ABSTRACT OF THE DISCUSSION

HELD BY THE FACULTY OF ACTUARIES

The text of the paper 'The Concept of Investment Efficiency and its Application to Investment Structures', by T. M. Hodgson, S. J. Breban, C. L. Ford, M. P. Streatfield and R. C. Urwin, together with the abstract of the discussion on it held by the Institute of Actuaries on 28 February 2000, are printed in *British Actuarial Journal*, **6**, III, pages 451-545.

At the meeting of the Faculty of Actuaries on 19 February 2001, both papers, 'The Concept of Investment Efficiency and its Application to Investment Structures' and 'Risk Budgeting in Pension Investment', were discussed.

Mr M. P. Streatfield, F.F.A. (introducing the paper, 'The Concept of Investment Efficiency and its Application to Investment Management Structures')**:** Our first paper is on investment management structures, and the second is more of a practical paper, looking at asset allocation issues.

We have three main thrusts to the first paper. The first is the importance of governance, and how a pension fund should be managed. We believe that it is important to match the complexity of investment management structures to the level of governance of the pension fund. Governance models should be re-examined to work towards better financial efficiency. This could be approached by looking at delegating complex parts of the structure to funds of funds, or focusing investment skill by setting up investment committees. This would depend on the needs of the funds and their financial objectives.

The second issue is risk budgeting. Here the focus is on understanding where risks should be taken by funds, and how they should be allocated. We want to look at financial efficiency in a broader way, and look at costs, risks and returns. We also note, when considering costs, that one must consider the transition costs of changing the structures, because they often get neglected. An important metric is the net information ratio, because it combines all three of the financial factors in a standardised way.

The third thrust of the paper looks at the non-financial factors which influence pension fund decision-making. The aim is to look at both positive and negative aspects, and how they change investment management structure decisions. We are concerned about regret risk and other non-financial factors. The key message is to control biases, to control the theta to ensure that as much emphasis as possible is placed on the financial elements of investment management structures.

In addition, we describe various manager types; with each of these types having specific risk/return characteristics and non-financial characteristics. These issues from the main paper have been further developed in the second paper.

Mr S. J. Breban (introducing the paper, 'Risk Budgeting in Pension Investment')**:** The purpose of the second paper is to place the first paper in some context, both in respect to the asset allocation or to the policy decisions that trustees make, and the ability of the trustees to implement both structures and decisions.

Within policy, we look at different asset groups: bonds are there to provide safety; equities are there to provide the return enhancements; and alternative assets are there to provide low correlation and/or additional returns. Within the manager structures that we looked at in the first paper, the conclusion is that passive manager types are there to provide low costs, safety, and operational benefits. The active core is there to provide a certain amount of alpha, but with limited governance requirements. Finally, the absolute return layer is there to provide a greater alpha, but subject to the requirement of greater governance.

All investment-related risk can be viewed on a common platform. The policy risk and implementation risks are all essentially the same thing. Prioritisation of decisions can be effected within a risk budgeting framework. Governance is a key differentiator between pension funds and constraints on what they can do. However, there are means of improving these governance structures.

We first look at the impact of active management on our benchmark position. We can introduce an additional level of risk to the benchmark position. We do so in the hope of achieving greater returns and a better manager's return, relative to the policy or benchmark position. So, we have an improvement in alpha, but at the cost of risk.

We then explore the position in the context of policy decisions. The policy position that we examine is the 70% equity and 30% bond position. Active management increases risk relative to the benchmark, as we heard earlier. What we go on to show is that, if we put that in the context of the different considerations of pension funds, and, in particular, the new accounting standard FRS 17, we can see that the risk is unchanged in asset/liability terms.

The final point is that the risk budget does support active management. The governance budget does not necessarily support it, because more sophisticated manager structures require more work from the trustees. This is something which we think can be managed, in particular with the concept of different governance models, and, in particular, that of the investment executive.

Mr A. S. Acheson, F.F.A. (opening the discussion)**:** We have here, as has been said, two papers. The first was presented almost a year ago to the Institute (Hodgson *et al*., 2000). Since then, three of the original authors plus one other have produced a second paper, which completes the picture. In fact, it almost seems to me that the second paper should be taken first, which is what I propose to do.

It seems to me that much of the time of fiduciaries, and certainly of pension fund trustees, is spent on implementation issues: choosing the investment managers, and monitoring them; going over past performance, and the reasons for it; establishing why we have done well, and why we have done badly. However, far less is spent on strategic asset allocation or policy issues. In fact, strategic issues contribute about ten times as much to the risk. It is almost like a man sitting on a plane, on a bumpy flight. He spends a lot of time trying to make sure that his coffee does not slosh over the edge of the cup, but he completely misses the fact that the plane is about to crash.

However, now we have the complete picture, and we are able to open the discussion with trustees and fiduciaries on overall risk. As the authors point out, much of this will involve stochastic calculus and stochastic models. We can — and we have done this in my own office — analyse the quality of the surplus which is produced. We can quantify, for the trustees, the chances of a certain strategy resulting in the decline of surplus. We can calculate the chances of a deficit arising, or an MFR problem arising, in the next ten years. All of these things help to paint a realistic picture for trustees. There is much that can be done, but I suspect that only the larger pension funds, the really large ones, are open to that sort of discussion at the moment. The real challenge for us is to try to open up this concept to many more people.

There is undoubtedly much more work going on at the moment on benchmarking. It is an issue which is coming up more and more in trustees' meetings, but, being the investment manager, I suspect that I am seeing only the tip of the iceberg.

In Section 3 the authors introduce the concept of risk budget, and discuss the appetite for risk. The inclusion of risk belief in that section is an odd one, because it is a non-financial factor. It is one of the 'SeemsGood' factors, to use the phrase of the authors, which the trustees should be striving to control.

The authors next move on to discuss the way in which the strategic decision is taken. They describe three splits: the bond equity split; the allocation within bonds and equities; and then the allocation to alternative assets, such as private equity and hedge funds. In practice, my experience suggests that the third decision, the one concerning private equity, is often taken first. The trustees decide, right at the outset, whether or not that they want to play.

The reader of the paper is then offered a series of examples, each one producing a new idea or concept which will improve the overall efficiency of the portfolio, culminating in the ultimate free lunch, where, because of the assumed independence of the components, the expected rewards — that is the outperformance — rise, while the overall risk drops. However, I always find that there is no such thing as a free lunch, and I think, as the authors explain, that, probably, it is the governance budget which goes up. This needs to be controlled.

The combined result is shown in Table 6. It shows an impressive increase in the information ratio, which is something that all trustees are keen to capture, if they can.

