to risk. It seems to me, for example, that, if you are an elderly pensioner, relying on your pension for the rest of your life, and with no other means of income, your risk profile might be very different from that of a company shareholder.

Mr Lofthouse said that 'just trust us' is not acceptable for a modern profession. I agree with him. Mr Smith said that the paper is a breath of fresh air. He also made the point that it is unwise to take investment risks in the pension fund, which jeopardise the core business. This, of course, is quite a difficult area, since the trustees are the people who determine the investment policy, and, although they have to consult the employer, they do not have to take account of the employer's point of view if they do not want to do so.

Mr Davies said that it was employees who lose out, according to most of the figures for the optional courses of action. I bring out the point that the Government is saying that the actuary needs to have a duty of care to the members. If this is enshrined in the statutes shortly, does that mean that, whenever there is a course of action which does result in the employees losing out, the actuary will be required to draw that to the attention of the members?

Mr Capleton said that defined benefits schemes are on the way out. I think that many people would disagree with the likelihood of that, although who knows what may happen in different situations. Defined benefit schemes so nearly meet the needs, not only of employees, but of many established companies, in terms of minimising long-term cost per unit of pension, that it is very far from being proved that DB schemes are, in fact, on the way out. He said that economic leverage was the key concern when pension funds hold equities rather than bonds. Certainly that is something which is already being investigated through asset/liability modelling studies, and, no doubt, will continue to be to an even greater extent after this paper.

Mr Teeger emphasised the importance of company credit ratings. That cannot be stressed too much, particularly when there is a pension fund which is mismatched in its investment policy compared with its liability profile. Company credit ratings are of crucial importance to trustees in determining whether that mismatched position can continue. He emphasised that the various economic indicators may all collapse at once in a disaster scenario, and that we do need to pay attention to the tail of risk.

Mr Evans could see the actuarial profession catching up with the accountancy profession. As I said earlier, there is a need for the professions to work more closely with each other. There might even be the odd area where the accountancy profession could catch up with the actuarial profession!

Mr McKeever said that he was pleased to see that we are looking at pension schemes and the employer as one entity. I think, for the purpose of this paper, that that may be true, but the real

life position is very definitely that they are not one entity. Actuaries and others need to remember that. The assets of the pension fund do not belong to the company, and it is not the company which determines the investment policy. They are two entirely different entities with close connections.

This is an interesting paper, which gives plenty of food for thought. It encourages us to widen our horizons. However, I doubt whether it will cause actuaries to tear up their existing valuation methods or trustees to switch their investment policies. Nor do I think that it will change asset/liability modelling studies much. Nevertheless, it is a very important landmark, by bringing out, clearly, the involvement of various groups of stakeholders, and the need for their various interests to be considered when decisions are made.

Mr C. A. Speed, F.F.A. (replying)**:** Why did we build this model? We wanted to quantify effects; we wanted to understand what was going on. Some speakers have said: "What you have done is far too complex!" Others have said that it is far too simple. On balance, it seems to be fairly even. I am quite encouraged by that. The model is a detail, do not focus on it. It is just a method for letting us think about what we are doing. If you concentrate upon the model, you do not pick up on the main issues of what we are trying to get across. Those main themes focus upon transparency. Let us be honest; this seems to be the way that the wind is blowing. Here is an opportunity to take that forward. We must also be totally clear about how we transfer wealth between different parties. There is a massive consultancy opportunity to do that. If we can do it well, there is a great future.

Deflators seem to raise much interest, and, maybe, this is one of the areas that people find complicated. Maybe you would like to think about them as stochastic discount rates. One thing that they are is market consistent. Look at the example in our paper, where we move the pension scheme from being 100% invested in equities to 100% invested in bonds. The sum of the stakes is the same. Does this mean that we have magically put in all the correct risk-adjusted discount rates? No, the magic, if there is any, has come from the deflators. So what have we shown? Deflators do take account of risk-adjusted discount rates. They are not inconsistent with all the work in modern finance textbooks. They follow those ideas. It is just a different presentation, and, probably, a more modern presentation than when the books were originally written.

One of the reasons that we did decide to go down the route of using deflators was because of the issues concerning complete markets. There they have a massive advantage. No doubt we have more work to do upon the communication here, but, as someone who has given lectures and seminars about option pricing using traditional methods, martingales, and differential equations, and used deflators, I admit that the deflator method appeals to me. You can set up your spreadsheet, multiply two columns of numbers, and you find your option prices within a matter of half an hour. It is not rocket science, and we should be able to communicate it.

