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# Seeking Diversification through Efficient Portfolio Construction Using Cash-based and Derivative Instruments

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## Abstract of the Edinburgh Discussion

[The Institute and Faculty of Actuaries, 18 March 2013]

### Contact

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This abstract relates to the following paper: Jones, M. W. Seeking diversification through efficient portfolio construction using cash-based and derivative instruments. *British Actuarial Journal*, doi: 10.1017/S1357321713000366.

**Mr W. D. B. Anderson, F.I.A. (The Chairman):** We have a great event planned for you discussing “Seeking Diversification through Efficient Portfolio Construction Using Cash-Based and Derivative Instruments”. It is good to see here such a wide range of different disciplines in which people are working. The paper touches many different aspects of the actuarial world. It is also particularly good to see a paper in which an actuary is writing about why actuaries can add value – in this case, to investment management.

I should like to invite Malcolm Jones to present his paper. Mr Jones is an investment actuary and works with Standard Life Investments.

**Mr M. W. Jones, F.I.A.** introduced the paper. The full text of his introduction is given at the London discussion on 23 February 2013.

**Mr B. G. Moretta, F.F.A. (opening the discussion):** It seems customary when introducing a paper to say how timely it is. Last week the results of a European poll said that credit default swaps on emerging market debt were currently the most dangerous financial instrument, so discussing derivatives does indeed seem timely. Though, to me, the most impressive point is how they conducted a poll that found 2,000 people who know what a credit default swap is!

The core problem that the paper addresses is illustrated in figure 2 in the paper. In our pre-2007 world, diversification produced tangible benefits as equities and bonds, in particular, performed badly at different times. This view has changed dramatically, with the paper showing fairly convincingly that the problem may be even worse than many think with equities inherently being less diverse or providing less diversification than many might have originally thought.

Another issue that figure 2 highlights is that diversification tends to disappear when we most need it, leading to complacency in good times when diversification is working well, and panics in bad times when it is not.

This has led to a search for genuinely diversifying assets or strategies. The author, in essence, suggests derivatives as a possibility either by opening asset classes that were previously difficult to access, such as foreign currencies, or new strategies, such as volatility.

The case made is, to some extent, in principle rather than evidence-based, though most practitioners will instinctively understand from where the paper comes. It has been shown that several hedge fund strategies can be characterised as derivative strategies, showing that they can provide diversification in practice and not just in principle. I think most people in this room would accept that derivatives can bring benefits. We would ask the question: which strategies can bring benefits? I do not think that the paper addresses this properly. And what are the risks that they bring?

I look to highlight the latter point, and I suspect that it will feature strongly in the discussion.

The author outlines some different strategies that are available, but the examples are a little confusing with regards to separating asset classes and strategies. Is comparing a single exchange rate position with UK equities appropriate? The latter may not be as diversified as perhaps we thought, but is surely more diversified than a single instrument. I am sure with principal components it is possible to sort assets into comparable levels but, as presented, the choice appears somewhat arbitrary.

The potential issues are many, and some of them have been discussed here before, though the context of the paper may bring some slightly different perspectives. I am going to try to list a few, though I am aware that many of them overlap. I am sure that the discussion will bring out some of those points.

In paragraph 2.18 the author mentions that one of the frequent side effects of diversifying means that risky assets are reduced in favour of assets with lower risk, but lower return. This is a serious issue for many, psychologically. We have seen the reluctance of companies and trustees to cut return assumptions in pension funds. The alternative, which the author suggests, is to gear market exposure, something easily achieved with derivatives. This, of course, raises the risk profile again. In the presentation the 220% figure was highlighted. Trustees will be more comfortable with understanding a market exposure that is in excess of 100% rather than a theoretical risk figure, which is one step removed and, to the layman, more difficult to understand. It may make that trade-off for them harder to make.

