RECORD OF SOCIETY OF ACTUARIES
1995 VOL. 21 NO. 2

SECURITIZATION OF INSURANCE LIABILITIES

Instructors: HANS BÜHLMANN*
SAMUEL H. COX
Recorder: SAMUEL H. COX

Securitization of insurance liabilities allows capital to enter insurance markets more efficiently by establishing insurance-based securities. The mortgage market has been securitized, and it may be possible to make a similar market for insurance liabilities. This should be of interest to actuaries working in reinsurance (the Chicago Board of Trade options are in direct competition with property and casualty reinsurers), investments, or financial management.

MR. SAMUEL H. COX: I'm from Georgia State University. This session is on securitization of insurance risk. Hans Bühlmann is the main instructor for this teaching session. Hans will give a presentation on some ideas about securitization of insurance risk. In the second period I'll give some specific examples from the Chicago Board of Trade's insurance futures and options. A third period will allow for discussion.

Hans is visiting us from the Federal Institute of Technology in Zurich, where he is a professor of mathematics. He is also former president of the Institute and former dean of faculty. He serves on the board of Swiss Re and is involved in a number of other activities in the actuarial profession in Europe. With that brief introduction, I'll turn it over to Professor Bühlmann.

MR. HANS BÜHLMANN: A symposium will be held next week at Georgia State University. It is about alternative risk transfers, alternative in the sense that, until now, risk transfers in insurance have typically been done through the channel of reinsurance. Alternative risk transfers are based on the idea that investors participate directly in the insurance risk in some form. That means insurance has added additional possibilities for reinsurance.

Typically this results in a capacity increase of reinsurance. For example, in the area of catastrophe reinsurance, people would like it for there to be more capacity.

If one speaks about alternative risk transfer, I would say that you can look at it from two different points of view—from the finance point of view and from the insurance point of view. Most authors of papers that you read and most symposium speakers will typically tell you a lot about that finance part. Typically people from finance tell you how they have constructed this product, how you can use them as an investor, and so on. I think they have been the initiators of this. I think a lot of this development to bring insurance and finance together has actually started on the finance side; we on the insurance side have been waking up somewhat late, but we are there now, too. I think there is also an insurance part of this.

---

*Professor Bühlmann, not a member of the sponsoring organizations, is on the faculty of the Swiss Federal Institute of Technology, Zürich, Switzerland.

Now let us look into what this is. The finance part would be how to construct such financial products, how to price such financial products, and how to use them as an investor. If you are an investor, how are you going to make use of them? The typical sales pitch that people in finance give to the investor is a category of investment that is not correlated to the stock market, so there is an additional source for diversification in the portfolio, which is a very strong point. I think for this reason many people who want to invest money will like to use this possibility.

There is also an insurance part. Put yourself now in the shoes of an insurance company or of top management of your insurance company. The insurance part says, "How are you as an insurer going to use these instruments for reinsurance?" because that's what they are supposed to do. How do you make use of them as reinsurance?

Every form of reinsurance and these instruments have a price. What is the price you can pay for these new instruments? What is the price you can afford? Typically, as an insurer you take in premiums. These premiums contain a certain amount of loading. Now you are willing to give away part of that loading for the additional security you gain. This is the same question that arises in reinsurance in general. How much of that loading should you, as an actuary, be prepared to turn over for these new instruments? Obviously, you should do the whole thing only if it increases your safety.

The symposium at Georgia State is supposed to bring together specialists of finance, and Professor Cox will later on talk about products that do exist on the Chicago Board of Trade. Quite a few people who have actually been involved in creating these products at the Chicago Board of Trade come down there, but we also have a very strong group of actuaries down there, and we want to get those two groups together. We want to approach the problem not just from the finance side, but from the insurance side as well. We hope that all of us will learn.

This is a very new field and if anybody tells you that he or she is a complete expert in the field, there is an element of exaggeration in that statement. I think the better description of this new field is that everybody is a learner. Some learn quickly and some learn slower. Some charge a higher fee for their learning process, and some professors, like me, charge a lower fee.