However, before piling in for this free lunch, the trustees should be wary of one or two things. I was pleased when the authors did that in the next section, sounding a note of caution before finishing. When looking at a strategic benchmark, increasing the overseas exposure has not always resulted in increased returns. In fact, our research shows that, over a long period, the extra returns are actually virtually negligible, especially after taking account of hedging costs. In fact, there are significant periods where overseas exposure has actually been detrimental to performance.

The other thing is that the last couple of years have been boom times for private equity, and trustees might be tempted to pile in. However, I accept that the returns from other asset classes, such as these, are less correlated with the likes of United Kingdom equity, and, therefore, the efficiency gains are real.

The risks in the management structure are dealt with in the first paper, and I will come back to these later on. Finally, the key question in the second paper, where to take the risk, is addressed, and how to allocate the risk budget is looked at. The authors refer to their own work, and to a couple of other supporting studies, and explain that the policy risk is about ten times bigger than the manager implementation risk. However, I would be willing to contend that trustees do not spend ten times the amount of time discussing it.

I now look briefly at the first paper, which deals with improving the efficiency of the investment management structures for pension funds. I am sure that many of the ideas discussed and developed in the paper will be familiar to many people, or at least readily followed by them. Many of the concepts involved in designing an optimal investment manager structure apply equally to the process of portfolio construction. Certainly, many of the behavioural issues have been discussed at length within investment management circles. These are discussed in Section 3.

However, we must remember that most trustees are not professional investment managers, and that there is a considerable challenge for us and the advisers, and all in the profession, to help raise awareness of these issues. I agree wholeheartedly about the influence of issues such as the regret risk and the aversion to loss have on decision taking and on the behaviour of trustees.

In tackling beauty parades, when you are pitching for new business, the whole game is to target the key decision-makers and hit their hot buttons. There is absolutely no doubt that poor performance is analysed far more closely than good performance. In fact, startlingly good figures should come in for equal criticism, and should be studied just as closely by trustees, so that they are comfortable with the risks that have been taken to achieve them. There is, however, no doubt that this is hardly ever done.

The home bias factor that the authors point out remains very powerful within the U.K. pension fund market, with most of the U.K. pension fund assets being in the U.K. market. There is some evidence, recently, that this is starting to change. However, the original MFR framework does not help. It makes no reference to overseas assets. Therefore, the regret risk factor, as the authors put it, is very powerful indeed.

One of the strongest behavioural issues which the authors try to tackle is the use of past performance statistics. We are constantly told by everyone that they should pay little, or very little, part in the selection process for investment managers; but, in fact, they undoubtedly still play a huge part in any decision-making process, even with sophisticated trustees. I think that it is true to say that advisers and investment managers play their part in perpetuating this. I would challenge consultants, in general, to tell me how many investment managers with below median performance records they include in shortlists. Hardly any, I should think. All the evidence, including the WM survey (The WM Company, 1998), suggests that, on average, trustees sell low and buy high. They would sack us very quickly if we did the same consistently.

Of course, we, the investment managers, are as guilty as anyone of using past performance records. We have two answers to the question: "Does changing manager improve performance?" The answer is obviously 'yes', if you are pitching for the business, and obviously 'no' if you are defending it.

The authors continue to develop these themes in Section 4, and introduce the labels 'SleepWell' and 'SeemsGood' — labels which I find particularly appropriate. Later in the paper the authors produce figures to suggest that the influence of these non-financial factors, as they call them, is around 50% or so. I suspect that it is far higher than that, especially among the smaller, less experienced, trustee boards.

Section 4.5, on risk, agrees with our own findings, in particular on the limitations of BARRA, which has underestimated the risk in portfolios for some considerable time now. However, there is no evidence that they are willing to change their methods to try to capture more of the risk.

However, as elsewhere, there is a great deal of basic education to be done by investment managers and advisers on the concept of risk. Amazingly, there are still trustees out there, admittedly at the smaller end of the spectrum, who are firmly convinced that the safest asset for a pension fund is cash.

The rest of the paper moves on to develop a step-by-step guide for designing a more efficient structure. Much of the onus is on the adviser to guide the trustees through this process. As the authors point out, it is difficult to quantify and model the non-financial factors. Hence, absolute precision is almost impossible. However, I agree that knowing about these non-financial factors, being able to raise them, discuss them and challenge them, does help limit their influence, and will, it is to be hoped, help the fiduciaries tilt the balance of power in their favour, and improve results over the long term. This is, ultimately, what we are all here to achieve.

Mr I. A. Farr, F.F.A.: That there have been several important papers presented to the Faculty and Institute over the past few years on actuarial issues concerning U.K. pension funds is a sign of the times. I speak as the actuary to a number of large U.K. occupational pension schemes, under which pensions are calculated on a final salary formula.

For reasons of which Fellows will be well aware, the role of actuary to such schemes has become progressively more onerous over the past 20 to 30 years. The role has never been more demanding or challenging — nor more fascinating. We all know that the interplay between assets and liabilities in a final salary scheme is at the core of its actuarial management. In particular, the strategic asset allocation between bonds and equities, as the paper recognises, is one of the most important areas of influence exercised by the scheme trustees.

Many long-established U.K. pension schemes have seen their liability profile become mature, with only a modest proportion of the liabilities now being in respect of employed members. This has been a main factor in the demand for U.K. bonds by many scheme trustees. No doubt, like many others, I am pleased that the market for corporate bonds seems to be expanding significantly, and this asset class should play a useful role in supporting the liabilities of many U.K. pension schemes. The increase in the market prices of bonds in recent years has, of course, affected the financial position of U.K. pension schemes significantly. Typically, actuarial funding valuations, today, where assets are taken into account at their market value, will show a significant contribution to surplus from the investment return over the inter-valuation period far exceeding that assumed, but offset in a material way by an increase in the value of the past-service liabilities, when a much lower future investment return is assumed for the future than at the previous valuation. I always do my best to point out to scheme trustees that a good market investment return for bonds brings with it an increase in the value of the scheme's liabilities.

However, of course, bonds normally form only part of the assets of a scheme. The role of equities has been, and remains, of importance, and, therefore, so too is the scheme's investment management structure. The days of the actuary being the only professional adviser in this area, other than the investment manager, are long since gone, with the investment consultant now having an important role to play. I enjoy working with investment consultants, whether they be colleagues in my own firm, some of whom have written this paper, or professionals from other firms.