In paragraph 3.14 the author highlights the divergent performance of synthetic and actual credit markets. This is a serious issue for investors. If you are investing in an instrument, you want to obtain the appropriate return. Part of this relates to the different costs involved in some derivative products; part is due to the effects of volatility on derivative pricing. This is an issue in the exchange-traded fund market, where the performance of many funds is diverging significantly over time from their target market and, I believe, is a future scandal for the financial services industry.

The measurement of risk perhaps raises the biggest issues, as it goes to the heart of whether diversification is successful. The author mentions the unreliability of risk measures generally, noting rightly that ex-post risk is almost always greater than ex-ante estimates, illustrating how limited our modelling can be. Ironically, the scenario where that is not true is when risk is falling and can lead to over-confidence in models. We have all had thoughts on that over the last few years.

In this paper the difficulties of estimating risk quantitatively are extended in two ways. Firstly, in the standard deviation example, the number of parameters required grows at a much faster rate than the number of asset classes (squared rather than linear). If we are concerned about accuracy of parameter estimates for our conventional asset classes, how much worse is this for a bigger list? Is there evidence of ex-post results being worse under such circumstances? Maybe someone from the floor can provide some insight.

Secondly, if the derivatives used have asymmetric payoffs then standard deviation is clearly a bad risk measure. A deep out-of-the-money option will have almost no correlation with the underlying asset value, while a deep in-the-money call will have a correlation of almost 1. A long-term investor may experience both scenarios within the term of the investment, making quantitative risk assessment challenging, to say the least. There are other measures, such as value-at-risk and conditional expected loss. However, the former is as flawed as standard deviation: neither is additive and accurate estimation of long-term tail risk is beset with the difficulties of which we are all aware.

The author is correct to say that scenario analysis can be helpful, but is inevitably limited.

Unfortunately, the interactions of asymmetric investments always seem to be capable of surprising us. This is even more so when we have new assets to assess, where the weight of investment in liquidity may mean they behave differently from in the past. I look to the floor for views on how we deal with these issues – how we help clients or employers to understand model weakness is not new and something, I suspect, with which most of us grapple at some point.

Appendix 2 addresses some of the specific risks of derivatives. The collateralisation system has reduced counterparty risks in many cases. But, unfortunately, it may not prevent an investor from losing diversification or hedging at the time it is needed most and is most expensive to restore.

There are also systemic issues, with which the profession may wish to grapple.

The growth of systematically important financial institutions (SIFIs) is intimately related to derivatives, as were some of the high profile failures in 2008 such as Bear Stearns and AIG. If you take the view, as I do, that the presence of SIFIs is undesirable then encouraging further growth in derivatives may have some adverse consequences. Do we need a strong Volcker-type rule to push all these activities into hedge funds, which can fail at little consequence to the financial system? Yet for long-term instruments with low liquidity we need substantial balance sheets to offer products of institutional size. The floor may have other views or ideas about how to mitigate the risk, but it seems a challenging topic.

I was appalled to read in Appendix 1 that derivatives traded on an exchange cost more than those traded over the counter. Surely that is some mistake in the regulatory regime? It may not be that simple – volumes in long-term instruments are low and most are constructed on demand. What should we do to fix that?

As my last issue, I would like to raise a philosophical point. When we invest in equities or bonds we know economically where our return is coming from – in the former, company profits, in the latter the default risk on a loan. We invest in real assets such as real estate or commodities for their ultimate economic use. That is not to say prices always match reality, but in the long run the returns will be there or thereabouts.

In the futures markets all products are matched – you cannot obtain a contract for delivery without someone agreeing to deliver it. Intuitively this is zero-sum in aggregate. The managed futures industry rationalises an excess return through some in the market being hedgers looking for financial security and are effectively willing to pay an insurance premium. This may be true in other derivative markets – an option premium, for example. Eventually these should come down to a real economic product – a farmer selling his crop or an airline buying oil. Where is the economic

endpoint for a long-term investment in volatility? It is esoteric, perhaps, but for those with non-expert trustees or boards to whom to explain themselves, it cuts to the heart of many uncertainties about derivatives.

