

ABSTRACT OF THE DISCUSSION

Mr A. M. Kaufman, Hon.F.I.A. (introducing the paper): I had a dream the last night — I guess you are wondering what I am talking about! I had entered a lift and was followed in by my chief executive (CEO), which was a little surprising, because I have exited the world where I had a CEO, but this was a dream. He said that he was on his way to the sixth floor to a meeting with some important investors, and he expected to be asked three questions. First, how much capital did he think this firm should hold? Secondly, what rate of return should be required on this capital? Thirdly, how does the firm establish performance targets in light of the capital level and cost of capital?

I said quickly: “First, the target capital depends on many factors. Secondly, the capital asset pricing model (CAPM) is not a reliable measure of the cost of capital. Thirdly, the performance target must deal with frictional costs and should not be confused with the cost of capital.” Suddenly the lift floor disappeared. I was falling down the lift shaft. Like that well-known actuarial joke, everything I said was completely true, but totally useless.

Fortunately, or not, this was a dream. I fell back to sleep, and again found myself in the lift with the same CEO who asked the same questions. This time I was a little more careful. I replied: “The cost of capital is based on the largest of three factors. First, we set the level such that the probability of failing ICA tests is less than 20% over a ten-year period. Secondly, we have enough capital to achieve an AA rating. Thirdly, the capital is enough to achieve these objectives while meeting our strategic objectives of growing the premium at 10% p.a., and having enough capital for one of our target acquisitions over the next five years.”

The CEO was getting a bit restless, so I added: “And that implies a one-to-one premium to surplus ratio.” He smiled. With that encouragement, I proceeded to address the second question: “Our cost of capital based on a CAPM analysis and a market consistent pricing methodology, using assumptions applied in a recent *sigma* report (Swiss Re, 2005), would be 9%: 4% equity risk premium; plus 5% risk-free rate, but there are other considerations. First, there is a debate about whether insurance is more or less risky than other industries (that is whether beta is more or less than one). Secondly, the Fama-French three-factor (FF3F) analysis implies that CAPM estimates of the cost of capital are low for insurance enterprises. That is because CAPM does not sufficiently consider the extent to which insurance market values are affected by failure risk to a greater extent than in other industries. Finally, our firm’s capital is invested more heavily in gilts than the average, and so our cost of capital should be lower.”

My CEO was becoming restless, but then I was still standing in the lift. I was beginning to feel the floor fade beneath me, so I added quickly: “So, our cost of capital is 10%; 9% accepting that beta is one, less 1%, because our capital is invested more heavily in gilts, plus 2% for the FF3F financial distress effect.” “10%”, my CEO said, and he smiled. I felt my feet firmly on the lift floor, and continued: “The internal profit margin is set to provide investors with a profit expectation of 10% on the market value of the firm after income tax. To achieve that 10% target for investors, our internal target must be high enough for: the cost of taxes (that is the double taxation effect); the expected value of the cost of financial distress; the market value of that potential financial distress; the expected costs and the market value impact of agency and transparency risks; and, finally, liquidity costs.” I could see that the CEO was becoming restless. Again, I added quickly: “And that turns out to be 15% on the capital.” “Good!”, the CEO said: “One to one, 10% cost of capital, 15% performance target. I can handle that. You come along, so that you can explain the details.”

We hope that, once you have worked through our paper, you will be able to survive the conversation in the lift and can also handle the details.

Mr C. A. Brooke-Taylor, F.I.A. (opening the discussion): The authors of this paper have achieved a number of useful things, in my view. First, they have put into place a summary of a wide range of relevant work. Many of us are aware of some, but probably not all, of this

material, and I suggest that we are all still struggling to use the ideas fully. They have sought to pool these ideas together into a coherent framework. They have not solved all of the problems addressed, but they have helped to take the thinking at least a step forward. Finally, they have given the profession a useful breakdown of the gap between investors' demands on their shares and the returns which the insurance business provides, along with the framework model for corporate finance practitioners to experiment with.

Considering the paper in more detail, Section 5 discusses bottom up approaches to the cost of capital, and my main comment on this is that a systematic attempt to close the gap between a pro forma return on capital targets and realistic targets is a useful thing to have.

The authors illustrate how management can create value by minimising agency costs. The key theme is communication leading to trust. Here we have an illustration of the charge which investors apply to managers, arguably just because of a gap in understanding. This is possibly as important as the mortality costs of the actual risk profile, and also something about which managers may be in a better position to do something. An example of the importance of communication is the growth example in ¶5.16. Unless the outcome of the investment is clear at all stages, the market value could fall unnecessarily in response to the perceived cost of the financial investment before the actual returns are clear. I think that this is a conclusion which ought to be added to the key messages in ¶5.19.

A great deal has been written about management's interests not being aligned with those of shareholders, because shareholders can diversify their risks while management cannot. However, the cost of financial distress and mortality affects shareholders as well as managers, and, in this respect, there is a natural alignment of interests. The growth example also helps to bring out the important distinction between investment capital and solvency capital. Investment capital needs to give an appropriate return on its own, because it usually represents money out of the door. Solvency capital, in contrast, is little more than a useful denominator against which to measure total returns. Typically, it is invested in income bearing assets, and, frictional costs aside, its risk characteristics do not change just because it is held by the insurer.

However, once we allow for frictional costs and the frictional costs of capital, it is clear that solvency capital could be regarded almost as a factor of production, and management's choice is how much to hold in stock, given the fluctuating availability and cost of acquiring more when it is needed. It is helpful, when considering the distinction between solvency and investment capital, to break out the components of the firm according to their risk characteristics. This is alluded to in ¶5.8.7, with the comment "gilt which have no default risk", among other things.

Paragraph 3.8.2 discusses different risk discount rates for different purposes, and, in particular, distinguishes the firm as a whole from the components of the firm. This is crucial in making sensible investment decisions, as projects may be rejected or approved inappropriately through the application of firm-wide costs of capital when they have very individual risk characteristics.

The relevance of this point to liabilities, as drawn out in ¶3.8.3, is of real importance, as CEIOPS (2006) considers a cost of capital model for valuing liabilities. Should this valuation depend on all of the circumstances of the firm, or purely on the nature of the liabilities themselves? I have no answer to this question.