I think that it is important that investment consultants be drawn from actuaries and also from those with other skills to offer, in particular skills that have been gained as investment managers earlier in their careers. When working with investment consultants, I always feel that my say, as an actuary, should be predominant in the advice given on the strategic asset allocation between bonds and equities, but, as we move across the spectrum through to subdivisions of asset classes and to the selection of investment houses, the investment consultant's role becomes increasingly more influential, so that, on the choice of investment house, for example, whilst I would expect to be consulted, the scheme trustees would rely heavily on the advice of the investment consultant.

The papers before us offer a framework for the advice given to the trustees of U.K. pension schemes by the investment consultant and the actuary. I agree with the main conclusions of the papers, which I have come to from experience, commonsense and professional judgement. That there is statistical support, therefore, is comforting. I believe that the authors have done us a service by focusing our attention on an area of primary importance to the financial management of U.K. occupational pension schemes.

Mr M. Brooks, F.F.A.: I add my support to both of the papers. The majority of my comments relate to the second paper.

I believe that the building of a mathematical framework around this problem is a positive feature. However, it can have drawbacks. The use of a one number solution can lead some to have undue faith in the result, without any awareness of its sensitivity to the underlying assumptions. One clear example of this is the misunderstanding of and over-reliance on tracking error predictions from risk models in recent years.

The importance of the underlying assumptions cannot be underestimated, and I welcome the recognition of this fact in the paper. In the practical implementation of this approach, I feel that the authors need to go one step further and illustrate the sensitivities of the results to some of the key assumptions. If this is done well, then this will lead to a far greater understanding of the key issues and enhance the use of this approach significantly. One of the key benefits of this approach is that it aids understanding of the interaction between active or implementation risk and policy risk. It is on this area that my main comments are based.

The paper stresses the importance of the strategic asset allocation decision. This is well understood by the majority of actuaries and fellow investment professionals, but the message has had difficulty getting past the behavioural biases of the decision-makers.

On the subject of active risk, in recent years there has been an increasing requirement for managers to measure and manage the prospective tracking error of the fund. Arguably, this has been done largely without any real understanding of the direct benefit to the client. This paper identifies that the effect of active risk on the end utility of the client is significantly diluted by diversification with the strategic risk. This raises a philosophical question as to the appropriate approach to portfolio risk management within an investment management company. In particular, how reactive should the manager be to prospective changes in volatility levels? On the one hand, the manager may be fully focused on managing the prospective range of active returns of the fund, even over short-term horizons. Under this approach, the managers will reduce the size of their active positions if they believe that prospective volatility is on the increase, and vice versa. The advantage of this approach is that it should reduce the chances of extreme underperformance. The disadvantage is the transaction costs that may be incurred in rebalancing the fund to the appropriate risk level, and the fund manager may be distracted from the key objective of adding value.

The alternative is to have a less dynamic approach to risk management. Under this scenario, the manager will aim to maintain broadly the same level of aggressiveness over time, for example in terms of stocks, sector and country position sizes, but not react immediately to short-term changes in prospective volatility levels. Under this approach, the active returns may be subject to periods of relatively high short-term volatility, but will not incur the rebalancing costs or the potential distractions of the dynamic approach.

The choice of approach depends on a number of factors:

(1) There is the confidence that the pension fund has in the manager's ability to predict changes in risk levels. The less faith that one has in this ability, the less merit a dynamic approach has.
(2) There is the impact of changes in the active risk level on the overall risk of the pension fund. If active risk is significantly diluted, as demonstrated in this paper, then a dynamic approach is arguably less appropriate.
(3) There is the investment horizon of the client. Although most pension funds claim a long-term horizon, they may focus in on a quarter's bad performance. Therefore, it may be in the manager's own interests, if not in the client's, to manage risk on the basis of a short-term horizon.
(4) There are the client's, the consultant's and the manager's understandings of these issues.

In practice, the industry seems to have found a happy medium. The risk models currently used tend to balance the goals of high predictive ability with the desire for stability. The industry has, arguably, found the right solution without necessarily knowing what the question is or why the solution is correct. In the future, a clear acknowledgement and understanding of these conflicting objectives will be beneficial. In practice, there is likely to be an increasing demand for more dynamic management of active risk. Indeed, one of the more sophisticated managers in this area is already espousing the use of a short-term dynamic approach, including the use of a 20-day daily tracking error measure as an input to the process.

From the manager's point of view, this may be a sensible way of managing the business risk, given the myopic short-term focus of some clients. However, I find it hard to see how it is in the pension fund's best interests. This level of precision would, perhaps, be admirable if it were mirrored at the strategic asset allocation level. Conceptually, the idea of dynamically managing the strategic asset allocation, based on changing volatility levels, has some appeal. In practice, this is unlikely to be a reality for the foreseeable future.

In summary, I support the concepts put forward in these papers. In particular, I feel that we need to increase our efforts in the practical implementation of these concepts, to focus attention on the big picture issues, and avoid spurious concentration on areas of relatively minor importance.

Mr I. W. McKinlay, F.F.A.: I have recently crossed from being on the funding side to the investment side. The papers enshrine for me the type of learning that I would have gained over the next two to three years, and have condensed that into something like two to three months.

In terms of the papers, particularly the second one, I found it quite hard to get a handle on the specifics. My experience of clients is that they simply do not have an understanding of the dispersion of funding level or of contribution rates. However, this is probably their area of interest. From the perspective of a funding actuary, I do not think that I have fully understood the dispersion either.

The opener spoke about selling these concepts to the smaller client. One problem that we have, as a profession, is that we present valuation results as a number, or perhaps two or three numbers, and we are unable to assign a probability to those outcomes. Within the profession there is a group working on stochastic valuations. The way forward to bridge the gap for an

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average small client, or even an average client, and being able to enter into the kind of dialogue suggested in the second paper, is probably the stochastic valuation. From a personal perspective, I think that we need to work a little bit harder on that.

Mr J. Hastings, F.F.A.: I am going to concentrate on the second paper.

In ¶3.3.4 there is a statement that essentially one unit of risk stays as one unit of risk, with which I take issue. I think that one of the problems that I have with the information ratio is that it is presented as being relatively stable. I think that volatility in the information ratio is one of the trickiest things that, as an investment consultant, I need to worry about. Unfortunately, it is one of the key foundations of this paper, and so it is something which causes me the greatest concern about the paper.

The authors address the concept of theta factors as trustees' non-financial payoffs. I would redefine theta factors to embrace more than the trustees alone. It is a subject that I think of as 'agency' cost. By agency cost, I mean the biases of any of the people involved in pension scheme management: investment consultants, investment managers and trustees.

