Session 96PD
A Brave New World: Pension Funding Methods—Testing, Testing (Does This Thing Work?)

Track: Retirement Systems Practice Area

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Summary: In Session 86PD, "A Brave New World: Pension Funding Methods," a number of proposals and ideas were discussed with regard to pension funding practice and its objectives. This session now re-examines these proposals in order to understand what might be produced in the real world. Also, theoretical funding issues that were presented during the financial economics webcasts will now be quantitatively investigated.

MR. KEVIN SHAND: Welcome everybody to the fourth and final session of the "Brave New World" seminar. I am the moderator, and I will be presenting at this session. Ken Buffin was the moderator for the prior session, and in his introduction he used my name and the words "genius" and "brains" in the same sentence. I will take credit where credit is certainly deserved, but the idea of the brave new world was Emily Kessler's brainchild. Emily has worked diligently on putting the seminar together, from helping with the recruiters to finding the speakers to the logistics of the rooms. She has done everything. I would like to show my appreciation for Emily.

In the session before this we were alluding to getting a chance to think outside of the box, like dropping the rules. If you could blow up the pension world and start all over again, what are the kinds of things that you would like to do? In the last session, we just heard a discussion on that. In this session, we will be doing the same thing, but we will also be looking at some of the problems or some of the situations that currently exist, and how those are being dealt with in light of issues that we have with funding. You will hear a little bit about some new ideas. You will also hear some innovative ideas and some practical applications on how to deal with some of this today. I will start off with my session, since I am standing up here.

I am a professor at the University of Manitoba. I just happened to notice a couple of my former students that are in here. If during my presentation you hear some bloodcurdling screams, it is because they are having bad flashbacks, I think. Anyway, today I am going to talk about margins. I have this pet peeve about margins and how they are used in actual practice and how I think that there might be an alternative approach to being conservative and not necessarily using the approach that we have right now.

When it comes to a pension plan, there are lots of stakeholders that are involved. I think the two major parties that we should consider are the plan members, whose objective is benefit security, and the plan sponsors, whose objective is contribution stability and minimization of costs. As I said, I am going to talk about the benefit security issue. Essentially, do we always have enough assets to be able to cover our liabilities? In terms of how I define liabilities, I will look at it on an accrual basis using a unit credit or an accumulated benefit obligation (ABO) approach and on a projected basis as well. I am not advocating which of these is the proper way to measure the liabilities; I will just entertain both of these. Again, the question is that we want, obviously in this case, a funded status, where I think it should be at 100 percent or higher.

Actual standards of practice—and this is global; I am not just restricting this to the United States—make these references to provisions for adverse deviation. In other words, the key word here is adverse. We will worry about what happens if actual experiences are worse than what you had assumed. To make those kinds of provisions, you are setting up the contingency reserve. You will either do it implicitly, which is what happens when you use margins, or alternatively, do it explicitly. This is the more popular approach. You are setting up a side fund to take into account any of the deviations that you have.

I am going to talk about the traditional approach in terms of the interest rate margin, which is where the largest risk is. I will say my valuation interest rate is going to be equal to my expected rate of return in this case. For the financial economics (FE) people who want to use a bond rate, this will fit in here as well too. I will show you a variety of scenarios to take a look at a couple of possibilities.

Your interest rate will be your expected rate of return dropped down by a margin. I guess one of the problems that I have with this margin is sometimes I think that delta is used arbitrarily. I have a fund here that I think is going to earn 8 percent; I have to put a little cushion in here, so I am going to knock it down to 7 percent. Why do you pick that 1 percent? Do you actually know what the implications are in terms of how much you will load up your normal cost as a result of assuming 1 percent? This is sort of what I am trying to get at. I am trying to quantify what the actual effect here is going to be.

If you want to implicitly build up this slush fund, which is actually what we are doing, do you take that valuation rate and use it on the normal cost and on the accrued liability? The answer to that is, if we do it implicitly, then you are going to end up showing a plan where their assets are going to be equal to the liability. If that plan experiences, say, that 1 percent shortfall, it still appears to be fully funded. That does not sound right to me.

The other option is that you want to use the margin to explicitly build up this slush fund, and then what you should be doing is just using the normal cost. Use the valuation rate on the normal cost. Use your expected rate of return on the accrued liability, and formally build up what you will have as a surplus, which is going to be used for recognizing this.

I guess what we are trying to do here, in terms of, say, cash flows, is look at what the long-term cash flows are and what an appropriate long-term interest rate is. I know that there will be deviations from it. Whether that 1 percent deviation, is going to happen over the long term is a whole different story. I have to try to think about what am I using. What am I padding this with? Why am I doing this? I am looking at a situation in which I think over the long run I might have this gap, but in the short run I have to fix it every time I am wrong. The thought of using that interest rate on the accrued liability for me just does not seem to make sense.

There is a little math here. If you have a normal cost and you are loading it up, then you are taking what the normal cost is at your valuation rate, and you are comparing against the expected return. In that case what ends up happening is that you have this loading factor, which we can reduce down to a fairly simple formula (Shand Slide 5). This is looking at the normal cost done using an accrual cost basis. You notice that if we looked at this with a different perspective, we would just say, "Look at the accumulated value of all the loading." I mean that loading that you figured out on day 1, which is going to have to accumulate for each member until he retires, needs to be equal to the accumulated value of what your expected losses are, which is what the delta would have been. You will find that you get the same formula. This happens only in the case of the unit credit or any accrual cost method that you use. I wanted to try to find a loading approach that did not differentiate my cost method. I thought that if you could attack it from this perspective, the reason it ends up equaling the accrual method is because of the nature of the formulas that are used in accrual cost methods.

Let us say I was using a bond rate, 4 percent perhaps, and I looked at the different types of margins that I am using. I used 1 percent, 0.5 percent and 0.25 percent, and just take a look at what kind of loads that we are looking at here. They obviously range quite differently. Your bigger margins are obviously going to have larger loads. At 4 percent, 8 percent and 12 percent (Shand Slide 2, page 7), you will notice that it does not change a heck of a lot.