I have some remarks on the finance part. I'm going to give you the theory behind it. Again, the theory sometimes is presented in a very difficult way. It is the job of professors such as me to tell you the essentials, and things become simple because all good ideas can be communicated in a simple way. What is typically an insurance future that is "traded?" I and many of my colleagues have been asking them to give us the spot prices of the products they're trading for a long time. We never get the spot prices, so it's not clear whether the insurance future is actually being traded.

What is such a future contract? Some of you who may have had an education in finance will say this is a pedestrian course, but it's good to hear it again. A future contract is always based on an index. At any time, and you can think of this as the value of the index at time zero, a value of the index Φ_k at time 1, a value of the index at time k, and at time k minus 1, you can say how many units you take of that interest.

Futures Contract

Index: $\Phi_0, \Phi_1, \Phi_2, \ldots \Phi_k, \ldots$

You hold: C_{k-1} units of contract in $[k-1, k]$

You pay at time k: $C_{k-1}[\Phi_k - \Phi_{k-1}]$

Marking to Market

You pay if $\Phi_k - \Phi_{k-1} > 0$

You receive if $\Phi_k - \Phi_{k-1} < 0$

If at the beginning you hold C_{k-1} unit of the contract in the period $k-1$ up to k, then at the end of that period k you get a settlement. The people in finance call this marking to market. So you look at how many units you have. You look at the difference between Φ_k minus Φ_{k-1}. You pay if the difference is higher and you receive if the difference is lower. This is from the viewpoint of the investor. That's how it would work.

How do we go about constructing such an index? The whole theory that we need is how to find such an index. The basic idea is to apply what the people in finance call the fundamental theorem of asset pricing, which means, for actuaries, that if there are no arbitrage possibilities—and that's what you usually like to avoid—then you can calculate prices as expected values. This is what actuaries use. Of course, you have to take the expected values with respect to the right probability distribution. I'm not going into that, but the basic idea is that you can calculate prices as expected values.

As these people in finance typically use a modified measure, what an actuary would call a loading is actually contained in there. All prices can be calculated as an expectation, but with what I would say an artificially distorted probability. This is what people in finance very often would call the Martingale measure or the risk neutral measure. The main thing is you can do this expertly.

I denote by E^* this expectation taken with respect to this artificial distribution that has these funny names such as risk neutral distribution or Martingale distribution. Whereas if I would take the two underlying probability distribution that say how that index is moving, I would arrive at expectation and E without the star, and I would call that the physical measure. Apply this to such a futures contract. What is the price at time $k-1$? Well, if two parties enter into this and one party has to pay if the index is increasing and the other receives and vice versa, the fair price for such an agreement must be zero. Otherwise, you would have to pay a premium for one party to enter into the contract. So just apply that expected value at time $k-1$. Mathematicians like to write that as a conditional expectation, given all the information up until time $k-1$. So, the expected value (given the information up until time $k-1$ of this settlement, number of units, difference of price, discounted back to the beginning) should be zero.

Apply to Futures Contract

Fair Price at time $k-1$: Zero

$$E^*[D_{k-1} - C_{k-1}[\Phi_k - \Phi_{k-1}] \mid \Phi_{k-1}] = 0$$

$$\updownarrow$$

$$E^*[\Phi_k - \Phi_{k-1}] \mid \Phi_{k-1}] = 0$$

Corollary:
Fair Futures Contract iff

index: $\Phi_0, \Phi_1, \ldots \Phi_k, \ldots$ Martingale with respect to E^*

Now, this discount factor typically is something that I know at the beginning of the period, so you can take the discount factor out of that expected value. The relation becomes the expected value of these differences of the index at any time, given all information I know up to that time, and should be zero but, expected values are calculated with respect to this star measure. So any index that satisfies this relation is a reasonable index on which you can build such a future. This is the general theory of building a future that was not developed in insurance. It was developed on the commodities market, typical for such things as oil or corn. The idea is always the same; that's how it is.