Finally, I would like to congratulate the author on producing a paper that was interesting, thought-provoking and readable. I look forward to the discussion.

**Mr J. Hastings, F.F.A.:** The paper adds to what is a narrow area of actuarial research over the last decade. This is rather sad when you consider, in particular, how much work was conducted by the Actuarial Profession in the first instance, setting up the actuarial indices in use in the country. It appears that most of the recent research that has been conducted in this area has either been done by index providers or various types of research and academic institutions, rather than the Actuarial Profession itself.

There are three areas that I want to comment on tonight. The first is benchmark analysis. The second, which the opener has spoken about, concerns protocols for risk diversification. The third item relates to the use of derivatives.

I wonder how many members of the Actuarial Profession, when referring to the FTSE All-Share index, have ever looked at the constituents of the index, and examined how concentrated it is by size or by sector or what is missing from it.

One element of the paper, which I think is critically important, is the analysis of the FTSE 100 index in sections 2.12 to 2.16, showing the low effective number of stocks in the index, and how poorly diversified is that index. This is particularly important because so many investors in the UK maintain a significant home bias. Much of the risk in the index, which is idiosyncratic stock risk, is due to this concentration. A simple portfolio construction adjustment, such as a 1/N approach of equal weighting of the constituents, would produce a much better index, from a risk perspective.

The author mentioned this concept of using 1/N or “1/N scaled by risk” as an approach to asset class construction. For something which looks so simplistic, it is amazing how powerfully 1/N construction works as a risk mitigation tool.

In section 2.21 (figure 5) the author compares diversifying strategies. I am happy to accept that the strategy on the right-hand side offers better diversification than that on the left. But it should be clear that diversification is only part of the picture. As the opener remarked, it is not obvious what economic driver produces the returns of the strategy on the right-hand side, because they depend on “zero sum” manager skill: the returns rely on managers being able to predict price adjustments to drive the return in those cases. Such portfolios do not have a core economic driver: equity returns come from cash flow or earnings or dividends; corporate bond returns come from the interest rate earned for lending money over a period.

It seems to me that a major problem with diversification is an increasing reliance on manager skill to widen the range of diversifying assets.

When we look at diversification sources, there is a risk that we will aim to resolve recent failures when traditional portfolios proved inadequate. Will the solutions we derive from an increased level of diversification, which imports skill-based concepts, just produce solutions that would have worked last time, but might not work next time? That is a potential concern.

Historically, portfolio construction was based on equities, bonds and possibly property. In the United States, the traditional concept was “60:40”; a portfolio benchmarked around 60% equities and 40% bonds, which, over a 50-year period from 1950 to the end of the century, delivered well over 90% of the return of pure equities with substantially lower portfolio risk.

We could investigate what it was that worked so well over that period. A significant benefit came from rebalancing continuously back to that 60:40 portfolio. This forces you to sell the tops and buy the dips. The returns of a portfolio of that nature benefit significantly from the additive effect of portfolio re-balancing. You are not just benefiting from 60% of the equity return and 40% of the bond return. You will likely capture at least a further one per cent on top purely from the benefit of that automatic rebalancing.

One of the reasons that you are able to re-balance effectively with the 60:40 portfolio is that both the equities and bonds are highly liquid and there are low transaction costs in rebalancing. You also tend to be rebalancing against momentum, i.e. selling what others are looking to buy and buying what others are looking to sell, minimising market impact, so that also makes it quite cheap to rebalance.

The problem I find with greater diversification is that the market tends to diversify into the same thing. That is why you see the problem of rising correlations. In a sharp market setback, the correlations of risky assets go to one because everything is correlated to investor psychology which, when push comes to shove, is risk averse. It is essentially a behavioural problem with which you have to deal.

In this light, there was an interesting paper recently produced by James Montier of Grantham Mayo Van Otterloo & Co LLC (GMO) in which he states that if you can ever find a diversifying asset, the last thing you should do is tell anyone else about it.