Another point which is relevant to the Solvency II discussion appears in the summary in ¶6.8, where the authors give three examples of return targets. The third of these is a return on equity target, which could be based on an artificially low, that is regulatory, equity component. Actual transactions, as for many internal projects, demand returns on equity nearer 15% to 20% in excess of the risk-free rate — a sobering thought, as CEIOPS (2006) develops the cost of capital approach to valuing liabilities.

Returning to the discussion of growth, the three cases do not bring out the distinction between what I refer to as 'more of the same' versus 'creative' growth sufficiently for me. By this, I mean that growth by acquisition usually requires investors to pay a market price, while suitable investments should require investors to pay only a book value and some investment capital. This lack of distinction — generally, but not in the paper — is possibly one hindrance to successful rights issues. Each of the components considered in Section 5 can also be applied to

the marginal project, making this model a useful corporate finance tool, although this raises a difficult question of capital allocation, which I consider later.

I had not come across the Fama-French model (FF3F) before reading this paper, so I was pleased, initially, to see this incremental extension to CAPM, which seems to explain more of what we observe. One criticism of the FF3F is the lack of theoretical explanation for the observed dependency on market risk factors. The authors attempt some explanation in the cost of financial distress and in the mortality risk. However, there are still difficulties in unpicking cause and effect. For a given stream of returns, a firm with a lower cost of capital is bound to have a higher price/book ratio, and I cannot see a direct link between the franchise value and the ability to raise further capital in times of distress. However, there may be a clue in my earlier comments about rights issues.

I shall now outline the key points which I take from this paper. First, no single mathematical model will tell you how much capital to hold, and regulators should remember this when applying any test. The discussion in ¶2.3, for example, illustrates the arbitrariness of some of the key parameters used in economic capital models. Second, tax is of huge importance in decisions which one might expect — and a regulator would prefer — to be purely about risk appetite. Third, high internal demands for return on equity are necessary, as much to close the expectation gap as to compensate for actual risk.

In ¶5.10.5 the authors give a good summary of the themes discussed under the cost of capital, illustrating the importance of the expected value of extreme events, the market price of the risks, which cannot all be diversified away, even by the shareholders, and the market low for imperfect information.

I also have a couple of suggestions for further work. I find the discussion of the underwriting cycle in ¶3.11 a little bit of a tease. I should like to see these ideas developed further, to help us to understand the optimal route through a cycle which can be so detrimental to all stakeholders in the industry. While working myself on corporate finance thinking in an insurance firm, one of the key questions which we faced was: “Do we allocate capital or not?” The main point behind this is the relevance of different risk characteristics of different classes of business. The question remains unanswered here, but I hope that the framework and the model described in Section 5 will help. Perhaps, also, there is a hint in ¶4.3.3.

This is a thought provoking paper, which I hope will be read, not just by the general insurance community, but also by people outside the general insurance world.

Mr J. P. Ryan, F.I.A.: The discussion on this paper would help enormously if we were to introduce some additional concepts to provide a better framework for analysis. They make the conceptual analysis much easier, and provide some explanation for many of the phenomena which the authors discuss in the paper.

First, I should like to deal with an actuarial howler. It is not correct to discount at the higher rate implied by the greater risk. Instead, discount at the risk-free rate, and then adjust for the higher return required. Not to do so encourages companies with low capital availability to have a greater bias towards long-tail lines, whereas highly capitalised companies will have to write short-tail business. If you do the sums in the correct way, which adjusts for the higher rate, and is my understanding of what financial analysts do, then you discount at the risk-free rate of interest and then adjust for risk. Doing it the other way round is wrong. This affects ¶¶3.2(2) and 2.7.2, as well as other areas in the paper. [See the first sentence of ¶3.8.3, which has been added to the original paper in response to this, and also to the written contribution from the authors at the end of this discussion.]

The financing of shareholder capital is important. The authors do allude to this, and it does affect overall results and some of the conclusions. Modigliani & Miller (1958) state that the value of the firm does not change according to how it is financed under conventional financial theory, but their original paper only applies to the shareholder aspect, and deals with the value from the shareholder’s point of view. The authors write about the financial distress element of it, and about regulatory capital. All these other issues are extra dimensions of capital funds which need to be put into a company, and which are different from the optimal financing structure of

the shareholder element of it. By putting in extra funds by a debt element of it, you are affecting the rating, the regulatory capital and the other elements of it, and there is an extra dimension which cancels some of the financial distress issues which the authors discuss.

In particular, on the assumption that the optimal shareholder value is less than the regulatory capital which is required to finance future growth, which will be the case with most companies, then some subordinated debt finance will be optimal to do this. Some care needs to be taken to make sure that the subordinated debt is admissible for regulatory purposes. There are a number of techniques to do this.

It is important to consider the rationale for this, and this is hinted at by the authors. The regulatory capital is there for the policyholders, because the policyholders cannot diversify their risk. Also, the debt is a good way of dealing with some of the franchise elements of what, as the opener referred to, can be financed by way of rights issues, and so on, because, in the event of a default, it has real franchise value which can be raised.

Consequently, Figure 2.6 will change if different financial structures are used. It also changes many of the comments on financial distress. For example, shifting a company from a BBB rating to an A rating is likely to be similar to the cost of debt differences, provided that the optimum shareholder capital is less than that required for the BBB rating.

The other important issue is diversification credits. Essentially, combining two non-perfectly correlated risks reduces the capital per unit of exposure. For example, combining a United Kingdom motor insurer with a United States property catastrophe insurer, which are both largely uncorrelated, will reduce capital per unit of premium. Defining the unit of exposure is again quite complicated.

This particular phenomenon, and the ability to diversify risks, alter some of the explanations in the paper. For example, the authors write about increasing equity exposure. Increasing equity exposure in something which has a great deal of other risk in it, which is probably uncorrelated, will have an impact on the capital requirements of the firm as a whole. This will tie through into some of the other issues.