Those who were trained in mathematical probability probably remember that a sequence of random variables is such that at any time point the next one conditional expectation, given everything known at $k-1$, is exactly the value at $k-1$; so this is exactly this information. It says this sequence of numbers $\Phi_0, \Phi_1, \ldots \Phi_k$ has to be a Martingale with respect to this star measure. So things have become even simpler. A future can be constructed from an index. You just need such a sequence of random variables $\Phi_0, \Phi_1, \ldots$ and all you have to make sure is that sequence of random variables is a Martingale. Then you can construct the future. So this is the basic principle of how to construct futures. In this principle, you want to construct these futures for insurance.

What is the idea? What are these people trying to take for such an index? Well, the idea is simple. If you have an insurance portfolio, think of the ultimate losses. Somewhere very far away in the future you will have ultimate losses. Call that random variable X—the ultimate losses—and then just take the expected value of these ultimate losses, given all the information you have at time k, do that operation again with respect to this distorted probability measure, and then you have such a Martingale.

Maybe you also remember that from probability courses. A successive sequence of conditional expectations in which your information increases more and more is always a Martingale. So this is a very natural way to construct such an index. This is the idea of the insurance future. Take X as the ultimate losses, take the expected value of that with respect to the information of today, and you have such an index.

Of course, in reality this is not so easy to make. Here they jump from the idea back to reality. They would say what an insurer has on its books as incurred can be considered

such an estimate. This is now where you jump from a theoretical world into a practical world. They constantly make an evaluation of what their ultimate is going to be, so the incurred the insurer puts in the books is exactly such an index. Then they say, I take, for practical purposes, the incurred that such an insurer has on its books.

You see, of course, what the problem is with this instrument: the insurer typically has problems of over- and underreserving. The whole thing presupposes that we have kind of a god-like insurer who does the reserving absolutely properly and always has the right incurred on its books. So if we have the perfect insurer that may have a reasonable way of doing it, but in reality these things suffer from over- and underreserving, how are we going to deal with this?

As one does not want to wait until the whole X appears, the other practical rule that the people typically insist on is that at a certain point you cut the tail. That means you go on what insurers would call a claims-made basis from some point on. Again, there is some arbitrariness in this element, so therefore we again must say that maybe this is an approximation to our ideal world, but in practice there may be some problems with that.

I personally feel—and I have made this remark before—that there is an enormous problem with transparency. If this market should work, all elements in that market should be transparent to all the players in the market. Realizing how much difficulty we had to get the information, I think it's even more difficult for an investor who would want to go into this market. I think the construction of these instruments as they are now being traded on the market lacks above all transportation. If you talk to the people, they typically would tell you they know this is big trouble.

Maybe one should say about this part of my presentation that these insurance futures are a good idea and should be pursued. But as far as I'm concerned, the products I have seen so far have not yet found a way to realize this good idea in a way such that one can say, "Hurrah, now we have a product that we could use to increase the safety of the insurance industry."

Maybe we are going to see some miracles happening down at Georgia State. Maybe some of the people who come in from the practical side will tell us, "Oh no. We know these problems that you are talking about, but we have been working on them and we now have a better solution." This would be great, of course, and we hope that something such as this will happen. So this was the finance side.

What about the insurance side? Well, the insurance side has probably not been addressed to the same extent, and I think it is up to us actuaries to address that insurance part. Think of your portfolio that you have as an insurer S. You can, of course, make operations on that total portfolio through classical reinsurance. You can buy quota share. You can buy surplus, stop-loss, excessive loss. All these operations that you do are basically nothing else than trying to modify this random variable S at a certain price.

What are you doing now when you try to protect S by a futures contract? Think of another portfolio that is not yours. Typically, for these contracts it is the portfolio of the whole market in which you are operating. S and T are two random variables in the same market.