Several of the criticisms of the Myners' Report, for example, relate to agency costs. If you consider the fairly low proportion of United States equities held within pension schemes in this country over the last decade, then I think that you can attribute that entirely to agency cost. There was collusion between investment managers, consultants and scheme trustees in their belief that the U.S. equity market was grossly overvalued, without really understanding the dynamics of the market. So, I think that theta factors extend way beyond the trustees themselves, and we are all to blame.

I inferred, from the numbers on the investment returns used in the illustrations in the report, that the authors were assuming that there is an excess return from equities of about 4.5% over corporate bonds. I found this quite aggressive. Maybe it is usefully aggressive for the purposes of illustration, but I think that one of the problems that we all have, when we produce asset/liability models, is that the results are unbelievably blunt. One way to make them less blunt is to increase the outperformance of equities, because that tends to stretch things. I would be tempted to use numbers that are considerably lower than those used in the paper. On the basis used, it is very difficult to get meaningful results which will overcome some of the regret risks of trustees.

The opener spoke about consultants omitting underperformers when constructing a manager selection list. I think that we are beginning to see several new developments in the way that investments are managed in the U.K. One of the disturbing developments, whichever way you look at it, is hedge funds. A great deal of the stock volatility that we see at present, particularly short-covering, is due to hedge funds. Hedge funds have their uses, but, unfortunately, they bring some unfortunate consequences. We are beginning to see a drift of some of the best of investment talent out of the bigger investment management houses into more 'boutique' hedge funds. If you believe that talent can produce excess alpha, then it means that the investment management houses are going to find it harder to find exploitable opportunities, or else, perhaps, they will need to develop alternative styles of management.

I think that the way forward for them is, probably, to adopt more long-term approaches to investment management, which I think means that they will need to focus a lot more strongly on their style of management. They will need to adopt more extreme value or growth biases or different approaches of a similar nature. I think that, in this environment, investment consultants will increasingly put forward managers on the basis, not of the returns that they deliver, but of their adherence to their chosen styles. We will find such an approach difficult to explain to trustees, but it is going to be an important component of pension scheme investment management, going forward.

I have one modest regret about this paper. I am particularly drawn to property as an asset class, which suits elements of pension scheme liabilities. My regret is that it seems, including in this paper, increasingly to be considered to be an alternative asset class that is outside the mainstream of pension fund investment.

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Professor R. S. Clarkson, F.F.A.: Some comments on hedge funds, made by Mr Hastings, struck me as very apposite. We, as actuaries, pride ourselves on managing long-term risk, but we do not take note of much of the literature on the subject, that tells us what has happened in the past. For a classic example of how banking short-termism fails, then you should read the book about the Long-Term Capital Management fund, *When Genius Fails*, by Lowenstein. Also, in February 1989, I presented a paper to the Faculty of Actuaries, 'The Measurement of Investment Risk' (Clarkson, 1989/1990). Downside risk is becoming the vogue as to how one should look at financial risk, but nowhere in the papers being discussed did I see any mention of it.

I have a great sympathy for much of what the authors say about behavioural finance. In ¶4.5.8, they state: "Fiduciary bodies may prefer to work with other measures of risk. Examples of other measures include semi-variance, other downside risk measures or value at risk (VaR)." To take VaR, there was recently a very controversial paper about the dangers of how value at risk is being used by banking institutions. Are the authors aware of this paper, and do they agree that the current measures of the VaR for banking risk are seriously wrong?

While I believe that much of what the authors have done in bringing to our attention the facets of behavioural finance is exceptionally useful to the actuarial profession in the U.K., they have not embraced downside risk in the way in which I believe they should have done.

The sooner the actuarial profession embraces the concept of downside risk, the better we will be able to help banks and other financial institutions.

Reference

Clarkson, R.S. (1989/1990). The measurement of investment risk. *J.I.A.* **116**, 127-178 and *T.F.A.* **41**, 677-750.

Dr D. C. Bowie, F.F.A.: My first comment is prompted largely by an earlier comment about the link between the actuarial side and the investment side of pension fund management. Over the second half of the last century, equities went up roughly 600-fold and salaries went up by about 40-fold. Given the exposure that defined benefit pension funds have to equities, it strikes me that pension funds should be extremely cheap. Yet, we are seeing now a decline in defined benefit pension schemes. Most new schemes are defined contribution schemes. One of the main reasons given is 'cost'. The authors have provided one possible reason, which is the governance cost. This must be very high indeed if it is to offset the impressive investment performance of pension funds.

The alternative explanation is that the systematic risk and associated return (the asset/liability information ratio that the authors refer to), is not really coming through in terms of reducing the underlying cost of a pension scheme. Indeed, the standard financial theory would support the argument that systematic risk and return are not going to offset the costs in defined benefit pension schemes. Maybe trustees are trying to solve a difficult actuarial problem entirely through investment policy. Perhaps the problem is trying to protect benefits which are simply too high. They would be better placed focusing their efforts on producing an investment strategy which produced a high level of security for a smaller benefit. Members treat their benefits as being absolutely guaranteed. It seems slightly bizarre that trustees are taking quite complicated risk/return decisions on behalf of shareholders about whose preferences they know very little. Those whom they do know about are the scheme members, and, since that group gain very little from the excess returns, the risk is nothing but bad news.

Related to that, in ¶3.6.4 of the second paper, there is a comment about maturity and the type of risks that can be taken. I wonder about that, because, if you are invested in equities or any risky asset, and there is a 25% crash, then your fund is down by 25%. The only way that you are going to get the fund back up is to put 25% more into the fund. Whether it is spread over ten years, five years or three years, the shareholders will still be putting exactly the same amount of money back into the scheme, once you adjust for risk.

In ¶4.1.2 and elsewhere there are descriptions of the hierarchy of decision-making within pension schemes, and the way in which advice is given. I suspect that many in the industry do

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something similar, in terms of setting a strategy first, and then taking that strategic (policy) benchmark, as given, when deciding on investment structures and selecting managers.

Clearly, in a mathematical sense, that is not, necessarily, going to be optimal. There must be information that you could get from the selection of managers that could be used to help set strategy. As an extreme example, if you could find a manager who is guaranteed to give you very high performance all the time, then it will be sub-optimal to have anything but a large proportion of the fund invested in that manager. So, strategy might, in principle, be related to manager selection. The reason that it is not done this way is probably tied in with governance costs and the fact that it is easier to communicate decisions in a step-by-step fashion. Governance costs seem to be a slush fund that grows in order to allow the system to run in an 'easy', but inefficient, way.