So, the answer to the question in ¶4.3.3 of Cummins & Phillips (2005) is not to use line specific capital costs to do the discounting, but to use a marginal increment in the capital per unit of additional exposure. Doing it this way, and using diversification credits, gives you a much better framework. This phenomenon probably also explains the apparent relative insensitivity of the price/book value in relation to underwriting volatility in the Swiss Re study, described in ¶4.5.1. It seems as though it should be more volatile, but I suspect that there is a degree to which this is affected by diversification and different capital requirements; and it means that the actual slope of the line in Figure 4.1 is less than it should be, intuitively.

While I very much commend the use of financial economics in forming general insurance provisions, I think that it is also important to recognise that the rules of economics also apply to the insurance industry in supply/demand curves. The insurance industry is an extremely price competitive industry. Therefore, the actual price is largely market determined. Consequently, many of the questions which the authors pose and answer in Section 5 are actually academic, because you cannot obtain those prices, as the market, quite rightly, will not let you do so. Otherwise, some companies would be able to optimise their capital structure more effectively to undercut you. This price competitive element should change the questions which the authors are asking from: "What capital return do I require for writing this line of business?" to: "How do I optimise my capital structure so that I can make sure that my company meets the target rate of return?" Therefore, Mr Kaufman, standing in his lift, should have told his CEO to tell the merchant bankers that they were asking the wrong question. The question which they are actually asking is: "How big a discount to book value is my company going to sell at if I do not get these answers correct?" If you follow through the theory, the price to be charged for a line of business is not derived from the capital market, but is the marginal increase in return required for the marginal increase per unit of capital written.

Unfortunately, I am not familiar with the detail of the two capital studies referred to in the paper. I do believe that the framework which I described earlier can be used to explain some of the discrepancies to which the authors referred. It is therefore likely that, for an insurance

company, the achievable target rate of return is nearer the CAPM number and not the FF3F number to which the authors referred. The reason for this is that, although the FF3F numbers are almost certainly correct, they are reflecting the fact that the market is putting those shares on a discount because they have sub-optimal capital structures. Clearly, if you can get those target rates of return, then you will also see them come back through. However, in practice, in a price competitive market, the market should not let you do that.

The methodology is interesting from that point of view, because it tells you at what price your shares are going to sell, because there is a way where you can actually go back and deal with it. Therefore, the CAPM methodology is likely — and, as I say, I am not familiar with the detail — to assume a reasonably efficient capital structure, and comes back nearer those types of issues. Section 5 needs to be thought through, in terms of the above framework, as to: “What discount am I going to come back to, how do I change the structure?”

The authors, of course, refer to the fact that some insurance risks are just too big to diversify, even with the size of capital markets, examples being Katrina, the World Trade Centre and some others.

My conclusion from all this is that the question to be asked is not: “What return should I be getting on my capital in general?” but: “How do I optimise my business mix and capital structure in order to maximise the value of the firm through which I am operating?” I need to set my target capital across the company, so that the marginal extra return must exceed the marginal increase in capital. Clearly, you cannot do that with line by line business; you need some care in putting it together. However, that is the target to which you need to aim. Finally, reinsurance is a very effective way of doing some of these things which are quite difficult to do structurally.

REFERENCE

MODIGLIANI, F. & MILLER, M. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review*, **48**, 261-297.

Mr T. A. G. Marcuson, F.I.A.: This is a thought-provoking paper, with a number of ideas which help to clarify the three questions raised, which are all too familiar.

When I read papers like this, I always find myself asking the question: “How do I put this into practice for my clients?” The challenge for insurance management seems to be to translate target returns and levels of capital, which this paper helps us to obtain, into decisions by which the business can be run, not just at a strategic level, but also at the operational coal face of day-to-day decisions. The real challenge which we face with capital models is to convert these high level targets to a sufficient level of granularity to be of practical use in setting objectives and enabling business decisions to be made to drive the insurer forward.

This year I was involved with the GIRO Working Party paper ‘Embedding Capital Models in the Business’ (Byrne *et al.*, 2006) presented in Vienna in October 2006. In it we explored a number of the ways in which insurers can get their arms round this challenge and some of the key issues presented.

I have some other observations on the subject of capital models:

- (1) There is the problem of adding margins to margins, which is referred to in the paper in a number of places. It occurred to me that, if we target a BBB rating and then add additional capital to make sure we do not lose this, do we end up with a company with a higher rating?
- (2) There is Tail Value at Risk (TVaR). Is it just nice mathematics or of real practical use? The difficulty seems to be in calibrating the tail. While this problem faces us whether we are dealing with Value at Risk (VaR) or TVaR, with VaR we only need to worry about what happens on this side of survival. I tend to think of the analogy of running across a mountain plateau towards a cliff edge and not knowing how far the drop over the edge is. Is it 1m or 1000m? Is it a nice seat or a gorse bush? Does anything about our experience in running towards the edge help us to know what will happen to us once we go over the edge? I would be interested in the views of the authors on this point.

- (3) There is disclosure. I am also interested in the views of the authors on how companies can signal better or worse management of risk and capital in the framework which they propose. At the moment, outsiders are heavily reliant on analyst briefings and rating agency reviews. What could companies do which would really assist in their interaction with external stakeholders, in light of this framework, which they are not already doing?
- (4) I found the presentation on this paper extremely useful in helping me to think about where the franchise value resides in different insurers. How much of this is what you might call 'front office' (that is, in the hands of individual underwriters), and how much is 'back office' (that is, reliant on the existing structure of the business and on the strength of its brand and, as the paper suggests, on its capital strength)? For example, many major personal lines insurers gain their franchise value from the strength of their brands, often reflecting past investment in advertising. Conversely, specialty lines, Lloyds or London Market operations, may derive much of their franchise value from the skills or the network of the individual underwriters employed there. The challenge for the specialty commercial lines insurers' management is that, while the capital may contribute significantly to the ability of the insurer to perform, attract business and maintain the profitability of that business, the loss of a critical underwriter may mean the departure of a significant business portfolio, and, no matter how much extra capital you raise, you may struggle to make progress without the underwriters to bring in the good business. We have a clear need to think about how we keep these underwriters and about the remuneration strategy, and how, overall, we get the business to perform, which is reflected in the way in which the company is set up and the business model which is there.