Now you take a look at the loading factors that would be based on a 30-year-old, a 40-year-old and a 50-year-old. There is very little difference, for example, for a 30-year-old, whether I am using a 4 percent interest rate, an 8 percent interest rate or a 12 percent interest rate. It still is loading somewhere between 31 and 34 percent, which is not a big difference. That seems kind of odd.

The loading is not varying much with what your expected rate of return is. Again, I would have thought that the riskier that my portfolio is, I would have to embrace more loading on it. That is not what happens with this technique. Something else kind of interesting that ends up coming out of this is this. If you take a look at the 30-year-old at the 1-percent margin, the 0.5-percent margin and the 0.25-percent margin, the numbers are cutting down by half. In other words, whatever my loading is depends on what my margin is. If I decide to cut that margin in half, I will have to cut the load in half. I almost get the same thing. This is not a coincidence, actually. If you go back to that original formula, you can actually play around with it and expand it out, and you will find there is a linear adjustment going on. That sort of stood out for me. I thought that was kind of interesting, so I wanted to take a closer look at it.

The problem is that when you use that margin and you use the accrual approach, you are making the assumption that you are going to lose 1 percent on your investments, and this is going to accumulate over time until retirement. You have to remember you just discounted from retirement to current age, or what you have

discounted is this loss that will accumulate. What you end up having under this approach is that you set the margin and you said, "Now you have to wait all the way until retirement." Then you have this huge gap for which your margin and your loading will have accumulated with interest as well and will cover it at that point. However, we know that when you have investment losses, you do not deal with accumulated value of the investment losses until someone retires. You deal with it right now. At the end of the year you have the loss, you make your correction for it.

What ends up happening in this case is that the loading is always going to be greater than what your expected loss is on an annual basis. You will have too much money to start out with. The load is too high (Shand Slide 2, page 10). Let us take an alternative look at this, then. If I set my loading such that, again, the accumulated value of the loading is equal to the accumulated value of the annual investment losses—in other words, I am not looking at a total lump-sum investment loss at 65, but rather I am looking at an expected loss that is going to happen every year—then I can calculate what my loading factor is. In this case, the loading factor ends up producing a value that is going to be less than what we are doing under the traditional approach (Shand Slide 1, page 11). Again, you are loading up on an individual basis and you are setting a target. I am loading up on an individual basis, but I am looking at the annual target to see how I can take care of that. I call this alternative the normal cost loading, compared to what the original approach or the traditional approach is. What you see now is loading, which differentiates by the risk in the portfolio now. Instead of 34 percent, or an average of 32 percent, which is what you see when we use the 1 percent margin for a 30-year-old, as the risk in the portfolio gets high you can see where the loading is occurring.

The half rule still applies as well, too, in case you did not notice that. In this case, it now varies with the interest rate. The risky investments are going to start to see more loading. The loading is less than the traditional approach, and of course, that means translating into less cost, less banking up with that slush fund that is

involved here.

I took a look at this and said, "If I use the old approach and I set what my margin is, what kind of margin is that actually translating into?" For example, with my 30-year-old, if I am using a 1 percent margin on a fund where I expect the 4 percent return, then I really should only be loading up. It translates into a margin of 1.72 for the 30-year-old, so it is a bit higher. You might be surprised by what the implications are of you thinking about the effect of 1 percent margin and what it is actually doing.

Then I took a look at a reverse situation. I said, "Okay, if I were to use the alternative approach and I just assumed I would use a 1 percent margin again for this example, what does it actually translate into in terms of current practice?" My 1 percent margin, if we use the alternative approach, only produces 0.6 percent for a margin. You are not achieving what you want to do.

In terms of the expected return, whether I want to evaluate that set of bond rates, which is what FE has been advocating, or whether I will use this on an expected return basis, it does not have an effect on a traditional approach. It does not actually have an effect on the alternative approach either. The point is that you are looking at an investment at time zero. However you measure that lump sum at time zero is irrelevant. Whether you are using an FE approach, or whether you are going to use an expected return approach is not going to have an effect on what you do with the margin.

The problem is, of course, that I just showed you is the traditional approach that is applied to each individual. When you just use this 1 percent and apply it to each person, as I said before, you are trying to build up a lump sum at retirement that will cover the aggregate value of all losses. We do not load for the individual. We should be loading for the plan. In this case, where we have a target for an individual, which is at age retirement, when you take a look at the plan and you

load up the normal cost overall, what is your target date? How far does that loading or that lump sum have to take you into the future for the plan? If you are thinking about a plan on a going-concern basis, there is no ending date for that plan.

The challenge here is that if you are going to try to calculate what a good load is on an aggregate, or plan, basis, you have to be able to figure out how far you take the floating before you expect it to be exhausted.

This is a plan that I use in quite a bit of the work that I do. It has 40 members, one member at each age from 20 to 59 years, and I assume retirement at age 60. In this case, I will assume that the plan is fully funded at time zero, so when I go forward, the only thing I am worrying about is what the effect is on the investment loss on that normal cost that has been invested.

Let us take a look now at what happens on the individual basis, which is the alternative approach, and then at what happens when I start looking at it on an aggregate basis. I took two types of plans, one a flat benefit plan with no indexing involved in it, and then I went to the other extreme and did a final average salary, final year plan, to take a look at what the effect was here. The first thing that came up out of this was that the loading that we use here again reflects what the portfolio is. Again, the riskier portfolios are the ones that are going to need to have a larger loading on it.

What also came out of here, though, was that the loading depended on the cost method. I wondered: why is it that the projected unit credit should be riskier than the unit credit, when in fact, you are taking into account the salary increases, where you would not do so on an ABO basis? The other thing that came out of here is why the loading depended on the plan design. Especially, why should the flat benefit approach be riskier than the final average salary plan on unit credit basis? It did not make sense to me. Using the same approach produced one desirable effect, but then it gave me two that I thought did not seem right.