In Section 6.1 the idea of fuzzy returns is mentioned. Much of the advice provided and decisions made depend very heavily on what return assumptions are made. I would observe that return assumptions need not be made purely on historical information. Furthermore, any Bayesian adjustments or other structural uncertainties modelled impact both on the return assumption made and on the volatility assumption that is subsequently used in determining a risk/return trade-off. If you are investing over a very short period of time, it does not really matter whether you decide that your equity risk premium is 4% or 5% or 3% or 1%, if the volatilities are up around 20%. Over a longer period of time the uncertainty in the risk premium at the outset is going to feed through also into the volatility of the asset returns.

Mr H. D. Sutherland, F.I.A.: As the profession's staff actuary with particular responsibility for the investment papers within the education syllabuses, I am always keenly interested in papers that can be referred to students. I was very pleased to see the first paper when it was discussed in February 2000, and, indeed, we have already incorporated this into the core reading for the investment examinations.

I therefore approached the second paper with considerable interest. I am afraid that I found it extremely terse. It worries me that it is going to give us some problems when we try to put it in front of students. I give you a couple of examples. In ¶3.5.2 the authors write about the use of the new accounting standard FRS 17, and so on. There are statements like: "It also represents the key interest of the sponsoring employers which, in balance of cost pension funds, have the over-riding concern with risk." I must confess that I had to read that sentence about four times before I could make any sense of it at all. The only way that I could make sense of it was by putting the words 'balance of costs' in inverted commas, and regarding it as some sort of shorthand for a class of pension funds, and then I could start to glean something out of it. I think that that is a shame, because I feel that there is a lot of good stuff in here, but it is struggling somehow to get out.

I had a similar problem with the figures, and, in particular, the triangles (risk increased relative to baseline), which seem to indicate to me that somehow this particular strategy was sub-optimal and that it lay inside the efficient frontier. However, when I tried to explain to myself where that triangle had come from in terms of the data and the figures, I found it difficult. It seemed to be pulling information and figures from different parts of the report, and I would have welcomed some sort of example.

On a slightly different point, the question of an appropriate measure of risk to be used is something that we talk about quite extensively in the education syllabuses, and we end up using the standard deviation, as we understand that it is most common. However, I think that many students and many people who look at it worry that, maybe, the standard deviation is not the appropriate measure, and that others, like downside measures and semi-variance, would be better.

So, I was pleased when I read, in ¶3.3.2 - 3.3.4, some comments on this, except that, eventually, the authors ducked the issue. In ¶3.3.3 we are told that: "Semi-variance measures could be considered, but the additional statistical complication does not generally yield much additional benefit." There was no supporting evidence to demonstrate why that should be the case. Similarly, in ¶3.3.4: "Other downside measures over alternative time horizons also do not

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generally add any new information'', but there is nothing to support that. As I say, I think that it is a shame, because I am sure that there is an enormous amount in this paper which would be of particular benefit to students.

Mr B. G. Moretta, F.F.A.: I refer to the part of the paper where the authors write about randomness and performance. They are right to emphasise this, especially when it comes to dealing with tracking errors, and trying to get diversification between managers. When we are estimating tracking errors, we, despite the increase in volatility, are actually seeing an increase, probably, in homogeneity between markets. What that means is that managers with high alphas are going to have similar styles and similar reasons for outperforming, which means that the ease of diversification between managers is probably reduced. I realise that I am speaking from a naïve bottom-up viewpoint, and, maybe, practical experience will be different, but it means that the benefits of diversification, in the first place, are harder to get, because it is hard to find managers who have positive alpha at the same time as a low correlation.

What it does also mean, perhaps, is that the alternative investment route is more attractive. Inherently, that is going to have a lower correlation, and while the authors suggest that there is a higher risk in the context of pension funds where you have real return target, maybe it is less true for other clients where there is an absolute return target. Certainly, the benefits of diversifying through an alternative route could well be greater than the examples suggest.

Mr C. W. F. Low, F.F.A.: I have a little sympathy with Mr Sutherland's statement; but I disagree with his aims. I would not want the second paper to be developed to such a theoretical degree that it would be regarded as suitable for teaching students. Its worth is the fact that it is practical, and that it indicates ways in which investment consultants should be starting to talk to trustees. I say 'should be'. Like Mr McKinlay, I translated from being a pensions actuary to an investment consultant over ten years ago, at a time when the chairman of the authors was with a fund manager. We had some interesting discussions. I used to work on asset allocation bases, using an index core fund. I was trying to persuade a particular fund management house to have an aggressive enough satellite portfolio, in order to get the active alpha on the fund up to the desired levels.

While the structure of this paper is excellent for pointing out the ideas that should be talked about to clients, I find that clients have great difficulty in getting a hold of subjective ideas. They need some numbers put in front of them to realise what they mean. However, therein lies the danger, because, if you put numbers in front of them, they tend to believe them.

Some have spoken about annual figures; and one of the things which always worried me when doing investment work was that the standard deviation depended on which calendar year you took. We all know that, if you take correlations from December to December, they are vastly different to the correlations for June to June, March to March, or September to September. Indeed, in ¶6.6.1 we have assumed correlations. The authors are certainly showing a sensitivity analysis, but just look at the degree of sensitivities, 0% to 40% — quite a range. That is just putting in context that these are indicators. I think that they can be very useful. From the time which I spent with trustees, typically using two, or three or four managers, I certainly recognise Regret Risk and SleepWell factors, and all the rest of it. However, we will have to take trustees into this area fairly slowly.

The position of investment consultants has become somewhat easier, in that their pension colleagues are beginning to wake up. The biggest difficulty that I had ten years ago, when doing some asset/liability modelling, was that one was exposing ones pension colleagues' valuation bases. The client would begin to understand that the deterministic basis, which he thought was the answer, was somewhere among the dispersion, which was undefined. Pension actuaries had never really paid enough attention to that marvellous paragraph in GN9, that you should illustrate the sensitivities of your results.

Of course, at that time pension scheme actuaries were largely using dividend discount models, as, indeed, I was. So, I plead guilty, certainly, ten years ago. They have now moved over, largely, to market value valuations. I was very disappointed that there was not as active a discussion as I would have hoped for in this Hall, in November 2000, on that subject ('Pension Fund Valuations and Market Values.' *B.A.J.* **7**, 103-122). However, it has produced a new benchmark, which I am very pleased to see that the authors have cottoned on to, which is FRS 17. To that extent, they are ahead of the game so far as the trustees of medium-sized funds are concerned, who have yet to wake up to what FRS 17 is going to do to the employer's balance sheet.

That is just one of the risks that trustees perceive. The trustees also have their wind-up risk. Many of the smaller funds are very concerned with that. Within the fund of funds there is the MFR risk. The MFR risk is a totally different benchmark to the FRS 17 risk. These are the sort of things which investment consultants have to manage.