How can you use T to improve on S? The idea is, of course, very simple. You use S. People in finance would say to use T to cross-hedge against S. By taking a portion of the random variable T you can reduce the variance in your random variable S.

Why can you do that? Well, typically in a catastrophic portfolio, if my portfolio is going to suffer from a catastrophe, the portfolios of my competitors in the same area are suffering from the same catastrophe. So the random fluctuations due to the occurrence of the catastrophe are not only seen in my portfolio, but they are also being seen in the portfolio of all insurers acting in this area. The whole idea is to cross-hedge S with T.

I think that's maybe as much as I want to say for the moment. Now, you could also say, "Well, this is not so interesting for us because we are life insurers. What Bühlmann is telling us regarding catastrophic cover is more interesting for casualty actuaries than it is for life actuaries." Of course, these ideas of using financial contracts to securitize insurance products have very wide application in life insurance as well.

What is the most dangerous element in the portfolio of a life insurance company? Well, all practical actuaries know that it is not mortality. It is interest rate. What happens if your interest rate is jumping up by half a percent or is going down by half a percent? It has so much more of an influence on the profitability of this portfolio than when the mortality is moving. So why not try to combine such insurance covers as they are sold on the life side with some form of securitization of the index for the interest? That would give you a product in which you are kind of securitized against interest sensitivity.

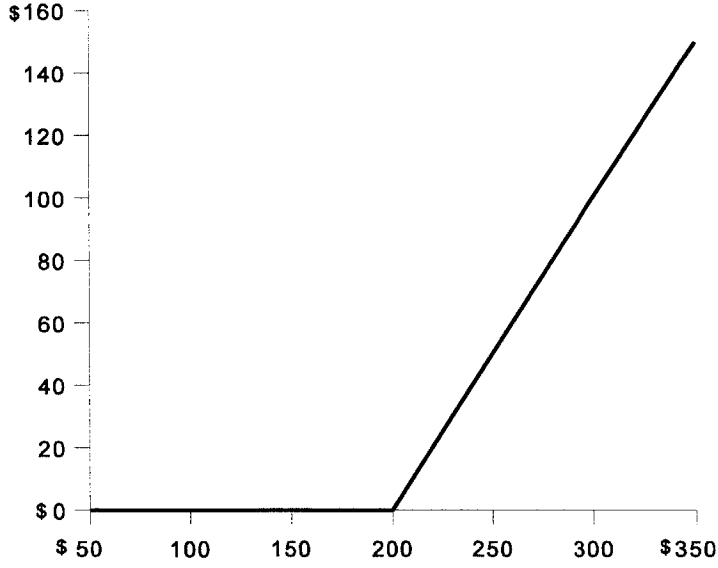
MR. COX: In general we use tools for managing risk that have something in common in finance. The portfolio managers in finance use the law of large numbers in the same way that insurers manage a portfolio of liabilities.

If the risks are correlated, as they often are in finance, then some other technique is necessary to manage risk. Options and reinsurance are both examples that have been developed in finance and insurance as alternatives or complements to the Law of Large Numbers. The analogy in these hedging tools—reinsurance versus call options—is that an insurance contract usually requires an insurable interest. Its purpose is to indemnify a loss, whereas the person who purchases a call option may or may not be seeking indemnification for a loss. There is no necessity that an option owner be hedging a position; whereas an insurance contract usually requires that the person who initiates the contract must have an insurable interest in it.

Although there is no insurance interest, options have some other things in common with reinsurance. They both require a premium for shifting the risk. Insurance generally is customized, whereas call options, exchange-traded options, are not customized at all. It is possible to get customized options from a dealer, but the kinds of options that you see listed in newspapers are exchange traded and not customized. So there are some differences. We have to be careful when using or when drawing over tools from finance to manage insurance risk. We have to be careful and look at the different environments in which they exist.