I went back and said, if I am going to load for this, I am going to go back to the same approach that I had done on an individual basis, but apply it to the plan. Now I have a loading factor in place, and it will have to take care of my expected annual loss for so many years. Again, the question came back to how many years should I be doing this for.

I ended up getting that loading factor, so I should be loading this normal cost for I believe until the next valuation, whether it is one year down the road or three or five years down the road. Again, you are trying to set certain realistic target dates. I think probably, as actuaries, we are better at forecasting what the expected rate of return might be over a one-year period than we are over a 40-year period when dealing with a 20-year-old. I thought that this was probably the approach to go with.

In that case, then, the loading factor becomes a fairly simplified formula. When I take a look at it, I find that if I am going to use this approach, and I want to say for example, I have a fund where I expect a 4 percent return and I decide I am going to use a 1 percent margin on it, I only have to load up the normal cost 1 percent. That is not very high.

In fact, what ends up happening is that I use lower margins, and lower margins again translate into lower loading. Higher expected rates of return also translate into the lower loading here. In my mind, I think that it is probably better to deal with the problem on a year-by-year basis as opposed to committing yourself to something that is so far out given that you are forced to make these short-term corrections anyway.

It seems that with the exercise of projecting really far out when I am going to have to fix this problem with every valuation, this might be a better approach. This was sort of a pet peeve of mine that I thought I would see if I could find something that

might work a little bit better. Here are the advantages to this. The commitment time for loading is less. It is one year or one valuation period. The commitment amount is less, which would make your plan sponsors happy. It is more consistent with amortization policy. Especially when we have been talking about FRS 17 and immediate recognition of experience, this tends to be a little bit more consistent, I think, with that approach as well. With anything that you get, as long as you start producing a contribution that is closer to best estimates, you are not going to obviously ever match what you have in a pension expense basis. You might get something that starts coming a little bit closer should things start working out. If I could be king for a day, and I could change how I do margins, this is what my approach would be.

MR. DAN CASSIDY: You just heard from Kevin, and Kevin is a strange combination of an academic and a practitioner, but he was getting into the theory pretty good there. I am a practitioner. I own a small consulting firm. I see Anna Rappaport here; I use to work with her at Mercer at the Boston office, and I worked at the Towers Perrin Boston office. Clearly, I am a practitioner of actuarial services, retirement plan consulting services focused on mid-market clients. Over the last couple of years I have been very engaged with Jeremy Gold trying to understand and apply FE with real retirement plans for real clients of mine.

I have written actually two articles that are in the handouts. I get very confused when people talk about the perfect storm, and I will talk a little bit about that, how I might think it is more of an earthquake. I will chat a little bit about how plan sponsors, my clients, have responded to this over the years. I'll talk about some current risks, and then talk about two clients that I am currently helping with dealing with FE. I am uncertain about how it will come out, but we are starting a conversation that has FE impact.

First let us look at the perfect storm versus the earthquake. I grew up sailing as a kid, and so whenever somebody says a "storm" to me, that implied, batten down

the hatches, ride it out, and it will all be safe again after the storm is over. I do not think that is really the scenario that we are in here. I see it more as an earthquake where the ground has shifted. Our clients have moved to defined contribution (DC) plans. The economic outlook that we are facing over the near to mid-term future is not the same as it was before the storm started. There are regulatory changes, the accounting changes people are talking about. Finally, there is even loss of trust. I would say that really has changed the agreement that we have between employers and plan sponsors. Those are really my arguments why we cannot deal with this as we would just a storm and ride it out. I think we have to deal with it in a different way.

I have a quick plan sponsor response to this, the "perfect storm" in a sense or the "earthquake." This is just from my clients' perspective. Your clients may have done other things, but basically the first year of the economic downturn they reduced head count; they did early retirement windows and traditional things like that. The second year they cut discretionary items. I had several clients cut their employer match. In the third year they went to cut their fixed costs and froze their defined benefit (DB) plan. I had several clients freeze DB plans. In addition to this, with this talk about offshore employment, our clients are changing their employment mix and their employees and who they hire and what type of people they hire here in the United States.

There are asset allocation changes, you know, questioning their commitments to equities. That is where the issues of FE that I am trying to struggle with are. This is when my clients are saying, "You know Dan, do you think we should be more into bonds?" How do I respond to that in a more informed manner?

The risks that I see that everybody else here would see clearly include inflation. Where do we see inflation going in the future? For turnover, I put down a kind of worst-case scenario. Clients that have frozen their DB plans clearly have made a grandfather group of typically older, longer-service, higher-paid people and frozen

their benefits. They added a DC program, perhaps improved their DC program, and so in a worst-case scenario, if inflation goes up, you will pay more in your DC plan. Depending on how your investments return on your DB plans, you could have some significant variations in your contribution to your DB plan. In a sense you froze this plan to save money, but in fact it actually may cost you more money in the future. I will show you a case study, and that is potentially what my client is looking toward.

Regulation is another risk here. The Pension Benefit Guaranty Corporation (PBGC) future premium increases. I am not sure if that will be on the horizon and where those premium increases would come from or where they would be. How high would they be? How would they be applied? I think that clearly is a risk that our clients need to know about, be informed about and think about. With accounting, again the FASB is moving toward a mark-to-market approach. I know chief financial officers (CFOs) have heard this. It is in the press enough. They are thinking about it and realize that it is a risk that they need to deal with now.

I have two case studies to talk about. One is a classic frozen plan situation. In here they have clearly made a commitment to an entire DC program. I will bring up some different issues there. The second one is a legacy DB plan. In here maybe this is more of a function of my clients, but I do have a lot of clients that are in the mid-market that have grown by acquisition, and they have acquired a company with a DB program. Then three-quarters of the company has DC programs, so the CFO is trying to operate his business, and he has to keep being concerned about this DB plan for only a quarter of his population. I will chat with you about that.

I have been very successful getting the CFO to entertain the discussion of immunization and partial termination of the plan, directly after talking to him about FE and the ideas behind it. Who knows if it will happen?