Consider also Warren Buffett’s approach: why should you diversify? You find out what you really want to invest in, you make sure you understand it really well, and you stick to it. You should not dilute the approach, trying to find many things to diversify into just for the sake of diversification.

Coming back to the core problem, is the search for diversification just another step in answering yesterday’s problem?

I would like to say a couple of things briefly on derivatives. The first has already been mentioned by the opener, which is the need to remember that derivatives buy into something. Investors should ensure they understand the “something” they are buying into before they consider stepping into a derivative.

Secondly, it is part of the human condition to be risk-averse. In economic terms, and this may be a philosophical viewpoint on my part, this will lead to a position where investors are likely to overpay for protection strategies. So, that leads me to a principle that if you are a long-biased fund you are likely to do better by underwriting the risks of other investors, and taking the premium for doing so, than you are trying to lay off your own risk. Maybe that is a sort of diversification that would be ideal for many long-term investors.

**The Chairman:** I found this paper stimulating when I read it and I have a number of questions, which I should like to ask the author.

Something which has been intriguing me of late, having attended a risk conference in Amsterdam last week, was the amount of discussion about low interest rates and the problems that they were causing life insurance companies that had offered guaranteed investment products.

I wondered whether, for your kind of products, low interest rates caused a problem.

**Mr Jones:** Much has been said about the philosophy of what you are really buying into when you buy derivatives. What is the fundamental driver? Is there a systemic risk premium for those strategies and, dare I say, a dependence on fund managers' skill? Many people who give money to investment managers think that all the return they generate comes from investment skill. The fact that 95% of the return, historically, has been driven by the benchmark index of their respective investment is neither here nor there to them except, of course, when it goes down.

In terms of building a multi-asset portfolio, you are depending on manager skill to identify these effectively cyclical risk premia opportunities. That is why many people thought they were investing in their fund manager in the first place: to deliver a return.

In terms of fundamental drivers for any investment decision implemented with derivatives, again there is economic rationale, since it is the investment strategy that matters, with the derivatives just being implementation tools. I would argue that a cheaper euro had plenty of different drivers, political drivers more often than not. It can be fundamental; it can be technical. In terms of Mr Moretta's points about the divergence sometimes between, say, a hedging asset, such as a credit default swap, against a credit portfolio, then basis risk exists.

Mr Hastings raised a good point that, in accessing a derivative, you have to understand what you are doing. Again, the core focus is moving the discussion away from the derivative and onto the benefits of diversification for the strategy. The diversification may not be lasting, but, within market timeframes, two or three years. We are not talking about high-frequency turnover for these investment ideas.

The rebalancing process Mr Hastings talks about does work well. Ultimately for the clients, back to the core point, why give the manager more responsibility for providing the end result rather than depend on some sort of 60:40 benchmark that they have to try to outperform? We live in a world of daily mark-to-market where people increasingly, under defined contributions, have to be able to provide consistent levels of return. That is an investment problem.

What traditional strategies have shown is that, in the long term, they are great, but they are not going to solve people's problems. We have plenty of savings problems in this country.

**Mr E. G. Munro, F.I.A.:** I agree with quite a lot of what Mr Hastings said. One of the things he said was that an important source of diversification is selling positions to risk-averse investors. I also accept that when you move away from simply relying on things like equity risk premium or credit spreads to provide the return, you are going to have to depend on some skill and judgement in the investment process. Part of that can be deployed trying to identify investors who are not profit-maximising; in other words, investors who are going to pay too much for protection.

I will give you some examples. In the depths of the financial crisis, equity volatility became very expensive. That was because people who had previously written products like variable annuities had

to go into the market and buy volatility at enormous expense in order to stop themselves going bust. They were not looking at this as an unconstrained investment opportunity, or making an assessment as to whether they thought that the pricing of volatility was correct for the next two or three years. Equity volatility was at 50%, sometimes slightly higher than that on a two- to three-year basis. These were not investors taking a rational view saying equity market volatility over the next three years is actually going to be 50%. They were forced buyers and presented an opportunity to active managers.