The payoffs of the contracts, say stop loss reinsurance versus a call option, are identical. So that's appealing in that there will be at least some common area in the mathematical development, because the payoff structure of the contracts involved are identical. The stop-loss contract is $200 in Chart 1. That would indemnify the owner of the contract for losses in excess of $200. If it's a call option, then the option conveyed the right to buy the underlying index or security, whatever it is, conveys the right to buy that at the price of $200 even if its market price is in excess of $200. If the price is $250 and you have the right to buy at $200, then you can convert that into a gain of $50 by buying under the terms of the call option or contract and selling in the spot market. So the payoffs are the same, although the way that we execute them is different.

CHART 1
INSURANCE VERSUS OPTIONS
CALL OPTION, STOP-LOSS PAYMENT



The index underlying the Chicago Board of Trade contracts that Hans referred to is a loss ratio formed by taking incurred losses. Well, it's almost incurred losses. It's paid losses plus case reserves. The earned premium is fixed so that the only variable is in the numerator. The earned premium is estimated at the beginning of the contract period and announced to the market; it will not change.

The bids on the index are in terms of the loss ratio times $25,000, with the loss ratio rounded to a percentage; so a minimum movement in the loss ratio is $250. This is the futures price and what they call the catastrophic loss contract. It's worth noting, though, that it's not just catastrophic losses. There's no attempt to distinguish ordinary losses from catastrophic losses. The loss is from property losses under a given set of contracts. No attempt is made to decide which losses are catastrophic and which are not.

At one time several other contracts were proposed by the Board of Trade. You might remember seeing in the insurance press in 1989 and 1990 that the Board of Trade was going to launch four such contracts. One of them was health insurance. It was the only one that is actually trading this catastrophic loss contract. There are also options written on the index. So if you wrote a call option on the index, then you would be essentially selling a stop-loss contract through the Board of Trade.

It would have a payoff like a stop-loss contract. Maybe it would serve for one if the owner's portfolio of losses was the same as the portfolio of losses underlying the index. Of course, the losses are not the same because the index is industry losses, and an individual company would be some subset of that. If you had some idea of how your losses were correlated with the industry, then you could use this as an imperfect hedge, or what they call in finance a cross-hedge in which you're using a surrogate for your own portfolio.

This is what the Board of Trade is hoping one would use as a substitute for reinsurance. Why is it doing this? Well, it is in the business of creating contracts for some customers who want to hedge their risk and for customers who want to use their resources to allow others to hedge risk, speculate, or to be investors. Its motivation is, of course, that it makes money by allowing people to trade. It hopes that people will use these as a reinsurance risk management tool and, in a way, it is trying to get into the reinsurance business.

It hasn't been as successful as it had hoped, obviously. Its announcement four years ago was that it would have four different lines of business such as this. As it is now, there's one, and it's not traded very heavily. There are some problems with it and I think Hans alluded to some of the reasons why it's not traded very heavily. One is that there are some difficulties in pricing what the options on the contract ought to be. How does one relate the loss forecasts or loss data to market prices?

Well, in finance there's a mechanism for doing this. This is already worked out in the case in which you can observe both markets. Let's think of stock options. We can see the stock market and we can trade in it. There's also a market for the options in which the option prices are set by trading. Well, because we can see both of them and we can trade both of them, we can price options by using no arbitrage model. That is, we can say that with a certain portfolio of stocks and a portfolio of bonds we can duplicate a call option contract on a stock. We can price the bonds and we can price the stock, so by the no-arbitrage condition, the price of the option must have the same value. That may be one of the greatest advances in financial economics. The Black/Scholes model is a result of that sort of argument.

One way traders use it is to look at prices in the options market and infer what the market distribution of stock prices is. That is, it's implied. Actually, in this model there's only one parameter, so they don't refer to it as a distribution. They just refer to it as the implied volatility of the distribution. Implied volatility can be calculated by looking at observed prices. That means they back out what the distribution of the underlying asset is by looking at prices in the options market.