Here is some quick background for a case study. This client had a DB plan; it was a

very inexpensive DB plan that replaces about 25 percent of pay after 30 years of service. We also had a DC program with 100 percent match up to 4 percent of pay. In the DB contribution history, it is basically fully funded: zero. Then in one year for the contribution, the minimum went up to 7 percent and the maximum I guess went up to about 30 percent of pay. I am not sure what my staff told me it was, but it was a large number, the maximum. In one year the minimum went from zero to 7 percent of pay. They talked to their corporate parent, and the corporate parent said, "Freeze it. We're done." This is surprising given the fact that they have had 3 years of zero, then that one little blip up, and they immediately said shut it down. That is the environment that my clients are in. I am not sure if that is similar to yours.

In its place they put a simple plan in after a design process where they just said simply, "We will match employee contributions to about 8 percent of pay." Questions come right off the top. When do you terminate this plan? How would you like to allocate assets in the interim period? As a minor note, what is the impact on executives? As an aside, this client is examining having a DC restoration plan put into place for executives, because of the impact of moving from this DB program to a DC program. I guess that is not surprising when you think of who designs these things ultimately. This is a nonqualified DC restoration program.

This is a stochastic forecast. We are a client of Mark Ruloff's fine firm, and this is a ProVAL software forecast, for a little commercial advertisement there. Jeremy and I have talked about the validity of these types of forecasts. This is your classic mean variance on the assets, and this is projecting their contribution of the frozen plan with an asset allocation of 60 percent equity and 40 percent fixed income, which they currently maintain. Where they come together is basically the median. Ultimately they are not going to save much money, even though they froze the plan, because they even had some losses in the year they froze the program. Ultimately it shows over time that the minimum will go down, but there still are some significant variations in the minimum contribution due to this program.

What if they wanted to terminate this thing? This is showing funded status on a conservative basis. We projected assuming the plan termination basis stayed the same, and I think we assumed about a 5 percent interest rate for a termination liability. There are two funding policies. Basically if they paid the minimum, that is the A bar. What if they paid the IRS maximum tax-deductible contribution? That is a different funding policy, the B bar. It is surprising to us, surprising to me, how long a plan like this is going to be around if they just follow a simple funding policy, especially a minimum contribution policy while it is in this frozen plan status. It was very surprising to me. Also, related to that was a surprise on paying the maximum tax-deductible contribution.

This was to the point where yesterday when I was doing the final preparations of this, I had my staff call Winklevoss to check about the maximum tax calculation. We were satisfied with what it was doing over the projection period, but I was very surprised that even paying the maximum, it takes 10 plus years basically to get to even an expected, median value of being able to terminate this plan.

FROM THE FLOOR: When you say maximum, you are not talking about the unfunded current liability. You are talking about 10-year amortization.

MR. CASSIDY: Yes, 10-year amortization. It includes a little bit of that, but there is a little disconnect, because as you know, the current liability is not what you can terminate these plans at. With a conservative plan termination assumption, the plan would still be even underfunded at that point.

I have another projection just showing different asset allocations. We have the current asset allocation. What if they went to a fixed-income portfolio and decided to immunize the portfolio in a sense by duration matching? The bars are clearly a lot tighter. There is a lot less variation and not much downside, or less downside risk in a sense, but it still takes quite a while to get to that point of being able to

terminate this program.

I struggle a lot with showing graphs of these types to our plan sponsors and having them make a full commitment to the idea of immunizing this portfolio. If they want to act like an insurance company for a while, maybe it is just better to terminate this thing, put all the money in right now and be done with it. Why have this plan sit around and your management having to be concerned about it, talking about it all the time? You might as well just get out of it. This client is not anywhere near that point yet. They are talking about it and we are thinking about it.

Case study number two is a kind of legacy program with a DB plan that covers it. It is actually 15 percent of the active work force. All the other employees of this control group are in a profit-sharing plan. The plan is evenly mixed between actives and retirees. This client actually was very well-funded, even through the decline, and has a funded status of 130 percent on a current liability basis. I was the actuary. I was hired right at the peak of the market. They had some assets at the point they hired me; the assets had declined by 40 percent, and they are blaming me 100 percent for that decline. I can remember to this day, I did a forecast for them at our first meeting showing funded status and all of this nice stochastic projection. The fifth percentile case simulation is actually basically what happened to them. I remind them that I told them the first time, it was a 5 percent probability, but we did hit that. That is the way life is.

The other thing you should know is that this is a small public company, and they are very concerned about the swings in the pension income and expense. Those have been very significant, as you can imagine, over the last several years. This is a client where I am having a little more traction talking about some FE topics with them, and thinking about immunizing by reducing the variability of this pension expense and perhaps immunizing by terminating some of the plan, mostly because they are very sensitive to the earnings. The CFO has to explain on his quarterly calls, why are his earnings up? The analysts I believe have asked him about the

pension plan earnings, how it swung from pension income to pension expense. He has had to spend some time on that, and he does not want to spend any more time on that. He calls me the week before the quarterly analyst calls and asks what is the forecast for the pension expense in the next quarter. He wants to know if it has changed from what I told him 3 months ago. It is that big of an item for him.

I have another forecast. The idea here is to show you some pension cost under two different scenarios A and B. Under A, the plan is normal, and under B, you settle the retirees and terminate vested participants. I will talk about service cost later. I think ultimately, that will be how I get him to buy into this. Scenario A says, here are some swings of your pension cost over the next 10 years, and it gets pretty substantial as you go out over time. Scenario B says you pony up some money. This is all in the plan. It is a very well-funded plan. The idea is reduce your funded status in your plan, buy annuities and pay for 50 percent of your liability. Settle it out. That is going to hurt your funded status, and your pension expense goes up basically. However, the variability also shrinks because it is just a smaller pool, a smaller liability.