I am grateful for those numerous suggestions that were made, particularly the ideas about agency costs, frictional costs, liquidities and human resource issues. Either the contributors are thinking very much along the same lines which we authors are thinking, or they agreed with our list in ¶7.4. Either way, I think that we agree that this is the first step along the road, and we welcome further research.

One of the most important things that I should like people to think about is the distinction between different elements. Mr Smith mentioned the idea of core products, people and capital; and the question is: "Where can we add competitive advantage, where can we add value?"

Traditionally, actuaries seem to focus on capital. We have turned this on its head, saying that this is not where value can be added. Where companies add value is different; it is in their core products and, maybe, through their use of people. That is why the human resource issue is the next key area which needs to be addressed.

Mr T. J. Gordon, F.I.A. (replying)**:** I first revisit the issue of salary risk, raised by Mr Wise, Mr Carne, Mr Long, and also, tangentially, by Mr Lofthouse. In retrospect, maybe we should have been clearer. First of all, I point out that the coherent research that I have seen into the

pricing of hypothetical national average earnings bonds does not support the view that they would be priced in relation to some equity risk premium or matched by equities. Secondly, I make the point, which is similar to the point made by Mr Capleton; where schemes are financially material, it is likely to be the case that pensioners and deferred pensioners are the significant financial categories. I assume that we are not still questioning whether pensions in payment and deferred pensions should be discounted using equity risk premiums, whatever they are. However, I do not think that these points are actually required to set aside the salary risk argument. The 'risk of salary inflation' is really a misleading sleight of hand, and here is why. As an employer, I pay my employees cash. If they are also in a final salary scheme, then I simultaneously pay them an increase in their accrued pension, which clearly is service and salary related. So, part of the pay award relates to the cash, and part relates to the deferred pension. This is the key point. I would not hold equities to reduce the risk of future cash payments to employees, which, after all, are the more financially significant cash flows, so it is rather odd to suggest that I would hold them just to reduce the risk of the increase in their accrued pensions.

In terms of where we go from here, this is really a note of caution. One point which has not been touched upon very deeply in the discussion is our professional reputation. I think that our profession retains a generally good reputation in relation to our primary job for final salary pension schemes — that is, advising on pension scheme funding. However, we need to remember that this reputation has been built up during a period when there has been plenty of carpet under which to sweep away any differences between our advice and reality. I am talking about all those things that used to make discontinuance cover so low as to be meaningless, such as: discretionary pension increases; no statutory revaluation in deferment; high long-dated interest rates; and no debt on the employer. The game is different now, and, independently of Myners' proposed statutory duty of care, we will be more accountable.

We should also remember that investment markets have generally been kind to the pensions industry over the past 15 years. Just imagine how we will cope if we have to face conditions that the Japanese faced over that same period.

So, having invested so much in building our reputation, it would seem careless if we were to lose it at the next major economic downturn. We believe that the way to avoid this outcome is for the profession to be clear about the cost of pensions, including the attendant risks. This means at least two things:

(1) Our valuations should not be manipulated depending on the addressee, or the purpose. If we are claiming to put in place a specially engineered funding method, then this should not be dressed up as a different type of valuation, in which we are allowed to fiddle with the assumptions to get a desired result. You can fund however you like. We are not talking about constraining funding methods (although there are constraints). What is important is how you assess how those different funding methods work.
(2) We should also be clear about any transfers of wealth. Sooner or later, we will be found out if we are not.

The Senior Vice-President (Mr A. S. Fishman, F.I.A.): It remains for me to express the thanks of the President and all of us to the authors, the opener and the closer, and to all those who participated in the discussion. We heard from 17 contributors, four of whom were guests, which, I suppose, is statistically significant, and, echoing Mr Lewin's remark, this goes to show that the quality of the work of actuaries is being appreciated by a wider audience.

WRITTEN CONTRIBUTION

Professor S. Haberman, F.I.A.: The paper provides a clear and interesting discussion of the relationships between the different stakeholders in a funded defined benefit pension scheme, and

of quantifying risks facing the different stakeholders. I have a number of comments on the paper and some questions arising from the approach advocated.