For insurance pricing, if you're going to price options on insurance products that the Board of Trade is offering us, there's no such widely accepted model. The main reason that the

Black/Scholes technology would not easily carry over is that no one trades the portfolio of losses. Well, maybe some people do, but it's not widely available to us to set up the hedge to duplicate the product in order to use the no-arbitrage argument. We would need to have access. A reinsurer could have such access. Maybe a reinsurer would be able to pull off an arbitrage such as that, but it certainly doesn't fit the conditions that are used in finance to derive the Black/Scholes model. There won't be, at least anytime soon, a Black/Scholes-type model for pricing these options.

For more information about the Chicago Board of Trade products, you can write or call the Board of Trade. It has a very well-written, informative brochure that describes very thoroughly the catastrophic insurance contracts.

There are some possibilities for other types of securitization other than the Board of Trade products. I'm thinking of things that are more analogous to the types of securities that are more customized or have grown out of customized types of arrangements. For example, banks, as a service to their customers, developed interest rate swaps and currency swaps. Now there's a market for such swaps. It could be that reinsurers become more like dealers of risk and have more customers than just insurance companies but also offer products to noninsurance customers.

For example, we know that some noninsurance customers put their capital at risk—say through Lloyd's of London—and they do it for compensation. Of course, it's unlimited liability—they're putting their personal wealth at stake when they accept premiums—but you could see a reinsurer perhaps develop a contract that's short term in nature and that has maybe just a layer of that loss ratio for a customer who is willing to put some capital at risk. Reinsurers could develop that market in the same way that banks have developed the swap market, and they could offer bid-and-ask spreads. That is, they will either buy or sell the security. You could become a reinsurer and get into the reinsurance market as an individual just by putting some capital at risk and they'd give you a premium. When you wanted to get out of the contract, you could just pay someone else from your premium to take your contract or go back to the reinsurer with it.

The Board of Trade products are exchange-traded and not customized. That's one of the drawbacks to them. Another drawback is that the regulatory officials don't yet know how to react to a company that takes a hedge with the Chicago Board of Trade. How can they use that hedge as reinsurance in their financial statements?

That wouldn't be a problem because these insurance companies would be buying reinsurance from a licensed reinsurer. The reinsurer would have to develop more expertise and it would need a securities license. All of that would be out of the hands of the regulatory authorities on the insurance side.

We had some students on campus from Munich. Munich Reinsurance has a program at Georgia State for some of its employees. One of its students is an actuary from Germany and in a seminar on this topic told me that his company would sell Chicago-Board-of-Trade-type reinsurance to a company. If a company wants that hedge, and it buys it through a reinsurance company, then the reinsurer, Munich Reinsurance, can hedge it through the Board of Trade.

Well, that concludes my remarks. Maybe we can turn it over to discussion now. Are there some questions for Hans? If some of you had some experience in this area that you would like to share, we'd be happy to hear it.

FROM THE FLOOR: Perhaps you could just explain the Chicago Board of Trade contract and how that future amount gets adjusted each year. I think some of the problems relate to participants in that process and the credibility that that index has with the general public.

MR. COX: The Board of Trade contracts are short-term contracts. They're written on a quarter of losses. For example, the first quarter of the year is called a March contract. The numerator will be losses that are incurred in that quarter and reported before the end of the next quarter. So they must be reported to one of the participating companies by the end of June. It must be reported as being incurred in the first three months and it must be reported by the end of June. Another three months are allowed for the data to be processed. The contract is actually settled in early October.

At this point, there are no long-term contracts. All the losses that are involved, as I say, are property, and so they usually, you would expect, would have been settled. Many of them would be reported and there's no tail problem. It would be much more difficult to design exchange-traded contracts for longer lines of insurance.

FROM THE FLOOR: I have a question. You mentioned that the expectation of Φ_k is Φ_{k-1}. Aren't you expecting the index to be stationary then?

MR. BÜHLMANN: No, it was $\Phi_k - \Phi_{k-1}$. That slash was a conditional expectation, given the information at Φ_{k-1}. That was supposed to be an *a*.

FROM THE FLOOR: So it wasn't division?