I welcome what has been put forward here. When we come to choosing investment managers and looking at the alpha of portfolios, we have to go through to looking at the manager's style. Style risk and the manager's internal governance are also very important here; the problem that I always found was heterogeneity. To get anything significant, you needed at least five years' investment figures, and I was looking at quarterly returns, so that, at least, gave you 20 sets of figures. Where could I get an investment team that had been homogeneous over those five years? Of course, they had not been, so trying to work out how much relied on the team, and how much on the method, and how much on the individual people, is always very difficult.

Somebody spoke earlier on buying at the top and selling at the bottom. It is very difficult to persuade clients to do anything about that. I can remember when there was one well-known merchant bank in London, which used to have a good record. In the late 1970s/early 1980s it was right down at the bottom of the pack, and they took a brave decision. They got rid of senior management, and they brought in a chief executive from a house with a very good track record and a lady equity manager from a house with another exceedingly good track record. I said: "Do you want a joker in the pack? They are right at the bottom. Now is the time to buy, because, if these two people gel, they will be 'top of the pops' in five years' time.'' They did gel, and they were, but few invested, unfortunately.

The President (Mr T. D. Kingston, F.F.A.): This is a subject in which I have a deep and abiding interest, and, indeed, in my Presidential Address I identified a number of big issues which I hoped and planned that the profession would tackle. The first of these was the investment process, and particularly what lies between the person who is actually investing the money, who is buying the stock or the bond, and the person who owns the money in the first instance. I think that this is an area which is clearly not exclusively actuarial; it affects everybody in the investment management business, but it is one which I think that we are in a particular position to highlight, and to bring out into the open, as this paper has done.

Indeed, the length and the complexity of this second paper shows just how much research activity is going into this area and into the process of determining asset mix, choice of manager, risk profile, and so on. Is this all worthwhile? When I began work on investment about 30 years ago, investment performance then was just in its infancy. Pension funds were largely invested in insurance company policies, and there was a certain amount of in-house management of large funds and a certain amount of segregated management, but not a great deal. Outperformance by equity managers at that stage was, in some ways, not so difficult. I remember, in the early 1970s, measuring investment performance in equity portfolios, and having consistent degrees of success, simply because they had better information than the world at large. Clearly, those days have gone.

Later on, we saw a move in these islands towards a concentration of pension fund management in the hands of a relatively limited number of large active fund managers. This was best suited for a situation where the pension fund was prepared to hand over all its assets and all its decisions to one or two managers. They delegated everything to them, and the only monitoring that went on was some form of investment performance on a comparative basis.

We have now seen a great deal of suggestion that investment performance in the past is no guide to the future. That is the thing which could destroy active investment management, as such, because, if there is no clear value added, you have to say what are you paying for. So, we are now witnessing a new wave, one where investment managers are becoming more specialised. If we look at Section 6 of the second paper, there is a great deal on this particular issue.

That move demands the concept of what is called manager of managers. To my mind, it is the process of how to carry out that role, in its broadest sense, that the paper tackles. About six years ago, I was first introduced to the concept of creating a fund of funds, or manager of managers, where you had funds managed by a number of different investment managers. That concept has caught on in a substantial way in Australia, and to a degree in the U.S.A. I think, as fund managers become more specialised, as Mr Hastings pointed out earlier on, that this is very likely to happen. Whether it is the type of movement that we have talked about in this discussion, or whether it is the fact that it is not clear that active managers are adding a great deal in relative performance terms, it seems to me that we are likely to have, at least for a period, an era of specialist fund managers. As those fund managers grow, then we can expect the manager of managers industry itself to grow.

I come back to the question of whether that extra layer is worthwhile. Personally, I believe that it is, because I think that it gives a greater understanding, and greater understanding should lead, at least, to greater predictability. It seems to me that we are likely to be entering a period of, perhaps, 10 or 20 years when equities may not perform as well as they have done in the last 10 - 20 years. It seems to me unlikely that we will get a yet further rerating upwards.

In such an environment, we cannot really rely on blind buying of equities, as, to some extent, we have done in the past 20 years. Those have covered all our mistakes of one sort or another. So, the whole question of setting objectives and determining risks for our funds is likely to come into greater prominence for that fact alone.

Of course, there is an issue of cost. Who is going to pay for this? To date, fund managers, by and large, have earned basis points, while investment consultants have largely earned fees. If investment consultants, or some derivation of investment consultants, are going to act as manager of managers, effectively, that is likely to change. I do not have to tell you which produce the higher earnings, basis points or fees. It seems to me that we may well see a change here, and the manager of managers is likely to wish to be remunerated in terms of basis points. The issue then becomes: "From where is he going to get those basis points?" Is he going to get them from the fund manager in some sort of wholesale discount, or is he going to get them from the ultimate client? That is an interesting issue, which still has to be resolved.

Mr G. M. Murray, C.B.E., F.F.A.: I find the papers interesting and stimulating, especially given that my ongoing professional involvement is with two fairly sizeable pension schemes on the investment consultancy side.

Therefore, I am surprised that I seem to be alone in noticing the fact that the authors have, fairly straightforwardly, inserted index-linked bonds into the bond section. It seems to me that index-linked bonds, because of their variability of return, could just as readily be included in the equity section as the bond section, and so, because of that, I believe that they would best be taken out of the two major sections and consigned to the alternative assets class. However, it does raise doubts in my mind. If there is a group of assets of such different variation in the authors' chosen sections, and they are largely ignored, are we looking at the correct things when discussing this particular topic?

Mr C. I. Black, F.F.A. (closing the discussion)**:** I start by reflecting a bit on the role of the trustee, because I think that this is really the key person, or body of people, who has to be considered in this debate. Historically, the role of the trustee was to take decisions that were reasonable and informed by expert input. There is, perhaps, an argument that that is becoming more onerous on the trustees. The risks that this position carries is that trustees occupy the middle ground, logically, because that is the hardest part of the ground to challenge. Therefore, the trustees may not take the specific circumstances of their own scheme or fund or company into account in some cases. The standards expected of trustees seem to be rising inexorably. This carries with it twin dangers: there is the possibility that individuals will not step forward to take the personal risks involved with being trustees; and, in the case of pension schemes, employers may even cease to sponsor schemes benevolently.

These papers help for two reasons: they make clear the decisions that need to be made, distinguishing the steps that, I believe, have, historically, been bundled together; and they provide input into the factors to take into account in making these decisions. Our President highlighted some of these topics in his Presidential Address in 2000. I think that it is important to reflect on how that goes hand-in-hand with this paper, particularly reflecting and encouraging new roles which emerge between those whose money is being invested and those doing the actual investment, highlighting the asset allocator role, the manager of managers, and also on risk and performance assessors, and advisers to members who need individual advice. The papers outline the roles, and help to push thinking forward.