The rationale from our perspective was that we could take advantage of that position. One of the things about selling volatility is that it is quite highly correlated with equity markets. If the equity market goes sideways, you will still make money from selling volatility, whereas you need the equity market to go up in order to make a profit if you are simply holding equities. This is an example where we were doing exactly what Mr Hastings suggested, taking advantage of non-profit maximising activity in the marketplace, buying something that has a more asymmetric payoff than the obvious purchase of cheap equities in mid-crisis.

The one point I would quibble with is that Warren Buffett's skill is so valuable compared to that of other people. In recent years you will find that there are other funds and other approaches that have delivered equally good returns with less volatility.

**Mr J. S. R. Ritchie, F.F.A.:** I have a question. In Appendix 2(c), the paper deals briefly with the management of counterparty risk. In terms of using derivatives, how has the degree of trust in counterparties changed since the failure of Lehman Brothers?

**Mr Jones:** What has happened since 2008 is legal paperwork. Whenever you trade a derivative over the counter (OTC) there is a whole range of paperwork that has to be done. It used to be hard before 2008 but it has become even more difficult and time-consuming ever since. You always have to deal with trust as an investment manager: dealing with an investment bank you do not. Lawyers' time has quadrupled since 2008.

If we are going to offer new mandates where we want to use many derivatives, it is an incredibly time-consuming and costly process for us and the client.

As for good things that are happening in the industry, one of the main initiatives, which is going to happen in the United States this year, is the centralised clearing of a number of major OTC contracts. You will have a system of clearing much more akin to futures clearing and the level of protection a clearing house can provide.

It is always a challenging field for us to be in, in terms of what we have done, or any investment manager will have done, since 2008. It has put even more checks on the choice of counterparties than it did prior to 2008.

**The Chairman:** Thank you very much, Mr Jones. I found that the paper challenged people like me in my job as a pensions consultant. It took me back to the beginning of my career when I was trying to get my head around the caps and peer group benchmarking. What you are proposing in this paper seems a world away from it. It gives rise to all sorts of questions about the groupthink of both investors and consultants. It also introduces interesting challenges about how to educate your trustees to think more widely about what they might be doing.

It would be great to have somebody from the pension fund consulting side talking about the challenges. There is much information here about different types of derivative contracts, which is easily available elsewhere but is usefully summarised here. It makes you wonder why we are writing it all down. Do we not use that in our day-to-day work, consulting with trustees?

Would anybody like to pick up the challenge?

What do you think the educational value is, and what should actuaries be doing about it?

**Mr Munro:** I look back to a deeply educational and instructive phase of my career in the early 2000s when I was managing benchmark-based capital portfolios, and I was responsible for the tactical asset allocation. I was going frequently into client interactions, where the conversation went along the lines of “I have added 100 basis points to the benchmark” but the client was still unhappy with the outcome, as the overall fund had fallen in value due to the equity dominance of the benchmark.

I think we need to be concerned that, as fund managers and actuaries, we may be conspiring to give an outcome that does not meet the customers’ needs. Our profession is often represented on both sides of the table: we might be providing a consultancy or governance role for the client, some of us might be trustees of pension funds, and some of us are fund managers. Could we be more influential in delivering a better outcome for our customers?

The learning for me was the need to engage much more directly with the customer around what level of risk they are happy to take, and the importance of determining the reference point against which risk should be measured, which frequently might be a measure of liabilities. Usually, if you go down that route, you are moving substantially away from simply having a portfolio that is in line with any industry benchmark. An industry benchmark does not usually move up and down in sympathy with pension fund liabilities.

**Professor A. J. G. Cairns, F.F.A.:** This is a question or comment that has been forming in my mind since the discussion in which Mr Hastings mentioned the idea about converging investor psychology. That is, you end up with everybody following a very similar investment strategy and, therefore, effectively pushing correlations up to one.