This brings me back to where I began, on how we drive the capital model through the business and the critical role which this plays.

REFERENCE

BYRNE, M., DUNLOP, C., FISHER, S., HILDER, I., MARCUSON, A., NEUYEN, L.-A., SHAW, P. & TOLLER, J. (2006). Embedding capital models in the business. 33rd GIRO Convention papers, 26-29. <http://www.actuaries.org.uk/files/pdf/proceedings/giro2006/Marcuson.pdf>

Mr A. N. Hitchcox, F.I.A.: In one of my previous employments I worked for a large, multi-national group, and was in one of its local operating subsidiaries. I asked somebody from the centre why the group choose TVaR rather than VaR. He gave me a very interesting answer, which was that they had built up their franchise value over many decades. Their plan was to be in certain territories around the world, call it 20, and they wanted to stay in those territories for the long-term good, they believed, because the economy was mature and they expected them to pay back after losses. He said that, when they were looking at the capitalisation of the local subsidiaries, they really had to expect to pay for that subsidiary when it got into trouble. They might do their capital planning to keep the capital in the centre, for various reasons, and then they would give the subsidiary internal group reinsurances. Their expectation was that, if a medium size subsidiary got into financial trouble through no fault of its own, but because of an extreme fluctuation, their intention would be to bail out that subsidiary, so that they could say to their customers in other parts of the world: "We will stand by our long-term promises to you." So, their idea was that they needed to have an understanding of when the bad loss happened with a particular frequency, and how much it could cost them. That is how they set their capital requirements for the local parts of the group as part of the overall group.

That has always been the thinking at the back of my mind. The TVaR approach is when you want to know how much the cost of the bad event is, because you intend to pay for it, albeit, perhaps, out of new money.

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): How good is the estimate of the

distribution in the tail? If tail events are supposed to happen less frequently than once every 200 years, how much data do we really have to calibrate the models?

Mr Hitchcox: I have no smart answer to that, except to say that we, as actuaries, unfortunately frequently get landed with this responsibility. Our job is to be the experts in the rare event. We have to take whatever data there may be.

The one-in-200 years event for the firm might be the combination of some more frequent events, so that we have to help the firm understand the interaction between several one-in-50 years events, but there is no easy answer. Parameter risk is a risk which the insurance industry bears long term. Something which I believe that we, as actuaries, need to help investors to understand — although we have to do this in a very clever fashion — is that quite a few of our risks are very hard to predict.

If I take the cost of hurricanes and court orders for liability claims, to use a financier's terminology for a moment, these risks are unhedgeable, and, if we are honest with our investors, they need to understand that there is a large element of the risks in our profiles which cannot be hedged or laid off elsewhere, and so they are taking that 'on the chin'. That is quite a tricky message to deliver. You need to deliver it accurately without making them too worried.

The subject of disclosure has been touched upon. If you think of all the international reporting standards (such as the IFRS) requirements which will be coming down the track in the next years, we will (if we are not already) be required to disclose anything which can affect the uncertainty of the cash flows coming from the firm. I think that some investment analysts want us to disclose more of our inherent insurance risk to help them judge the firm. I now give you a couple of examples. The first one comes from outside general insurance. An article in the *Financial Times* said that investors require more disclosure on pension fund risk. They want firms to say that there is a publicly available mortality table published by the Institute of Actuaries. Some firms use 100% of that mortality table and some firms use 80% of it. Also, some firms model it into the future to take account of improving mortality. The investment analysts would like to know from these firms, which have huge pension funds, almost as large as the market capitalisation of the firms themselves, the underlying basis behind their pension fund valuations, so that they can take a view on whether the pension fund valuations are optimistic, pessimistic, maybe about right, or how they compare with other firms of a similar size. That caught my eye. I was thinking: "How do I turn that into information which I could use for an insurance firm?" If I were a catastrophe underwriting firm, if I were disclosing the risk in my firm in an IFRS statement, maybe I would disclose what percentage of which particular firm's model I use for my catastrophe modelling, and what percentage I use for their loss frequencies for US hurricanes. Then an analyst has the ability to judge: "Have I priced that well, or have I priced it more highly than some other firm?" Another one would be if I have a firm with many U.S. liabilities. I could disclose under that how my basis compares, on a rough, crude measure, with, say, some of the typical A M Best studies which are seen in the market? Again, that gives the external analyst the opportunity to say that firm A is using A M Best at 100% and firm B are using A M Best at 120%, so I then know more about the quality of the earnings from firms A and B.

That would be the extreme answer to how much we should disclose about the risks in our funds. This might lead us to disclose the basis of how we set the mean for our claims costs in quite explicit detail. I am not advising that that is a way to go. I am saying that that is an extreme example of what analysts could want from a firm.

Mr D. I. W. Reynolds, F.I.A.: While considering TVaR, I draw your attention to the paper, Dowd *et al.* (2004), which was published from the Centre for Risks and Insurance Studies at Nottingham University. It is a very substantial critique of VaR, and very much favours TVaR and discusses some of the issues which have been mentioned. I recommend it to be read by anybody who is interested in this topic.

REFERENCE

DOWD, K., BLAKE, D. & CAIRNS, A.J.G. (2004). Long-term value at risk. *Journal of Risk Finance*, 5(2), 52-57.

Mr S. Pollack, F.I.A.: I should also like to address the issue of TVaR versus VaR on a couple of fronts. I think that one of the issues is: "For whom are you are holding capital, and what happens if it runs out?" If you are a mutual insurance company, and it is your policyholders who effectively provide the capital, and you are managing capital with policyholders in mind, then they are going to be very concerned should that capital run out, with how much it then impacts upon your claim payment ability. They should, therefore, be very concerned with TVaR.

If, on the other hand, you take a hard-nosed view of shareholder capital, and you decide that you are looking at this from the shareholders' point of view completely, then, if capital is exhausted and they have lost their franchise value, then they have no stake in the continuation of the firm. From their point of view, paying claims at a rate of 99p in the pound is the same as paying 1p in the pound. In that case the VaR might have been a more appropriate measure.