I now go over some other comments that have been made in this discussion, and pass on some of my own thoughts. The opener spoke on policy risk versus implementation risk. I echo his comments that trustees do not spend enough time on policy risk. I think that that is where the clarity, in terms of drawing out steps in the process in these papers, is a most valuable contribution, and our obligation is that we should use this as the tool to educate people. He also commented that poor performance attracts more scrutiny than good. I think that that is undoubtedly the case. I do not know that we will ever get away from it; but I would emphasise that, if we take an appropriate approach to risk and risk measurement, and the ex-post results of that, then we will be taking steps in the right direction.

The comments by Mr Farr are a sign of the times. The role of the actuary has become progressively more demanding. That is undoubtedly true. I would reflect on my comments on the role of the trustee. I think that the trustee is feeling the pinch. That is why we need to look at seeing the governance budgets increase. Governance budgets, by and large, in the hands of trustees, are limited by time. We have to have the time to devote to the decisions, and that may be their own time, or that may be by having resources to whom to delegate some of the thought processes.

Mr Brooks commented on active risk, and about managers needing to measure prospective tracking error. Undoubtedly, the historical tools that we have used have not been very good at predicting the level of risk, and, therefore, have perhaps confused the debate. Undoubtedly, we will have to develop these tools, and see what we can do to improve them as useful tools for the future. Mr Brooks was highlighting the risk that investment managers may be led to focus on their short-term risk and effectively on their business risks. I think that I would emphasise that that too is where these papers can help us, in order to work on getting schemes to avoid costs of restructuring as a result of overly frequent manager changes.

Mr Hastings raised the point of agency costs, particularly on the issue of the level of U.S. equity investment. I go back to the herd instinct, as it were, or the trustees not wanting to stand out from the pack, and, therefore, not being able to be shot down easily. Undoubtedly, that has been a significant factor in the level of U.S. equity investment in pension schemes. The slight balancing factor is that overall equity investment has also benefited by that in the fairly recent past, and that has had some compensation. However, if you look at the level of U.S. equity investment in pension schemes, and compare that to the level of the U.S. equity market in world index terms, there is clearly an anomaly.

Dr Bowie was effectively asking the question: "Should defined benefits focus more on higher security for lower benefits?'' There was also the issue relating to maturity. More and more of the benefits are becoming guaranteed, and therefore there is a squeeze on the trustees. They have less flexibility, there is less discretionary benefit, and, therefore, they really would have to target lower benefits, but where does that sit against the expectations of the members?

Mr Sutherland raised the issue of standard deviation, or appropriate measures of risks, not being properly followed through in the paper. Undoubtedly that is an issue that we will have to address, and get further work done to ensure that we can move our understanding of that area forward.

Concerning randomness in performance: managers with high tracking errors; alternative investment strategies. I have a fear about alternative investment strategies, and I think that it is probably shared by many. It may be very much in vogue, and certainly there could be opportunities there, but often they come with liquidity costs, and we are looking at an environment with increasing pressure on the level of maturity of schemes, and, as a consequence, we have to bear liquidity in mind.

In the conclusions of Section 7 of the second paper, the authors state that funds should increase their governance budgets through better resourcing and organisational design. Undoubtedly this is true. Often the clamour is for more budget or more resources to deal with issues. I think that this may actually be a reallocation of resources, the resources that have been focused on implementation should be stepped back, and used more on policy, with, perhaps, more delegation on implementation.

The funds should consider their non-financial requirements, but aim to limit their influence. Many in our profession may be sceptical when asked to consider these non-financial requirements, but we must not forget that the decisions that we are considering have been taken by real people, who are not necessarily steeped in financial markets and financial market theories, so do not underestimate the power of these sometimes irrational behaviours.

Mr R. C. Urwin, F.I.A. (replying)**:** I shall describe a little about the goals behind these papers, and where we are going from here. Then I shall deal with the two major themes, as I see them, the first being risk in its philosophical form through to practical application, dwelling on Professor Clarkson's questions, among others, and also bringing in the themes that the President introduced, to do with our role in the process issue, and where we go in relation to applying these types of theory to the funds for which we have responsibilities.

On the question of goals, I was indebted to Mr Low, when he once described our first paper as a time and trouble paper. That was a good phrase. We spent a lot of time wordsmithing and trying to explain a great deal of complicated stuff in over 70 pages. I did not conceive that it would be that sort of paper to start with, but that is how it turned out. We were very careful about the way that we presented it. I am gratified that this is now recommended reading for students, both in this country and also across the world, I gather.

In the second paper we rather ran out of steam. Mr Sutherland is entirely right, that we wrote a terser paper, but I am pleased that we did, because it is more likely to be read. I think that that is an important consideration. Both papers are framework papers, and I have a lot of sympathy with you in trying to draw practical applications from them.

One of the criticisms that I do feel acutely, here, is that we are taking a 'holier than thou' position in writing these papers. I stress that consultants are part of this agency cost, every bit as much as other professionals in the field. Dr Bowie referred to this as the slush fund issue, which I thought was a good phrase. Consultants — and we are definitely included in this — have a lot of difficulty in measuring risk; and if you cannot measure it, can you manage it? Probably the better mantra is what we can measure, we over manage, and, therefore, I think there has been too much attention paid to performance without regard to risk. I would repeat a phrase that I have used several times — just because you measure performance to two significant figures does not make those figures significant. In relation to the measurement of risk, we have quite an irony, because some of the measurement here is to two significant figures.

There is a major issue about trying to say that risk and return are somehow exchangeable. That is really a central theme of the second paper. Basically, if I can reduce risk through various forms of diversification, then I can then take more risk and get higher returns. That is the principle. So the issue, though, is that return is really about simple arithmetic, and risk is about complex mathematics, particularly as regards diversification and correlation issues, none of which are stable. That is fair comment.

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We are talking about the comfort zone of returns — certainly I believe that my clients sit in the comfort zone of returns. None of my clients eat risk adjusted returns. (This refers to the opener's point about no free lunches.) The free lunch principle is entirely valid, with maybe two moderations. One is that you can eat a free lunch if you are prepared to eat alone, which is not much fun. Secondly, you can go in for the latest fad, which is food combining. Food combining is really about trying to draw something special from combinations of foods, and, of course, that is a metaphor for how we are dealing with risk diversification.