To some extent, I think that would really only happen in the very short term. Over periods of days, if everybody is following the same strategies, then everybody has to end up with the same market portfolio.

Ultimately, if you look over a longer-term horizon, the individual assets are not all perfectly correlated. Individual assets have their own idiosyncrasies, and so on, that will result in less than perfect correlation.

The question that is forming in my mind, in terms of the plots that are in this paper are, is: how much of these numerical results are dependent on the use of one particular, possibly relatively short-term, time horizon, which is, in some sense, the traditional way that asset managers have looked at these problems?

How does that contrast with the needs of, say, pension funds which might have short-term uncertain requirements for cash, and so on? Ultimately, they are long-term investors and therefore we should be doing separate calculations for those who definitely have short-term requirements.



To what extent would these figures change if the time horizon moved from weeks or months to years?

**Mr Munro:** In terms of time horizon and how it impacts on investor behaviour, recently I was listening to a lecture by Professor Jeremy Siegel of the Wharton School, who famously wrote a book “Stocks for the Long Run”. He was advising his audience to invest in the equity market, wait 30 years and collect the long-term rewards, which, in his view, was likely to be delivered by fund managers over short-term horizons.

I do not disagree with that. What I have a problem with is that I have never met an investor with a genuine 30-year time horizon. One of the difficulties is that investors may say they have a multi-year time horizon but they are then forced by accounting pressures, and so on, to take a much shorter-term view. The longest-term view I have seen anyone genuinely exhibit is perhaps two or three years. Perhaps the with-profits industry illustrates this point. This is an industry that thought it had a long-term horizon but then the pressures of collapsing equity markets and immediate solvency concerns meant that it did not have the capacity to run that strategy for the long term.

Therefore I would challenge whether these investors really are so long term? A supplementary challenge is that if they cannot afford to wait for these long-term returns to come through, what are they going to do instead?

**Mr Hastings:** I think one of the worrying things that Mr Jones said was that we live in a “mark-to-market” world. In the organisation for which I work, a reasonable amount of the business involves declining defined benefits schemes. But, a growing part of the business is built around defined contributions. Everyone here should worry about how they are going to communicate to defined contribution members, and educate them to understand they are not in a “mark-to-market world”, particularly when they are in their 30s and 40s, and maybe even in their 50s. If they are building up a pot of assets to fund retirement, they are going to be paying contributions for a long time. They cannot only consider the assets sunk in the ground. They have to think about the value of the contributions that they have not yet paid. When you are running risk metrics for these individuals, you need to take into account the diversification that comes from their future career earnings and their future contributions. Only by considering risk holistically are they likely to allocate the assets that will generate the sort of returns they will need to deliver decent pensions.

There is another aspect to diversification. In a typical long-term institutional portfolio, if you ignore the gilt element, at least 80% of the risk comes from secondary market exposure, whether this is equities, corporate bonds, property, etc.

I am not wholly convinced that, in the Western world, that is going to be appropriate going forward into the 21<sup>st</sup> century. Where will returns come from? It is all very well to look at the growing populations in the emerging market world, but the question I ask is: why should they want to share any of their economic growth, and the economic return that that delivers, with us? They have enough capital of their own. If I were in their position, would I not think that “Europe is a retirement community and it is not my problem?”

I think Western investors need to think how they are going to diversify away from taking rent from capital markets. They need to use some of their capital to build GDP in the Western world.

I think we need to consider how we are going to help address the discussion of risk within the wider defined contribution population, how to move it away from mark-to-market thinking, and how to help them to think about all the things in which they might be able to invest, including assets that build GNP. That could include quite a lot of infrastructure, agriculture, housing, timber, etc. – all real assets that are important for the world.

**Mr S. J. Makin, F.F.A.:** I want to pick up on the point on which Professor Cairns also picked up, and that is the remark we have heard a few times this evening about ‘all correlations going to one in extremes’. I have to confess my dislike for this phrase. It is a sound-bite, and the problem with sound-bites is that people use them far too readily.