MR. BÜHLMANN: That's an increasing sequence of sigma algebra, so the one below that was an *a*. I didn't want to go into the mathematics of that.

FROM THE FLOOR: I thought it was a Φ_{k-1}.

MR. BÜHLMANN: It is a_{k-1} so it's just saying the Φ_k is a Martingale. If you have a Martingale with respect to this modified measure, then you can always do an index and a future. The theory of how to build a future is extremely simple. The practice is very complicated. The theory is to take any Martingale with respect to that measure and always do a future on that. But how to then get this Martingale into a practical realization is complicated, unless you have a market that gives you spot prices every day. In insurance, this is not there.

MR. COX: Yes. That's what I was saying about the breakdown of the analogy between Black/Scholes-type pricing of financial products and pricing these insurance products.

FROM THE FLOOR: Again, regarding pricing, if you're going to ultimately have a coherent theory, somehow the insurance pricing issue must be consistent or compatible with the finance pricing issue. I think the fundamental theorem of asset pricing gives you

that for traded securities. Now, that suggests—and I know people are doing some work on this—that rather than pricing and using what we might call old-fashioned pricing principles, the right pricing principle is one in which you change the measure of the insurance. You take the loss distribution—you have your best model for the loss distribution—and then change that distribution in some way and come up with a new distribution that would be the equivalent Martingale measure in the context of asset pricing and then use expected value. However, it's not clear at all what that transformation should be; how you get from the original measure to the new measure in the insurance context when you don't have trading.

MR. BÜHLMANN: Well, the best answer I have to that question is that you cannot argue in the same way that you can in the Black/Scholes case—just by looking for the equivalent Martingale measure—because you will have a situation in which people in finance would say that it is not a complete market. For actuaries, one way of doing that transformation is to go back to the theorem of Karl Borch regarding risk exchanges. In that theorem of Borch, you have kind of a common LaGrange factor that appears there. This common LaGrange factor actually can be related to this function by which you do the change of measure.

Following up the idea, I once wrote an economic premium principle on these ideas. So you can do it on the basis of this, but this, again, presupposes that you know the utility functions of all the players. The other approach to this, which might be closer to the way we have been thinking in insurance, is to make an economic model of the players on the insurance side, get some idea of their utility functions, and then try to get this change of measure based on the utility function.

I had an opportunity when I was out in California to have a one-day discussion with Darrell Duffy, who is one of my great champions. I think he's a great man. He personally also believes very strongly that in this type of market one should go much more into utility function modeling and general equilibrium. That might be the good approach.

FROM THE FLOOR: I have a question. Do you think the price would be ideal for risk portfolios, such as having two risks? The price for these two risks together would be the sum of two individual risks.

MR. BÜHLMANN: If you make the assumption that this is going to be a traded product, then you must have additivity. If you think these things will be a traded product, then you always insist implicitly on additivity. Traders otherwise split the whole thing in half and you have arbitrage. Having a traded product typically implies additivity. Now, of course, many of our insurance products typically are not traded products. But I think the approach taken in securitization is to bring more of the insurance products into a tradeable form, and then I think we must go for additivity.

MR. COX: In that diagram I gave you, on the one side it would have to be additive; but an insurer selling to customers might not have to be additive. A dealer selling to customers would have to be additive.

FROM THE FLOOR: It strikes me that the reason that you don't have pricing for the insurance liability is because there is no market. So when you can generate a market and active trading, you'll have pricing. Additionally, I don't have any experience with this type of securitization, but I do with real estate. One of the things that was a big boon for that was the collateralized mortgage obligation (CMO)-type structures in which you could take a particular type of risk and tranche it out and sell it to different parties. I'm wondering if that type of thing is being contemplated.

MR. COX: Maybe somebody in the audience knows about that. I have thought about it, and I have mentioned it to a few actuaries who work for reinsurers.