However, when we looked at risk in detail, we concluded that risk was the number one threat to the financial efficiency of many strategies, because it was so difficult to measure it and to see through it. On the other hand, risk is certainly the number one opportunity to be more financially efficient, to achieve higher performance, and this, I think, represents a very great challenge for all of us in the investment industry.

I now try to deal with the two major practical difficulties with risk, as I see it. I start with BARRA. We are not here to defend the BARRA organisation, or the competitors in this field, who measure the tracking error of different portfolios. On the other hand, I do feel that they come in for a measure of criticism that is at times too great. My principle, here, is that the messenger is being shot. The messenger is being shot for the fact that risk is not stable over time, as Mr Hastings pointed out. Risk is not stable over time; but models that try to deal with an unstable item like risk are bound to have major difficulties.

So, my sense here is that risk measurement may well use BARRA as a very effective model of how risk is supposed to behave in a linear world, all else being equal. We know that the investment world is not linear, and all else is not equal. So what we need is risk intelligence, interpreting the statistics that come from the BARRA tracking errors, and actually making a competitive advantage of our reading of those risk statistics.

I do not see that as being, necessarily, a skill of the investment management industry. As I look around investment organisations at the moment, more of the talk is about knocking the accuracy of these figures as opposed to being intelligent. It is understanding when they overstate, as, statistically, they must. The nature of the regression approach to setting risk, based on a historic figure, will underestimate tracking error at times.

I was pleased that Professor Clarkson mentioned Long-Term Capital Management. I have had discussions on the subject during the year which followed it, because our industry did not see it coming. No one was expecting such an event to take place; hence the book *When Genius Fails*. The first point to raise is that LTCM was a 13 Sigma event. That was a statement that came from the presentations of what went wrong afterwards. Of course, that is totally crazy statistics, because we know that we can discount something that is a 13 Sigma event on the basis that it is bad measurement. Of course, so much of LTCM was based on the correlations that were across a generalised marketplace, and were not based on the correlations that could take place under downside conditions.

So, of course, downside measures in that particular case were much more valuable, and, in the hedge fund area, downside measures will dominate relative to more traditional measures. Essentially, the hedge fund area has to be looked at differently. I would not argue, though, that we would necessarily immediately leap to using downside measures across every investment product, or every asset allocation question, simply because the benefits of being rather more precise about downside risk that makes sense are actually offset by the lack of a universal language applied to semi-variance measures, and by the mathematics being quite intractable.

So, on that basis, I believe that we are throwing away one or two too many measures if we think about downside risk too readily without thinking about what we might be giving up in balancing the upside and the downside. I totally agree with Professor Clarkson's point that, maybe, we need to approach downside risk because of the growing dominance of value at risk. As actuaries, I think that we can contribute significantly to discussions on the subject.

I now refer to the place of investment consultants and actuaries in this type of area. It is helpful to think about the history of our work here. Looking back ten or 20 years, I feel that actuaries had a position of trust with their clients to look at assets alongside liabilities, and, over a period of time, that has evolved towards more specialist individuals. So, when I look at the make-up of our investment consulting team, it is made up of a very broad mixture of skills, many people who have had experience in investment management, as well as many actuaries trained on the liabilities side, and some trained purely on the assets side. It is a very 'broad church', and I think that it draws strength from that range of skills and backgrounds. I think that the future is very interesting, insofar as it has become a *bona fide* industry, the investment consulting industry, and, as the President said, the fund of funds area beckons.

It is very easy for us to remember the importance of funds of funds — one of the simple measures of this is that there are far more mutual funds in the U.S.A. than there are securities. Shortly, there will be more funds of funds than mutual funds. This industry is starting to break out its products in more complicated and structured forms. It is changing the balance, so that the investment management balance, as we see it, is changing towards doing one of two specialised things. First of all, it is adding substantial value, with high degrees of investment freedom. That is our view of what makes sense to the active investment management industry. Then there is tracking various forms of investment benchmark, at low-cost, high efficiency, and a high degree of simplicity. These are the major areas that the investment management industry will deliver.

Alongside these there will now be an increasing growth of what you could call the fund engineers, who are putting together funds, securities (not so much securities as funds), and managers. The structures that they will use will determine the effectiveness of their work, and, ultimately, the performance of their work.

My sense is that this is growing now at the geometric phase, before something that might be a little more like an exponential phase, of change in our industry, which is premised on the President's remarks about how much of the active investment management industry is disappointing. My sense is that other people will now move onto something that looks a little bit different, which is based more on a fund of funds approach.

There were a couple of important points about categorisation. I realise that those who are natural protagonists for the property market feel disappointed that it is called an alternative asset. It is not our intention to marginalise property. It is merely our intention to mark it out as an asset class that cannot be benchmarked conventionally, and so, for that reason, we think of it as an alternative to equities. Of course, alternative assets carry other connotations, and it is to those connotations that a couple of the speakers were referring. Our belief is that real estate represents one of the asset classes that is quite naturally part of the line up, provided that the governance budget of the client is sufficient. All too often the governance budget is not up to managing real estate, because the benchmarks are not there, and it requires a long-term attention span. So, for that reason again, it comes back to our way of structuring a fund and having regard to governance.

My comment about index-linked bonds is that their design is with liabilities in mind, and, therefore, it is inevitable that index-linked bonds would be matched to certain types of liabilities. That is why index-linked bonds would certainly be in the bonds section.

One matter that did not get much mention, and where, perhaps, we will be moving things forward, is the question of the trustee's position in governance. I was very glad that the closer referred to this issue in his summary. Governance research on how decisions are taken represents a very significant step forward.

My sense is that the first paper was the 'full Russian doll,' so we have here a very comprehensive account of manager structure. We did not give you the full Russian doll of the second paper. It was a version that was consistent with the whole, but we did not wordsmith it to be a student's paper. I think that time will mean that we never do that; but what I would argue is consistent with the Russian doll theme.

I strongly promote these three concepts as being the way forward in structuring funds: governance should be the start of people's decision taking rather than being part of the decision process later in the process; financial efficiency should be seen in risk adjusted terms as opposed to purely in return terms; and the behavioural aspects of investment are hugely important, and need to be incorporated in the model, rather than being left out of the model and somehow ignored.

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The President (Mr T. D. Kingston, F.F.A.): I should like to thank the authors for what has been a most interesting contribution to a fascinating subject.

This has been a very valuable discussion. As I said earlier on, it is a subject that is very dear to me, and it is a subject that is going to evolve. Mr Urwin referred to the geometric progression of one aspect of it in his reply to the discussion. I suspect that we are going to see a geometric progression in discussion on these kinds of issues over the next few years. I hope that there will be subsequent discussions here.