We must be more precise in what we say. What we should be saying is that we have seen some bad historical scenarios where asset classes have behaved like this. These, we hope, are scenarios in the extremity of the tail, and it is meaningless to talk of correlations there: by definition correlation is a measure that applies across the whole distribution.

The motivation behind my point is to caution against these sorts of sound-bites leading to knee-jerk reactions which then lead to unnecessary and pro-cyclical changes in correlation assumptions. We should take a longer-term view in setting correlation assumptions, being very careful indeed to avoid pro-cyclicality.

**The Chairman:** That is a great note on which to end. I have been fascinated by the almost synonymous nature of what has been described here as systemic risk and pro-cyclicality.

May I ask one more question? From a societal perspective rather than from an investor perspective, is any of this helping us reduce pro-cyclicality and systemic risk for our society? That is a final philosophical question.

I will now ask Mr Jones to respond to some of the remarks.

**Mr Jones:** I have already covered some of the comments that were made earlier. Thank you for the richness of the questions this evening.

One thing I agree with Mr Hastings about is how narrow investment has become within the Actuarial Profession, during my 25 years in investment, and many of those as an actuary. Unless the word “liability” is mentioned, being an actuary has not mattered one iota. In a way, I find that a pity in terms of the skillset and taking a pragmatic approach to uncertainty. I think that diversification and the range of risk measures that we are now seeking across all aspects of business present the profession with a great opportunity should we wish to pursue it. We are a profession – I hate to say it – that has lost interest in investment.

Counterparty risk is a major issue. It is the subject of a paper in itself with the range of issues that it highlights and that need to be addressed. The appendices only cover some of the broader issues.

Mr Hastings said that we should forget about mark-to-market, as it does not really exist. I am afraid that it does. Locking people up in investments they cannot access when they most need money is truly scary. Liquidity is what we need to provide, giving people access to funds – funds which, for the most part, are insufficient to meet their retirement benefits.

I concur with Mr Hastings that the challenge is how we can build better lifestyle models than we currently have at the moment.

Mr Moretta commented on issues on parameterisation and on definitions. There were some excellent points that I need to go away and think about before I come back to him with a more thoughtful response.

I want to finish on two points. One is about the issue of groupthink. Groupthink does happen. People follow each other, and the nature of that reduces diversification opportunities.

Let us look at the position here, though, where you can build a portfolio and can choose strategies from all around the world: asset classes, currencies, interest rates, etc. How many people are going to copy your strategy? You are dealing with different market places with different traders and countless investor groups with different requirements. In currency markets most of the people participating are not profit-seekers. They are there to hedge risks.

There is fantastic inefficiency already. It could be decades, centuries, before it is taken up by all people investing in the same way.

My final point to reiterate is that there is a cost to derivatives. They provide a fantastic benefit in terms of diversification, but there is a cost in terms of infrastructure in that you have to put in place risk management systems. The idea that you might push them into hedge funds I find truly horrifying. It is a bit like saying “The Internet promotes terrorism, paedophilia, and so on. Let us ban it.” That is patently ridiculous because there are many benefits of the Internet. Likewise, derivative strategies, prudently used, provide many benefits.

Our measurement of diversification in a world where the investment manager, rather than some sort of proxy benchmark, is given responsibility to provide a return, provides an opportunity for the profession in terms of measuring the effectiveness of any investment strategy.

**Mr Munro:** Thank you, Mr Jones, for this paper and thanks to everybody who has contributed to the discussion.

As I said in response to some of the discussion, I regard myself as a fairly practical user of the theory discussed this evening. I welcome the fact that it provides some more academic backing for what I have known and have done in practice in my daily job; namely, to try to find diversification opportunities in the market place and build portfolios that have real diversification.