Take, for a further example, Lloyds, which has both a degree of mutuality and a degree of shareholder capital. There may be some kind of compromise solution. I imagine that there is no clear, directly correct way in every circumstance.

The other point of view about the TVaR, versus VaR might come from the rating agencies. I am not an expert on rating agencies. However, I believe that two major rating agencies, Standard & Poor's and Moody's, when rating debt, take slightly different viewpoints. Standard & Poor's looks more at the 'probability of default', and Moody's considers closely the 'loss given default'.

When the rating agencies are asked how they rate insurance companies, they will always say that capital modelling is only one (albeit important) factor in the process. There will be no exact formula as to how much capital modelling is taken account of in a rating. However, one may conclude, broadly, that, if you are targeting an S&P rating, the VaR approach might be more appropriate, and if you are targeting a Moody's rating as your principal capital measure, then a TVaR approach might be more appropriate.

I should like to echo the point made by Mr Marcuson about the actual implementation of capital models. I think that this paper is excellent, partly because it does not have any integral signs and difficult differential equations. It is practical. It borrows a great deal from established bodies of theory for giving numbers, and rules of thumb, etc., to help companies manage their capital. I applaud that general approach. As a profession, we need to start moving more into the implementation of our ideas and of our models rather than just marginally refining them to be mathematically more perfect.

As a thought experiment, if a chief underwriter for a certain region, say, was provided with a single target, to make an x loss ratio on y of premium, then what happens is that his or her mind becomes focussed on a single number. There would be a discontinuity at that number. While they are below their target they will pull out all the stops to meet their target. Once they have their target, they will then be inclined to stop writing business unless they have a continued stake in the 'upside'. They will stop trying to make profits because they have hit their target. There may be subtleties around the edges, but, generally speaking, as soon as you focus on one single number for one business unit you tend to get a discontinuity in the risk/reward trade-off.

The challenges of all of these models of returns on capital, CAPM, and so on, are that they assume that there is a continuous relationship between risk and return, as represented for the capital holders. As soon as you translate CAPM or other capital measures into a single number for a single business unit, you are always going to get this discontinuity, and I am always interested in ways of implementing sensible capital models at that level. One way is to set up some kind of company internal trading mechanism, like internal reinsurance, which is negotiated between an internal reinsurer and a line of business manager, where you might have the internal exchange being managed by some kind of capital model.

Mr A. D. Smith: I should like to refer to a point made by Mr Ryan regarding the actuarial howler which he claims to have discovered. I do not believe that it is a howler. In talking about the valuation of risk-free cash flows, a plain evaluation of these, I think we all agree, is fairly straight forward using a risk-free rate. I think that Mr Ryan compared two methodologies, one of which was to value by adjusting discount rates, which, of course, underlies embedded value reporting, among other things. The alternative is to discount at risk-free rates, and to adjust the cash flows in some way for risk. I think that Mr Ryan's suggestion was that the latter was superior.

In fact, in the models which are used around the financial world there is a variety of different methods which are applied. The underlying economics are about hedging arguments and about the equilibrium construction of risk and returns. For example, the CAPM is usually stated in terms of the risk adjusted discount rate. If you wish, you could restate it in terms of risk adjusted capital cash flows. The Black-Scholes model is the other way round. It is usually expressed as a risk adjustment in cash flows, but you could, should you so wish, express it as discount rates. Mathematically you can transform one to the other, and it is a matter of convenience.

In the particular case where we are looking at franchise value, there is a technical reason why discounting at the risk-free rate first and then adjusting often does not work. That is when you are looking at companies whose growth rates are expected to be greater than the risk-free rates. You can see that a discounted dividend approach does not give you a very good point from which to start and then adjust subsequently.

I encourage you to look at both of those approaches. In fact, some of them were based on models previously built from the other approach. Mathematically, I do not believe that we are talking about a point of principle here, we are looking at the point of presentation.

Mr M. H. D. Kemp, F.I.A.: This paper and the discussion both include comments on TVaR versus VaR, and the numbers are not hugely different. If you also look at Figure 2.1, which shows the wide range of historical corporate default rates, I conclude that the degree of uncertainty in either statistic is actually quite sizeable, and is probably larger than the degree of uncertainty of one, given information about the other.

Mr N. Shah, F.I.A.: I should like to make a point on the VaR versus TVaR debate. We seem to be focusing too much on whether there is one correct metric. The key thing is to understand the impact of the metric, both on the distributions at which we are looking and also on the decisions which those metrics are driving. In some circumstances the VaR and TVaR will likely give you the same decisions, whereas, in other extreme distribution circumstances, the decisions are likely to be very different, or the point of decisions is likely to be very different under the two circumstances.

So, the key, so far as modelling is concerned, is to keep an eye on both, because they both tell you something about the distribution at which you are looking.

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): We have had brief mention of distress costs. I come from a background of a life operation owned by a general insurer, which was effectively forced to sell it off, at what many would say was a significant discount, at a time of distress. It was also forced to make a rights issue at a rather difficult point in the stock market cycle. Taken together, these two did seem to be rather a large distress cost. I am sure that there are other examples of distress in general insurance companies recently. I wonder how significant this can be, and whether the numbers in the paper are really representative of the cases which have happened in the recent past.

Mr Smith: With regard to financial distress costs, they are famously difficult to measure. The fact that the business is sold at a discount to what management would have liked to sell it does not necessarily mean that a cost has been incurred. It might just mean that the management was more optimistic than the rest of the market, in which case you have to ask: "Why did they sell it?"

We tried to make the numbers realistic, in a general sense. Plainly they do not apply to any specific company, but we have had regard to a fairly comprehensive piece of work by Ros Altman, looking at financial distress costs across a whole range of financial organisations. It is very clear that they cannot be ignored. It is also clear that, in some senses, if you sell a financially distressed company and then some of those distress costs are passed on to the person who buys it, they are not all borne by the initial seller.