MR. ARNOLD A. DICKE: I wonder if you have given any thought to the kinds of securitizations in which a couple of attempts were made to do it in the life insurance area a few years back. These came under a couple of different forms, but basically the earliest one, if I remember right, was one in which one company said it was selling off the loadings on a variable life series. Of course, when the loadings would occur and whether they would come in was not certain.

Consequently, it wasn't just like selling off a stream of income. It was selling an uncertain stream of income. Then later on somebody went further and sold. One way they talked about it was that they securitized the deferred acquisition cost (DAC). Of course, in GAAP accounting that amounted to, in a certain sense, the value of the contract. If you were doing value-added accounting, you might make the DAC be the value added at the time of sale. In a sense, people were receiving cash for the value of a life insurance contract when it was sold.

It just struck me. Have you looked at those kinds of things? Because I had the same thoughts as this other gentleman just before me—that the possibility that you could tranche one of those things might get you the kind of market you're looking for. By the way, those things all failed because the statutory regulators didn't allow them to create surplus. However, it struck me that there was no reason why that had to destroy the market if there had been risk transfer aspects to it. Did you look into those at all?

MR. COX: Well, I've looked at it in sort of a "what if" sort of way. I've thought about it, but I haven't written anything up. I think you could probably do that. So this would be an example of securitization in the life insurance area, but I haven't heard of anybody actually doing it.

MR. DICKE: There were a couple of contexts.

MR. COX: I knew about the securitization of loadings and premiums and securitization of premium loans. Those are both securitizations of assets.

MR. DICKE: Well, one of them actually involved, I believe, the entire book profit stream from the contract, so I think it involved the insurance risk as well. I've kind of forgotten it. I haven't looked at it in years.

MR. COX: Well, they both have life contingent risk, so the premium loans are basically paid at death, so that's a portfolio of death benefits and those were securitized successfully.

MR. DICKE: Right.

MR. COX: There has been some activity in that area, but I haven't looked at it any further than just to note it. Maybe someone else here has some experience or some ideas along those lines. I'd love to hear about it.

MR. DICKE: I'll throw a different pitch in your direction, if you like. Another place where the lack of a market has come up and has affected practical kind of work—when I say work I don't mean mathematical-type work, but the kind of work I do on a day-to-day business—is in the area of financial reporting, particularly in GAAP reporting in the U.S. We have this odd situation in that the FASB decided to mark some assets but no liabilities to market. That, of course, struck most theoretically minded people as a rather odd situation, so many groups try to talk about what might be done on the liability side. Of course, the lack of the market affects things there, too.

Interestingly, some of the models that have come up have had things happen such as the need to have the liability sometimes act like a financial liability. At other times it seems sort of reminiscent of what Harry was talking about—moving some of the earnings into loadings on the mortality and other risks that were priced into the liability. Have you done any thinking about how all this you're talking about might connect to financial reporting? Might we get a more logical system if this market developed?

MR. COX: I've thought about it, but I don't know. Those are issues that we'll have to deal with. I haven't done anything on them. They're certainly related, as you say.

MR. DICKE: Let me put it another way then. In other areas, and I think I heard you say that in some places in Europe there are some markets of this sort operating. Is there a more logical financial reporting? That goes without saying. Is the financial reporting there logical? Does this help it at all?

MR. BÜHLMANN: At the CAS meeting in St. Louis, we were going into that. First, there are not strict rules in European countries. An accounting profession does not tell you that you must do things in a certain way. I think that there are more possibilities to come up with a solution and then explain why you think it is a reasonable solution. Then you may agree that's the way it is going to be done. Although because of the European Community, there are now pressures coming on us similar to those in the U.S.

The idea that I proposed in St. Louis was how to develop an actuarial growth rate of assets, which could actually be a very good application of our actuarial techniques that we have developed. You could then kind of use that actuarial growth rate in this country only if you needed to make projections, but maybe in another culture you could even use them for making up your balance sheet. In any case, my point is that good financial accounting is not doing financial accounting on each individual item. You should do it on the whole portfolio. That makes sense to anybody who has the vaguest idea about such things as probability.