Essentially, I think this paper is attempting to itemise the factors within markets and those factors that exist in one asset class. When you look at a market like the corporate bond market, there is inherent diversification. You have an underlying interest rate structure, government bonds, and then you have a spread relative to that. The spread element is probably highly correlated to equities. Whenever equities do badly, it is usually in an environment in which people are reassessing the outlook for growth. The credit spread typically widens at the same time. In the current market parlance, that is seen as a “risk-on” position. It is going to be highly correlated with equities, whereas the interest rate element is likely to be “risk-off”. So when investors worry about growth, government bond yields typically fall, even as credit spreads widen and therefore within a corporate bond portfolio you have some inherent diversification. This inherent

diversification has probably seriously flattered the risk-adjusted return of this asset class on a backward-looking measure of risk.

Anyone looking at the corporate bond market would probably do well to split the return factors out and ask “Is that the right mixture of interest rate exposure and credit exposure?” When you buy in the corporate bond market, you have a particular amount of credit spread and seven years of duration, typically. Maybe that is the wrong number of years of interest rate duration. Maybe it is not the right amount of credit spread for the portfolio. What the derivatives market allows you to do at a portfolio level is set each of these factors to the level that you think is right for the client’s portfolio and for current market conditions.

Another example might be something like an emerging market bond market. In Mexico, for example, the interest rate structure behaves exactly like the developed markets, so if you expect that growth is going to be slow and interest rates are going to fall, and inflation is going to fall in Mexico, you would expect interest rates to come down. But the peso is going to do badly because of its “risk-on” nature.

The paper brought out helpfully the advantages of itemising your portfolios into the risk factors that each investment is made up of – perhaps a currency exposure, an interest rate sensitivity, a credit spread sensitivity – and how using derivatives may allow us to build appropriate portfolios with much greater precision.

I like the idea that we can now, through this paper, have some thought given to genuine measures of genuine diversification in a portfolio. I think that it is important to put return expectations to one side and look at diversification as a separate issue. If you do not have a 30-year time horizon, then you are going to have to depend to a greater extent on skill and judgement, because only if you have that type of time horizon do you have the luxury of sitting back and depending on these market betas coming through reasonably reliably.

If you have to build portfolios that suit the client’s time frame, then you will value some genuine measure of how much diversification is in those portfolios. This paper gave us some clues as to the approaches that we might want to take.

Some of the more philosophical points that were raised today dealt with the desirability of this type of investment versus, perhaps, other more worthy causes. I would love to see money going into building the infrastructure of our economy: into the road network, the rail network and agriculture. These are sensible investments. I would hope that they would find their way into portfolios. However, we have to face reality and, for all sorts of reasons, time frames have become shorter. We have moved to more mark-to-market assessments of solvency and even in the defined contribution environment, people expect to have daily priced funds and daily liquidity.

Maybe there is an education opportunity for us as a profession to say “Is that in your best interest? Would you not be better off allowing the fund manager responsible for building these portfolios to invest over longer time frames?” I think that that would probably lead to better capital allocation across the economy.

I hope that this is just the beginning of us trying to be more sophisticated in our approach to investment risk within portfolios. Some of the things I have picked up from non-actuarial risk

professionals in the industry, or “quants” as we call them, is that there are lessons to be learned from research in other fields. They are exploring ideas from epidemiology and ecology and applying them to markets. This is fascinating. One of the dangers we face is that we allow ourselves to imagine that we have to invent all the relevant science in our field. When you think about how diseases spread and how contagion arises, could models from epidemiology not be useful to predict the wider consequences of, say, the situation in Cyprus at the moment?

I should like to see ongoing innovation and research in this field coming from our profession. With that, I will close and thank Mr Jones and the working party for the work that has been done. I think a useful start has been made in this particular field. It has to be important to better understand portfolio diversification. Thank you very much for your participation.

**The Chairman:** Thank you very much. It is great to see that there is scope for further papers to rise to Mr Jones’s challenge to seek other actuaries to create more impetus behind what actuaries can add to the world of investment.

It just remains for me to thank Mr Jones, Mr Munro and Mr Moretta and all those who participated this evening.