Mr Kaufman: There is a point which we dodged in the paper, which I will call the question of diversifiability. Mr Smith talked about risks not being hedgeable, but more important than that, I think, is the question of whether one can diversify them, because, if you can diversify your risk across other risks, then there is an economic argument which says that the amount of return which you could get from a diversifiable risk is fairly small — it may be zero. We give an example in Appendix A, which goes through that question, and says that, if you had a bond which earned 4%, and then you added the random element, if you rolled a pair of dice and you got a bit of extra return based on the outcome of the dice, you would know exactly the outcome. There is an extra variability, but is there enough to generate extra return?

We go through an argument which says: “No, essentially there cannot be much extra return because everyone knows what the dice will do. There is variability, but you could roll the dice enough times to make that a very small number.”

The question with insurance models is that you do not get the chance to roll the dice that many times with a catastrophe model, so that you do not know its impact. So, the diversifiability within catastrophe models is small, but then the argument goes that you can diversify that across the rest of your pricing models, and, maybe, all that risk goes away because it is diversifiable, or maybe it does not. If it is diversifiable and goes away, we achieve no extra return on that, and all the examples in Section 5 assume that there is no extra return, and that the only risk which the firm actually has on the outside of it is the way in which it is investing its capital. The insurance has to earn a return because of frictional costs, not because of variability. So, I wonder whether anyone has any thoughts about that diversifiability argument.

We can show that firms need to earn big returns to cover frictional costs, but the paper actually says that that is in addition to any extra return which you might get because things are not diversifiable. I think that we have just dodged that issue.

Mr Shah: When considering being paid for non-diversifiable risk only, I think that these arguments only apply to very large liquid markets where there is relative symmetry of information. In the insurance market, the key aspect is that there is much model and basis risk, and that is what insurance firms are paid for. Hence, with many of the arguments as to whether risk is diversifiable or not, it is hard to separate the two components, so, in my opinion, there is always an element of non-diversifiable risk which has to be paid for.

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): A number of general insurance companies will, by now, have had to prepare ICAs for formal submission to the FSA, and will have had feedback from the FSA on them. They will, I presume, also have adopted a capital policy of holding some capital in excess of ICA plus any ICG. It would be interesting to know what the capital policy of any company is, or how it is constructed, especially if it is not constructed similarly to the way set out in this paper, but no one is willing to speak. Obviously, either nobody works in capital management, or it is far too secret to mention.

One of the other things in the paper which I noticed was the fact that the model assumed a one-year time horizon and a 99.5% probability, or the equivalent on a TVaR basis. Working on the life insurance side, it is always necessary to question whether a one-year time horizon is adequate for particular types of risk, even though it is the FSA's ‘preferred’ time horizon. For life insurance business, looking much further forward may give significantly larger capital requirements in some cases, particularly with regard to long-term guarantees backed by equities, or to longevity.

There was some mention in the paper of the time horizon, but it did not get a significant

discussion. I wonder whether that was because, for most general insurance risks, the long-term horizon is not all that significant, though I would imagine that, for inflation linked liability claims, this should at least be investigated.

Mr Hitchcox: I have always found the insurance cycle very hard to deal with. There is absolutely no doubt, when I look back across any set of insurance results, that the insurance cycle is very clear. I have seen graphs inside the firms for which I have worked, and we had some GIRO working parties a year or two ago, where the cycle was very strong and all the lines moved at once, which said that it was driven mainly by pricing and supply and demand.

It is the one topic which I find very hard to discuss with investors. Part of me wants to tell them the truth about the degree of future uncertainty. It is a message which is very hard to deliver without getting some very tough questioning back as to why the industry is doing this.

We discussed the cycle at length in the course of writing the paper. I do not know whether anybody here has a greater insight than this. I have never yet had a discussion with an investor who understood the cycle and had come to terms with it. Having said that, I have to speak to the firm's management as well as to the investors, and they ask me how to handle it. The best solution which I can come up with is, having studied the cycle, that you make an approximate forecast of where you think it is going to be for the next ten years. Then I believe that you should set your capital, first of all looking at the cross-cycle average, and then, secondly, more for performance setting targets, you should set your sales managers and underwriters shorter-term targets which relate to where you are in the cycle at the moment, and manage the business tactically round that.

That is the practice which I have seen. As I have said, I have always found it very hard to then take that conversation further to the investors. They feel very uncomfortable with a feeling of a cycle downwards as well as upwards.

Mr J. B. Orr, F.F.A.: I would like to make a point in favour of the one-year time horizon — it is a common currency, making it easier to talk about and compare companies' risk profiles.

In terms of investors who understand the underwriting cycle, I used to work in Lloyd's and met many individual Names. They had the option of investing and staying in for a particular year of account. When there was a distressed market and prices were strong — you could say a 'hard' market as opposed to a 'soft' one — they saw that they had a two or three year window of opportunity in which to make money before underwriting conditions worsened.

Perhaps the problem with incorporating the underwriting cycle into the assessment of the value of a firm arises where you do not have the choice to go into, and come out of, particular years of account, and you have to take a long-term view of the business. It is just that much harder. I think that it then comes back to the problem of valuing an insurance portfolio. The real challenge is how to write a quality underwriting portfolio. When we see businesses which are successful, it is because they have addressed that problem in addition to the important capital aspects.

Mr M. G. White, F.I.A.: I have a brief comment on the underwriting cycle. I now work, or nearly work, depending on regulatory constraints, for the one company which I think does know how to manage the cycle. That means simply, if the rate is not enough, just write nothing. That is the very clear instruction throughout the business.

The point is that, not only do the investors understand the business, but the investors control it. That is the distinction.

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): I wonder whether it is any easier to tell where you are in the underwriting cycle than in the stock market cycle. Nobody really knows when you are at the top or at the bottom of a stock market cycle. Are the peaks and troughs in the underwriting cycle also something which you can identify retrospectively, or is it somehow possible to know where you are in the underwriting cycle as it happens?

Mr Hitchcox: You have to do your best as a manager of a firm. I think that it is fair to say that, over the last five or ten years, most insurance firms have devoted a great deal of internal effort to monitoring the changes in terms from one year to the next for general insurance business, first of all starting with the easier quantifiable things, like changes in price and changes in exposure. I think that they now have enough will and effort to try to track the softer things, such as changes in terms and conditions.