He has indicated some appetite for this, especially thinking ahead just in the two years to 2006, to the idea that he might be able to shrink it down so that the bar is about two-thirds the size. That has some appeal to him, even though he knows it will hurt his funded status. The way I think I will get him to think about it and maybe go a step further and say, "Maybe I should invest in bonds for the entire pension portfolio" is really the service cost. The idea is that if he is talking to analysts, he can say, "Our pension expense is about our service cost, and our service cost is a measure of cost of these benefits this year. That is what is there. We immunized the assets and our earnings should be more stable in the future. So bid up our price in that sense." Maybe that is a simplistic view, but I think that may be ultimately the final nail in the coffin to getting this client to perhaps think about it and really execute it.

MR. MARK RULOFF: I was a last-minute addition to this panel, so I apologize for some of what I will have to talk about later. I am not a practicing actuary as Dan is; at least for the last four years I have worked for a software firm, so I do not sign off on any schedule Bs. I will pretend that I am a practicing actuary. I will pretend that I am operating in a brand new world, and we can make up my own rules as I go. I hope you will bear with me.

Anyway, I plan to talk about first just the standard valuation technique. Then I will introduce the concept that we will not have stable returns, that we will actually have volatile returns, and I will try to amortize that away. Then I will do a forecasting for the future, first on a deterministic basis and then on a stochastic basis, then look at what I consider to be long-term problems that I will run into. What those long-term problems will be is what I define as the probability of ruin. You might remember that concept from your actuarial examinations.

Here is my standard approach. Say I have this client come to me, and he happens to have all 25-year-old employees, and basically they will all retire together at age 65, or they might quit earlier. He wants to have level funding over a career. Now I realize that might not be in agreement with FE, but that is what he wants. He also insists that the plan cost less than 10 percent of pay.

I appreciate the fact that Dan had a client where the contributions jumped up and the client said to terminate the plan and get out of here. That is how I imagine my case too. The client said very strongly that if the contributions go up to 10 percent of pay, he will terminate the plan and fire me. Again, I am not a practicing actuary, but how many people have clients like that? Their contributions go up to a certain level and that is it. I am surprised it is only a few of you.

Anyway, I plan to apply entry-age normal-level funding. I will have a 60/40 mix. I happen to have something like a 10 percent return expectation on equities. My return on my 60/40 mix is going to get me 8.25 percent. I then calculate the

normal cost of 2.65 for my plan, and I will not go into the specifics of my plan. After writing papers on these issues and talking about it, I have come to the conclusion that I will not convince any of you of anything. The best I can hope for is that I get you to think that you should research this more on your own, and you can discover things for yourselves. That is what my goal is for today. Anyway, I calculate the normal cost to be 2.65 percent, and I think that is well enough below 10 percent that I will be all right.

Based on my cost method I will fund over future service to age 65 when all these people are going to disappear. I do see some volatility in my contribution level. In any case it stays below 3 percent of pay. I do note that it is getting worse in the future. I also want to consider stochastic forecasting. I actually can have years where the return goes negative. Next, let me do a stochastic forecast based on this. I do have actual expected returns a little bit above 8.25 percent, so on the median basis, I actually see the contribution level coming down.

Anyway, in my stochastic forecast in Ruloff Slide 5, I am starting in the year 2004. I will go 10 years into the future. I am showing how viable the contributions are as a percentage of pay. The dark blue area covers 50 percent of my results. The shaded area and dark area combined are 90 percent, and then the white/shaded and dark all together are 100 percent of my results. I realize that there is a chance they will be outside of that, but this is what my trials have produced.

Now I do see a lot more volatility on this basis. It has gone above 3 percent of pay, and it continues to get worse and worse as time passes. Let me go and do a 40-year forecast to where this plan is supposed to wrap up, and I will actually pay everybody a lump sum at age 65. I do that, and I see there is actually a potential that my contributions will be above 200 percent of pay. I do not need to look that high. I know he will fire me if they go above 10 percent of pay. As for the other thing, let me think about this first. The contributions keep getting more and more volatile in the future. I thought the longer my time horizon, the risk was supposed

to decrease. I look at my compound nominal returns. I see a lot of volatility in the first year, and it reduces in the future. My risk seems to be getting smaller with the passing of time, in that I could have a 10 percent loss the first year, and then after I get 7 percent return year after year after year. On average I get close to 7 percent returns. What does that mean to my contributions? I get a 10 percent loss the first year, I have to amortize that loss compared to my 8.25 percent assumption. I get a 7 percent return the next year; I have another loss that I have to amortize on top of it. I get another loss the next year, another loss the next year, and my contribution just keeps getting bigger and bigger. On a contribution basis, my risk is not getting smaller with the passage of time; it is growing.

Now let me look just up to 10 percent of pay levels (Ruloff Slide 8), because I know at that point I will be fired anyway. Basically my 95th percentile level is where the shaded area and white meet. That is my 95th percentile level, and 95 percent of my results in any year will be below that. I might say, "Well, there is only a 5 percent chance I will get fired." Then I have to realize that is not one particular trial following that line. My individual trials are very volatile. I have some trials that are above 10 percent in a particular year, other trials that are above 10 percent in a different year. It is not only 5 percent. I look at the individual trials and I notice that out of my 1,000 trials, 473 go above 10 percent. I have a 47 percent chance of being fired by this client. You might say the odds were with me. On another basis I might say, "Well, I can make it 10 years." I have to ask myself if this is a good plan. My answer is "Duh. No!"

I now want to come up with a plan in which my client will keep his DB plan and will not fire me. I run into this concept called target cost. It happened to be developed by my boss, Howard Winklevoss. I will tell you that nobody in the world uses it, so it was a great idea that I have now latched onto it. The idea is that if you look at the stochastic forecast, you can figure out the contribution level that you have to at least start out with or pay level over the forecast such that you have 50 percent success, 75 percent success or 100 percent success.