The authors present us with a market-based pension valuation methodology, which views the whole economic system in which the pension scheme operates. Values are placed on the shares of all the parties to this system. So, like a conventional pension valuation, the future dynamics of the system are reduced to a series of present values (using the sophisticated device of deflators rather than deterministic discounting). However, it is not clear whether these deflators are unique in an incomplete market, and it is not clear what assumptions are needed about the market to enable the deflators to be estimated. Also, it would be interesting to consider how the methodology might be adapted to address the dynamics of the scheme. The model and the deflators used are calibrated to current market conditions — say, at the valuation date — in Section 4.3. Presumably, this means that the choice of a different set of market conditions will lead to a different set of results. What are the sensitivities here?

Section 6, on results, then presents us with a comparative statistics analysis, explaining what happens to the values of the different stakes if certain features of the model are changed. Again, the dynamic element of this is hidden from us.

On the stakeholders, we should note that there are some pension schemes where there are no shareholders — for example, local government and public sector schemes. This feature would affect the applicability of the results. Also, I note that the authors have little to say about trustees — who are required by law to be (to use the nomenclature of the authors) scheme centred. They are responsible for investing assets on behalf of all the scheme members, and have no responsibility for the interests of shareholders and other stakeholders.

Trustees are in a different position from, say, managers appointed to run a company on behalf of shareholders. As the authors and other contributors to the discussion point out, agency costs may arise from the misalignment of the interests of managers and the shareholders, but this would not apply to trustees. This seems to be an important area for future work.

I am surprised by the authors' selective approach to the actuarial, rather than to the financial, literature. Much has appeared in international actuarial journals over the last decade on the different interests of the main stakeholders in defined benefit pension schemes, and the trade-off between these when determining optimal funding and investment strategies. So, for example, the sponsor's interest in contribution stability and the member's interest in benefit security are modelled, but there is no mention of this approach in Sections 6.7-6.9, which look at these issues.

The authors are critical of ALM in Sections 2.4-2.6, but their critique is based on a caricature of ALM studies, and is, in my view, based on rather weak ground. They argue that ALM studies do not provide:

— a quantitative assessment of risks;
— a method of placing values for each category of stakeholders in the light of different possible funding and investment strategies; and
— do not have well defined objectives.

They also make some other points about the presentation of quantiles of distributions.

I would have to take issue with this viewpoint. As background, I am the convenor of a working party set up by the Pensions Board to investigate stochastic approaches to pension fund valuations. Our terms of reference include, *inter alia*, addressing the communication and presentation of degrees of funding risk.

We have been working on this task for a few months. Our preliminary ideas resonate with those of the authors, except on the usefulness of ALM studies, so:

— we support the use of discontinuance funding methods as providing an objective target (McLeish & Stewart's DABM);
— we recognise the different perspectives of stakeholders;
— we recognise that trustees will wish to reduce the risk that the promised benefits are not paid;

— we recognise that the sponsor will wish to reduce the risk that the employer's contribution will have to be increased within a given time frame;
— our approach is dynamic, considers a range of time horizons, including the period up to the next reporting date, and does not necessarily concentrate on the long term (as the authors recommend in ¶3.3.3);
— we take funding and investment strategies together; and
— we quantify the trade-off by looking at the simultaneous effect of these strategies on our chosen risk measures (some of which are mentioned in Section 2.6). These measures include:
  (a) the probability of a solvency deficit at a fixed future point of time;
  (b) the mean shortfall (given a deficit) at a fixed future point of time, which is a coherent risk measure; and
  (c) the probability of having to increase the employer's contribution at the next decision point (e.g. the next reporting date).

We would argue, therefore, that much demands on the level of sophistication of the ALM study.

With the approach that we will be advocating, we believe that we can address the authors' suggestions on disclosure, in Section 7.2, which we would strongly support. The main difference is that we focus more attention on projections over a given time horizon rather than placing a value on stakeholders' shares in the system at a point of time.

Some questions:

— How sensitive are the results of Section 6 to the choice of a ten-year time horizon for calculating values, and how should this time horizon be chosen?
— How sensitive are the results of Section 6.12 on the impact of scheme maturity to the availability of matching assets? I have found it difficult to assess whether a full range of maturities of bonds is modelled by the authors — this is implied by Appendix C, but not explicitly mentioned in Section 6.

I thank the authors for a valuable contribution to our thinking and understanding of the financial characteristics of defined benefit pension schemes.