So, that is the response of industry management at the moment — to track pricing strength indicators, or whatever you like to call them, build up those databases for as long a period as possible, and then, if you believe that your ultimate loss ratios for a year or two previously are firmly based upon sound claims evidence, you can then use that to project forward your current expected loss ratios to get a better view on those. Then you have to take a deep breath and project those ULRs from the past ten years into the next ten years, acknowledging the extent of the cycle. That is the hardest part.

It is a central theme, not just of the actuaries in the industry, but of the senior management in the industry. That is one of their challenging tasks.

If I were an investor in a firm, one of the questions which I would spend a great deal of time asking is: “What is your view of the cycle, and how do you intend, as the firm’s management, to deal with it?”

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): The other area which was mentioned briefly in association with the cost of capital was its possible use in Solvency II calculations, I assume for setting a prudent margin in the Pillar I calculations.

I know a little about how Solvency II might operate on the life insurance side, but very little about how it could operate on the general insurance side. I hope that there may be some present who can say a little more about whether these are the methods that we expect to see used to generate margins under Solvency II, or whether we would expect to see the essence compacted into much simpler formulae or, indeed, other approaches.

Mr Hitchcox: The way in which I would answer that is that, in terms of the proposed methods for applying a cost of capital approach to setting the risk margin for reserves, people are settling on a relatively straightforward formula. I do not think that they are objecting to the structure of the formula. The \$64,000 question is: “What is the appropriate cost of capital to apply as input?” There is a wide range of debate about the appropriate level there. That is key to the final answer. I know, for example, that, whenever I read material on this topic, there are various placeholders’ values published. For example, the CEA published a placeholder value of 4% over risk free. We know that the Swiss solvency test uses 6% over risk free. Whenever I look in anecdotal documents, I see people saying that real transactions in the market place are taking place at levels of something like 15% to 20%, which is a lot higher cost of capital than the two previous examples which I quoted.

I do not know how that circle is going to be squared. As you can imagine, it has a high impact on the final result.

Mr Kaufman: The paper, as illustrated in the Section 5 examples of converting the market cost of capital into a return on capital inside the company, reflects all of the frictional costs. That is one of the pieces which has been missing from the risk margin debate. The numbers tossed around as placeholders, say, x over risk free, are the cost of capital from an investor point of view on market value. That is the essence of those numbers. The paper shows that this has nothing to do with what you need inside the firm. Inside the firm you need enough to cover taxes, you need enough to cover a return on market value, as well as capital inside the firm, risk of mortality, and so on. The whole debate about the cost of capital has been missing these features. We hope that the paper will enter the fray at least in that respect.

Mr P. J. Copeman, F.I.A. (closing the discussion): I have been asked to close the discussion by trying to draw out some themes and by giving some comments of my own.

I share the view, which was expressed by the opener and others, that this is an important and welcome paper in a critical field for insurance firms. It is also timely to be discussing these matters. It is two years since the introduction of the ICAS solvency regime in the U.K. We are also in the middle of discussions about Solvency II, the proposed framework for a European solvency regulation, and about IFRS.

I also suggest that, although the paper has a general insurance title, it seems to me that much of the content also has applications in other fields, such as life insurance.

The authors do not claim to have provided complete answers to the three questions raised at the beginning of the paper. These questions were repeated by Mr Kaufman: "How much capital should be held? What rate of return is required? How should the performance targets and premium loadings within a company be assessed?"

The authors have, however, taken forward the debate in an impressive manner. They have also provided a very useful summary, for an actuarial audience, of various pieces of pre-existing work, and have gathered them into one place.

Returning to Solvency II, as mentioned by some speakers, we seem, at the moment, to be moving apace in the Solvency II initiative towards a cost of capital approach. Similarly, in the IFRS discussions, one of the options being considered in connection with risk margins is a cost of capital approach. "What capital?" and "What cost?" are questions which need first to be addressed. In a solvency regulation context, the regulator may, of course, prescribe the basis of such a calculation, perhaps, as Mr Hitchcox indicated, in a fairly straightforward manner, but, to the extent that there are unresolved issues in Solvency II or IFRS, the material in this paper is relevant. The opener alluded to the question of whether, in Solvency II, the valuation should depend on the circumstances of the firm or just on the nature of the liabilities. Mr Hitchcox mentioned various different options for the cost of capital which are currently under consideration in Solvency II. So, this is a very timely reminder of the issues which are associated with the topic.

I felt that the discussion in the paper, aided by practical examples, helps us to address these questions. In particular, it covers the different perspectives of the shareholders' demands and the returns provided by, or required by, the insurance business.

Turning to some of the other points raised in the discussion, it did not surprise me that there was discussion on discounting, because I know that that tends to be quite a hot topic.

I am not going to attempt to adjudicate in the intellectually heavyweight debate between Mr Smith and Mr Ryan. My hope is that the interesting questions raised by Mr Ryan should get some response in due course.

Another topic mentioned was the disclosure by firms of the risks and uncertainties in their businesses, such as are required under IFRS. This is clearly an important area.

I found the section about confidence levels interesting against the background of the ICAS regime in the U.K. The different uses of VaR and TVaR were explained, and I found the analysis on the relative levels of capital required for different credit ratings illuminating. The use of VaR and TVaR, not surprisingly, is a topic on which there is hot debate. My take on this is that they both have their uses, as has been said, and I agree with Mr Shah that the point is to understand how each measure operates and what each is telling us about the business.

Another point relevant to this area is that there is a difference between confidence levels based on an analysis of company defaults in a given period and those derived from insurance company DFA models. In my view, we must be careful not to get too carried away with the apparent precision of mathematical modelling and risk losing touch with reality. An insurance company DFA model simulates scenarios using a very large number of very uncertain assumptions. Anyone who has been involved in such an exercise will know that the outcome, and indeed the ICA number, is very sensitive to small changes in some of the base levels of those assumptions. Views can change about those assumptions, and they have a very significant impact. An obvious recent example is the change in the perception of the U.S. wind risk, following Hurricane Katrina, for, particularly, catastrophe underwriters, and the various changes in catastrophe models which have taken place. It is also difficult to conduct reasonableness checks, or perhaps you could say reality checks, on the outcomes of models.