Focus your attention first at the risk-free rate normal cost. I have also learned from listening to Jeremy that maybe I should go to an immunized bond portfolio. I can go out to the market, get the rates and calculate my liabilities based on that. I can immunize it, and calculate my cost based on that. I figure out that their normal cost on that basis is 5.42 percent. That would be a great solution. If I could put in 5.42 percent, I am well below the 10, and if I can immunize it throughout the forecast, I am in great shape and it should not go very far from 5.42. However, I recognize that I am not that skilled, or I cannot actually perhaps immunize a liability payment or a benefit payment that is due in 40 years. My client might not have access bonds that will exactly match his portfolio. Maybe the best I can do is just consider going to bonds. That is an option.

I also mentioned target costs already. If I look at the target cost and figure, if I want to have 100 percent success looking at my stochastic forecast, what would I have to contribute to the plan on a level basis with my 60/40 mix? It is 13.38 percent of pay, already above my 10 percent number, so I have a problem. I consider going to all bonds. If I go to all bonds, even though I am not matching up to the liabilities, I can build a forecast with my all-bond portfolio. Quite by luck, my number did come out to be under 10 percent of pay. I can start out at least putting in 9.69 percent of pay, and virtually guarantee that I will not move up from that level.

Now as I said, my boss developed this normal cost idea, but he does not do coding. He talked the coders into calculating the normal cost, but unfortunately my software does not actually allow me to implement that idea. It just calculates the number. The best I can do is change my interest rate assumption in my forecast. Let me take a very conservative low interest rate such that my contribution starts out at 9.69 percent. I will go to the all-bond portfolio, but I do not actually calculate the normal cost every year after that right now. I just come up with the idea in the first year. I put in employees, but then I let it run out and do not adjust it every

year. Just doing that, I have reduced the probability that I will go above that 10 percent level from 47 percent down to 16 percent. If I actually do calculate the normal cost every year after year after year—which I can do, I just cannot forecast it—I would actually virtually guarantee that I would not have any failures. I meet my client's calls and on top of that I manage to keep my job and keep my clients having a DB plan.

What actually happens with the contributions, though, is I start off at this very high contribution level, and as good experience materializes, I can reduce the contribution as it materializes. It starts off high and it comes down under most of my scenarios. There are some cases where I will need to keep it still at 9.69 percent.

Before I go on, let me say how this relates back to the prior sessions. The first testing I did was similar to the current rules ignoring current liability issues and full-funding limit issues. That is what we are permitted to do. If I actually want to implement this approach here, I am not sure I can. What I would have to do is basically make sure that this level is above my maximum tax-deductible contribution. Therefore, the first thing I will want to test when some new rules come out is to see if I can take this approach.

How do I deal with these high contributions if I go to an all-bond mix? This has been talked about throughout the day, that you need to talk to your clients and let them realize that even though they have higher contributions, you have been taking the risk out of the pension plan. One of the ways to potentially deal with that is to gear the company back up by having them issue bonds and buy back company stock, or I guess take one more risk inside the company. In many respects, that is a vote of confidence in your core business. It shows that they are willing to take the risk in their core business as opposed to invest it in some other companies inside their pension plan. On top of it, there are tax advantages to this. As we have been saying all day, if you consider the tax advantages, they would definitely recommend

an all-bond approach.

Another thing I do for testing is I look back in history. This material is included in an article in the September/October issue of *Contingencies*. I had a plan sponsor say to me that if it took itself back in time 10 years ago, to 1994, and set out its pension plan, set in a certain type of investment approach asset allocation, and then had gone to sleep and awakened 10 years later, how did its investments do? The answer would be its investments did great. They actually outperformed what you expected to happen. Then the sponsor must be in great shape. It would say, "No, actually we are in terrible shape and we are experiencing the perfect storm." How do you reconcile those two things?

I went back to 1994 and, if I put in the 60/40 mix, what was my return on my portfolio during that time? It actually ended up being 9.62 percent. We could have done a forecast and said, "Here's what happened to your contributions with the 9.62 percent. It is rather stable and no problems, right?" However, if I reflect the actual year-to-year volatility, a different picture emerges (Ruloff Slide 18). This is obviously on a different scale. The blue line is still the same, but now I am reflecting what is happening to the contributions, reflecting the actual experience. We would have had bad returns the first year, and the contribution goes up a little. Then we had great returns and the contribution goes down to zero. We have a contribution holiday for several years, and then all of a sudden we get whacked with some bad returns and our contribution has spiked way up.

Let us go with this idea that we go to an all-bond portfolio. Had I gone to an all-bond portfolio and if I was basically marking my liabilities to market as well so that as my bonds moved, my funding liability moved as well, I would have higher contributions, but they would be more stable than they were under the 60/40 mix. I could not actually get them to be completely stable, because under the current rules we have different amortization of gains and losses versus assumption changes. As I mark my liabilities to market, that would be an assumption change

that would amortize one way. My bond experience would be amortized another way. On top of that, my year-by-year service costs or normal cost would vary with market conditions, so they are not completely stable. That is the bad news. It would have cost a lot more.

Look at the good news. We would have ended up with a lot more assets. Basically the money we put in would not go anywhere. It would still be there. We would end up with a prepaid rather than accrued pension cost, because we were putting more in. Our ABO funded ratio would be greater. The analyst would give us some benefit for that. We would not have this enormous reduction in shareholders' equity. Therefore, I would say, there are some negatives, but there are also a lot of positives to this approach..

In conclusion, I would like to ask you to start examine your plans, or your plans for your plan sponsors, and look at stochastic forecasting for many years. Look at the potential probability of ruin and the chances that you might get fired for it. I think you will learn a lot from that. This idea of ongoing liabilities that reflect the equity risk premium without the risk is definitely leading us to stocks, and it is a mistake. Eventually the volatility materializes, the risk materializes, and it causes ruin. We should develop our funding approaches using stochastic forecasting, or we are going to take a deterministic approach where we pick a rate or a collection of yield rates. We should be using a risk-free yield rate to calculate what the contributions should be.

Even though we will have higher contributions under some of these alternatives, we need to take the blinders off and not focus solely on the pension plan. We need to take other things into consideration and see what benefits they might have to the corporations or to the shareholders. I think we do need to be showing those risks. We need to be reporting this risk, and if we focus more on the risk, we could actually show the advantages of a DB plan over a DC plan more clearly. Thank you.