For a mere mortal, the practical difference between return periods of 200 or 1,000 years is quite difficult to grasp.

One characteristic of this paper which I particularly welcome is that it attempts to explain and to reconcile the actuarial and financial economic approaches to this subject. This, it seems to me, is a productive way of moving forward, rather than, perhaps, sitting in different camps and indulging in sniping. A current theme of the FSA in connection with ICAS is embedding the approach in the business, and the introduction of the 'use test' is going to focus the minds of management in the near future. Several speakers mentioned this 'embedding' issue, and how to drive through operational changes, and this whole area is very important. My understanding is that there is a view that, in too many instances, ICAS is regarded as a piece of compliance which can be delegated to the actuaries or to the statisticians to come up with a model before management gets involved in really meaningful discussions over the amount of actual capital. Despite this perception, it is a testament to the impact which the ICAS regime has had in the U.K., that such matters are at least now discussed at senior management and director level, and that we have all been obliged to grapple, over the last couple of years, with these difficult issues.

This leads me to my final point. My impression is that some companies are very familiar with the details of the ideas summarised in the paper, and use them in running their businesses, and I think that they are in the majority. The paper has been written primarily for an actuarial audience. If we are to take the discussion forward and engage with management and with the directors in understanding these issues in a Solvency II context or in another context, I would suggest that the next step is to consider how best to communicate the concepts covered in this paper to a somewhat wider audience.

Mr Hitchcox (replying): We wrote this paper with the intention of helping general insurance actuaries in the U.K. become better experts in capital modelling. We concentrated on two main themes:

- becoming an expert in rare events, and putting a price on them; and
- being an expert in blending insurance risk with the risk/reward ideas of our capital providers in the investment markets.

In Section 2 we discussed the setting of target capital for the firm. Some readers had said to me before this discussion: "Is not Section 2 rather long?". I do not think so. It is important to understand, as best you can, the impact of all the different measures of risk tolerance for rare events, and it is also important to understand that the capital ratio of your firm can affect its cost of capital and the valuation of future profits.

In Section 3 we made a big effort to help the reader understand the other differences between the risks which are related to the financial markets and the risks which are independent. The latter are the so-called diversifiable risks, and it is important for us, as actuarial experts, to be able to engage in conversation with the financial investors and to explain to them, not only the frictional costs attached to the so-called diversifiable risks, but also, as we have described earlier on in some of our conversations, the impact on the firm — the value of the firm arising from the fact that many of these insurance risks are very hard to predict and are not capable of being hedged in standard financial market terms.

In Section 4 we quoted from two very valuable studies of real stock market data: Swiss Re in their *sigma* publications; and by Cummins & Phillips (2005), as part of the Casualty Actuarial Society's risk premium project. We put in the paper a good summary of both of these papers. If anybody wants to become expert on those topics, I recommend that they go back to the originals, and refer to the references in the paper.

In Section 5 we included a lengthy worked example on how to turn our ideas on target capital and on cost of capital into a risk load for inclusion of premiums. Several readers have said to me, over the past week or so, that it is a long and difficult section. I totally agree with them. The first time when I read it I found it very tricky. Over the past few months I have read it quite a few times, partly from interest and partly as part of my proof reading duties. Each time I re-

read it I understand more and more of the ideas in it and the overlaps between them. So, I encourage readers to return to Section 5 several times.

We have been asked what areas of future work we have in mind. If we can find the time in our busy schedules, I know that, as a working party, we would like to tackle the topic of the insurance cycle. I am not sure what will come out of the work. We would also like to tackle the topic of capital allocation. It was in the paper when we started writing it, but, eventually, it became quite clear that we had run out of time to include it. We might try to tackle that in the future.

Mr Ryan mentioned several areas which we did not touch on in the paper, such as the debt equity gearing ratio. We were aware that that would impact on some of our graphs, but again, for reasons of simplicity, we focused on the equity cost of capital and left the debt equity side to other papers. We also did not go much into the topic of diversification credits, again because that led us too much on to the topic of capital allocation, and we did not have time to complete that this time.

Mr Ryan also mentioned that, when you look at the intense competition in the industry, and you are subject to the supply and demand balances there, often the question is not: "What capital should I set and what return should I set on it?", but you should turn it around and say: "How shall I optimise my earnings mix and capital structure?"

We totally agree with that, but one of the thoughts which we have in the back of our minds, which, perhaps, we did not state clearly, was that we were saying to ourselves: "Where is the walkaway price?" We were trying to get our handles around that sort of question. Again in one of my previous existences, I worked in a firm which, not only had general insurance, but had life insurance and a thriving asset management arm. Capital was short in the group, and that question was put to the managers of all the subsidiaries in the group on the P&C arm on a regular basis. If the insurance cycle turns down so much, there will come a level where we might not want to allocate capital to a business. We probably had that thought at the back of our minds, how to help a business manager know where he should start walking away from P&C business.

The Senior Vice-President (Mr M. R. Kipling, F.I.A.): I should like to express my thanks, and the thanks of us all, to the authors, to the opener and to the closer and to all who participated in the discussion.

WRITTEN CONTRIBUTION

The authors subsequently wrote: The authors disagree with Mr Ryan's comment at the meeting that including a higher discount rate for risk will bias a company towards long-tail business. Consider two separate situations: first, when discounting liabilities in order to value them at a point in time, any allowance for risk will reduce the discount rate (not increase it), and hence increase the cost of long-tail or riskier liabilities; second, when valuing a stream of future earnings, the allowance for risk will increase the discount rate, thus reducing the present value of earnings from a long-tail or riskier line of business. The paper described these two different usages of the term 'risk discount rate' in Section 3.8. The original text did not explain that the allowance for risk needs to be applied differently depending on the situation in which it is being used, and we have subsequently inserted an extra sentence at the beginning of ¶3.8.3 in order to clarify the matter.