FROM THE FLOOR: I wanted to know from Mark if he ran this experiment in a variety of different time periods and if he got the same results.

MR. RULOFF: I do not think I could prove anything to any one of you in the long run. I think you should do this testing on your own and really make your own judgment. I think my judgments are right, and I think you will find the same thing.

FROM THE FLOOR: First I want to say that Mark has been a great mentor to me over the years. You taught me almost everything I know, and there is no "but." You have done a great job.

I particularly was attracted to one thing you did, because we have dealt with the convergence of annual returns as the time horizon goes out. Then we rely on authorities to tell us that something else big and important is growing, even as the annual returns are converging. I think you found something to show us as actuaries, and as you know we are trying to solve the problem of making the FE relevant to actuaries. You found a great demonstration that shows that, even as the annual equity return risk narrows, the contribution risk may be growing. I think that is a valuable contribution. Thanks.

MR. RULOFF: Thank you.

MR. ROBERT C. NORTH, JR: I think, Mark, your *Contingencies* article is a source of something that is very useful. At least I intend to use it going forward, in that for fiscal year 2000, I charged the city about $700 million. I am projecting to charge them $5 billion within a couple of years. Some people seem to think this is a rather steep increase. What you have shown, which I think is a very valuable exercise, is by our standard actuarial practices, following standard routines, most of us decreased employer contributions throughout the 1990s in response to investment gains. Then the supposed perfect storm arrives and things reverse. If one starts back at the beginning of the process and just projects the expected returns that we

had all along, it is very easy to demonstrate that we would probably be in about the same position now. When you show them all this bitter medicine about how much more they are paying, you can then tell them to look at how you could have charged this much more all along, and you are only getting back to where you would have been anyway. I think that is a very valuable exercise to help mitigate the pain that has to be dealt out under our current practice, so thank you.

FROM THE FLOOR: So far we have had everybody congratulating you, and I appreciate what you have shown us. I have some questions on risk besides investment risk. You could have other kind of risk too. Suppose we improve mortality. People are living a lot longer because we have all these great new operations where we live longer. We have not really gotten rid of all our risk. You were trying to get the 100 percent point where there is no risk at all. I guess we need to buy annuities. Then suppose the insurance company goes under, so we need to make sure we buy annuities in states where we have a guarantee that exceeds the person's income. Suppose we have a pension plan that has an early retirement benefit that is subsidized. Maybe we need to fund toward the most subsidized early retirement age. It can get pretty expensive, especially in the funding method that you had. You had just one person who was approaching age 65, and you were funding any loss at age 64 over 1 year instead of 40 years. It was definitely exposing the risk a lot.

There are a couple of things here. One, in an ongoing company you do not have that one person getting closer and closer to age 65, although you can get older work forces. Also, do you have a situation where we can get totally rid of all risk? If we cannot, is 99 percent good enough? I do not know. If 99 percent is good enough, then is there a way of doing it using equities too? Would you say, maybe it is okay to have some equities? I am just rambling now, so please answer one of these questions.

MR. RULOFF: There is definitely other risk. Investment risk is a major risk out

there. There is longevity risk, as you point out. We should all start talking about longevity risk, because there are DB plans and DC plans where we have longevity risk. We should start talking about that too. If we have a small DB plan, longevity risk is a big risk. Maybe we should hedge that as well. Buy into annuity contracts and when someone retires, it is not a battle. The risk of having early retirement subsidies and paying a lump sum instead of an annuity are plan design issues that we put into the plan. Maybe they should not be there because we cannot hedge these things if we start to focus on the risks.

MR. MITCHELL I. SEROTA: Mark, I have two questions of you. One is methodological and the other is assumptions. For the method, you said, here is your group of 25-year-olds, and you will amortize basically all gains and losses over the future working lifetime of those people. As they get closer and closer to age 65, you have less and less time to amortize the gains or losses, and I wonder if that has an effect on surging those costs way up really quickly.

MR. RULOFF: The answer is yes. I looked into that before I came here. I will tell you it did not change my probability of being fired. It is an issue that people bring up to me, including the *Contingencies* article. They say, if you did this and you did that, it would not turn out to be the same. I agree it would not turn out to be the same. I cannot test everything. I do not think I can prove anything to you that you do not have to prove through your own testing to yourself.

MR. SEROTA: Here is the fun part of the assumptions, because on the ProVAL software, when you do a stochastic projection, there is a correlation matrix, which shows the relationship between what happens to inflation and various other factors such as equity return and bond return, and you can break it into all kinds of tiny components like long-term bond return, short-term bond return, high-value equity and low-value equity. Also, as equities go up, what happens to the bonds? It is a gorgeous matrix. I think it is part of the implicit assumption of what is going on when you do your projections here. There was kind of a standard assumption of

how those correlations work, based on historical evidence, which is something that Jeremy cannot stand. I wonder whether that played into how the stochastic model worked.

MR. RULOFF: The answer is yes. I ran interest rates first, the short-term rate and the long-term rate, and I figured out bond return based on the movement of the interest rates. I figured out equity returns as well. I did use historical data and did not modify it, although I would in practice; my future expectations are not history. However, in order to prevent myself from perhaps being judged as tweaking it to give results I would like, I chose not to do that and simply used historical data.

FROM THE FLOOR: I was just thinking that when you are dealing with the entire pension plan, as time goes on you have new entrants, new employees coming in. That which sounds so bad over here would be masked in terms of the employer, because you would have the funds that are coming in for the new employees that would build up the assets in the plan to do the masking. That does not mean you should rely upon it. I guess the concept would be that every 5 years or every 10 years, you separate the groups, take out the new employees and look at the old group. Historically you are looking back and projecting forward. Look at the new group separately and see how they are interacting. How much cushion do you have? How much do you not have? That would sort of help guide the plan along.

MR RULOFF: Let me turn the question over to Dan. Dan, in the plan where you got fired for the contributions exceeding 7 percent, were there new entrants?

MR. CASSIDY: Yes. In the frozen one, there were no new entrants there, but in the other projection I showed you, the legacy plan, we would include new entrants in that. That is a very common tool that we use in projections.

MR. RULOFF: Your plan is then 2 percent contributed, 2 percent for those years, so they are nice and smooth. Would you have been fired?

MR. CASSIDY: I am not fired.

FROM THE FLOOR: First point, the example you showed going from 1993 to 2003 is a particular real scenario. If you went from 1990 to 2000 you would have had a very different conclusion in term. If you are really going to test it, you should look at a collection of 10-year realistic periods. It happens I am very familiar with the one that runs from 1993 to 2003. It does bring you to a certain predictable ending where equities do not look good. My second point would be that there is another way to be fired besides having your contributions go above 10 percent. You can have the owner of the company go out with the owner of a comparable company in year 3 and say, "What contribution are you making?" He says, "Oh, I am in equities. I made zero." Then he goes out again and has lunch in year 4. There is the same question and the same answer. He does it in year 5 and year 6. It is very possible that you do not get to the end of scenario, because the owner has become convinced through repetition that maybe bonds were not the best place to be throughout the experience period.

MR. RULOFF: I definitely agree that staying with bonds will most likely increase the contribution. However, I still believe that FE will show us that that approach increases shareholders' value.

MR. SHAND: I have a question for Mark. When you were doing your simulation, were you also simulating salary increases?

MR. RULOFF: Yes, I had salary increases.

MR. SHAND: Also the correlation matrix was brought up, and it has not really been mentioned at all during the day. As you know, the correlation between salary increases and bonds is much stronger than it is with equities, which then helps to reduce the volatility as well too. With the argument being made to have bond

investments, that connection should also be recognized as well.

FROM THE FLOOR: I have a question too, just before Jeremy, and Jeremy might be able to answer it too. I have been struggling with trying how to show that idea of shareholder value, like how that gets increased. Have you been successful? In that second example, legacy cost, the bars are shorter and more predictable after you immunize, after you buy annuities for this group, but that is a real cost to them in a sense. How do you show the net result three or four steps down, that increase in shareholder value, or have you done that exercise in a sense?

FROM THE FLOOR: It is called the case against equity, or case against stock and corporate pension plans. You will be happy to know there is a sequel coming out shortly. It is already on the Pension Research Council Web site, which is the case against stock and public pension plans. It takes you through the mathematics. The paper you are referring to is in February 2003 *Pension Section News*.

MR. RULOFF: The basic approach that they walked me through was that I could lever or gear the company back up. I take how much I have moved out of equities and moved into bonds. Then after some tax adjustments, I issue bonds and buy back my corporate stock. Then I have issued the bonds and basically had the bond rate, and I buy that. I assume it has the same return as any other in my portfolio. It shows you how much you then increase the company's earnings and then that cost. That increase in the company's earnings will more than pay for the increase in the cost in the pension plan.

FROM THE FLOOR: I have a different question. If we think about the shareholders as individuals in the public, we can think about the public as somebody that we could divide up by quartiles, in terms of the richest people in the top quartile, the second and the third quartiles in the middle, and then at the very bottom quartile those who certainly do not have any financial assets. I am curious if you made these changes. I hear that we are shifting risk to individuals. Have we studied and

do we understand the distributional effects of this and how it impacts people at different levels of wealth at the end of the day?

FROM THE FLOOR: I would disagree with the premise that we are shifting risk to individuals. Complete transparency will reveal all the risks, and it would be found to be held entirely by individuals. It always has been. Institutions cannot carry risk overnight.

FROM THE FLOOR: I would say perhaps we are shifting the risk from the individual plan participants to shareholders and lenders.

FROM THE FLOOR: That is often economic value added, because they are more capable of carrying the kind of risks that are generated by real investment, which is the only source of financial risk. I wanted to comment on one thing. Twenty years ago it became pretty fashionable in the consulting business to say we are total compensation consultants. I have not heard that expression all that much. In fact, there is something about the interaction of final average plans, projected benefit obligation, ABO, salaries and so on that total compensation consulting can answer in a way that much of what I hear you complaining about we seem to be tossed about, like your 10 percent problem.

I would take that assignment and very confidently if you just gave me control of the salary administration system as well. I do not mean that facetiously. I will still have to give total compensation that is competitive with my competitors. However, when I have long-service employees in a final average plan, I should be making careful distinction and giving them smaller raises. Then the short-service employees of the same age and same productivity level are getting something of greater value every year, the roll up in their ABO under a final average plan. If I do not recognize it, a lot of the other pieces are not going to fall into place. That is one comment.

The other was the question about nonfinancial risk, the demographics risk. One of the critical lessons of the whole capital asset pricing model analysis is that some risks, the independent risk that Mark was talking about when he talked about houses, are completely amenable to the law of large numbers. You bring enough independent risks under one roof, and the experience goes to the mean. We will talk about model risk in a moment, but the experience goes to the mean with no variation. That is why we see large insurance pools for term and home insurance. We see large numbers of policyholders owned or bet against by one company. You need to get a big aggregation. No matter how much you aggregate and diversify stocks—and this is the lesson of the capital asset pricing model—because of the correlation that every stock has with the market (beta), you cannot get rid of that beta risk. You have to pay for it. Who did I do this to this morning? You must distinguish between what are called orthogonal risks that can sometimes be white noise, which we can drive to zero, and those that we cannot. That is sometimes a subtle point, but it does tell us about what we can and cannot do.

Finally, if we had misestimated the mortality model, part of the answer for how an insurance company can manage that risk once we get the aggregated mortality risk to insurance companies is, as you said, by buying annuities. We need to look to supply-side diversification rather than to the demand side. Catastrophe bonds used by the casualty industry can guard us against or share at least the risks of aggregate systemic mortality.

MR. SHAND: I am be happy to say that we have concluded the Brave New World.