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ECONOMIC ASSUMPTIONS FOR PENSION PLANS

Moderator: WILLIAM DAVID SMITH. Panelists: ARDEN R. HALL, JAMES J. MARKS, CHARLES E. NIGHTENGALE*

1. Investment return
2. Salary scales
3. The "Spread" - Investment return minus salary scale
4. Effects of inflation and economy on other assumptions

MR. WILLIAM DAVID SMITH: The panelists today are Dr. Arden R. Hall, James J. Marks, and Charles E. Nightengale. Jim Marks is filling in for Ray Neff.

Actuaries use assumptions for certain economic conditions or events which affect the cost of pension plans. Actuaries are well trained to determine how different economic assumptions impact cost estimates. They are well trained to measure what has happened in the past to the economic assumptions of the plan they are studying, to other plans, and to the economy in general. I believe we are not well trained to assess the current state of the economy and what that will produce in the way of economic results in the future. Many of us merely use the past and extrapolate into the future which may easily produce incorrect assumptions. This is an excellent reason for today's subject of discussion.

The actuary, when he asks for help in determining economic assumptions, can go to either a biased source or an unbiased source. The biased source generally is the plan's sponsor, or others who have some interest in the estimate of cost. These sources are rarely better trained than the actuary, and may choose assumptions for the wrong reasons.

An independent economist is an unbiased source, but when an actuary asks an economist for a long range projection of salary inflation, inflation, or investment yield, the economist is likely to think five years is long range. Of course, the needed time frame is much longer than five years.

It is for these reasons that the actuaries have made most of the decisions involving economic assumptions. They are the only ones that are there to do it.

Today's first speaker is not an actuary. His name is Dr. Arden Hall. He has a Ph.D. in economics from the University of California at Berkeley. He is with SRI International (formerly Stanford Research Institute). Dr. Hall and I have worked together on two projects, both of which will be mentioned in today's discussion. We have had interesting and lively discussions as part of that work. Dr. Hall will speak to us this afternoon on this general subject from the viewpoint of an economist.

*Dr. Hall, not a member of the Society, is associated with SRI International.

DR. ARDEN R. HALL: Since I am some kind of an economist, I will by definition be speaking from the viewpoint of an economist. My remarks will be fairly specific. I am going to describe some work that we did to assist a particular pension plan in choosing the economic assumptions to use in a valuation. Bill was the actuary involved. The pension plan was California State Teachers' Retirement System (STRS) and a year ago they were in the preparatory stages of a valuation. With some urging from Bill, they decided that they would like some additional help in choosing the economic assumptions for the valuation.

There were three assumptions that they wanted to be chosen. I am sure that they are familiar to you. They wanted a prediction as to the rate of inflation, the overall rate of increase in prices. Also, they needed an estimate of the rate of future wage inflation, in particular, wage inflation for California state teachers. Finally, they wanted a prediction of the rate of return on new investments by their Fund. They told us approximately the mix of investments and asked us to try to predict the rate of return.

The time period that we were to look at was the period 1980-2020, a forty-year period. It is safe to say that most economists worry about the workings of the economy over much shorter periods of time. While economists have done quite a bit of theoretical work on long term economic trends, most are not aware of any practical use for that kind of work. Most research on long term trends has been theoretical and not aimed at specific questions such as these.

STRS had an additional question for us. They particularly wanted to know whether the difference between the rate they had assumed for return on new investments in the last valuation and the rate they had assumed for wage inflation was reasonable. The rates used previously were 7½% return on new investments and 5½% wage inflation. They assumed a difference of 2%, and there was some question as to whether that difference was too optimistic. We treated that as a hypothesis to be tested, that is, is 2% a reasonable difference and what kind of circumstances would be needed to produce that 2% difference.

Our approach to the problem was to break these rates down into their basic parts, to look at the parts in isolation, and to combine them again and come up with some predictions of the quantities of interest. The first step in doing that was to take inflation out of the other two rates. We economists believe that the nominal rate of return and the nominal rate of wage inflation have two components. One of the components is inflation and the other is a real rate of return or a real rate of wage increase.

We started by thinking in terms of the real rates rather than the nominal rates. We asked, what was the real rate of return that STRS could expect, and what was the real rate of increase in teachers' salaries that they could expect. A fair amount has been done in studying long term real rates of return, although some aspects of the problem have been studied more than others. The actual return that a particular asset earns is a function not only of the long term real rate but also inflation and the risk premium on the asset. Some assets are more risky than others, and investors demand a higher rate on risky investments.

For some of the assets in which STRS intended to invest we could not

find empirical work that would give us an idea of what the real rate of return should be, for example, real estate. It is easier to find estimates of the long term rate on riskless assets, such as short term Treasury bills. We found some work by Gibson that indicated a long term real rate of between 2.3% and 2.6%. And another study by Schaud indicated a real rate for corporate bonds, which are somewhat more risky than Treasury bills, of about 3%. STRS plans to allocate its new investments to equities, bonds, and mortgages. We did not have all of the pieces to come up with a precise estimate, but on the basis of these two studies and some other work, we assumed a real rate of return on new investments of between 2½% and 3½%.

The next step was to look at the rate of increase in teachers' salaries. Here again we broke the study into two parts. The increase in teachers' salaries after inflation can be thought of as made up of two components. One is general wage growth. The other part is the movement of teachers' salaries relative to the average. Obviously there is much more study done on the overall wage rates than there is on California primary and secondary school teachers. We looked at the average and then looked at how teachers were moving relative to that, and tried to predict what would happen to teachers relative to the average in the future.

To predict what would be happening to real wages we utilized the economic theory of how wages are determined. That says that in a competitive economy the wage that a person earns is equal to his marginal product, that is, the amount of additional output produced by working an additional hour. Now the United States is not a perfectly competitive economy, but the competitive model is probably realistic in the long term. The economy has a way of removing monopolistic elements even as new ones develop. For that reason, the competitive model is not such a bad way of looking at the economy over a very long period. The point is that the assumption that wage is equal to marginal product implies that the rate of wage growth will be equal to the rate of growth in labor productivity. This is a point which we found that not all non-economists immediately and totally accepted. Given this experience, further discussion might be of value here.

Labor productivity is simply the amount of output that a particular worker produces, and it goes up for a variety of reasons. One reason is that the workers become better trained. They are then able to use existing machines more efficiently, and are prepared to use more complex machines when they are introduced. Not surprisingly, economists argue that this greater productivity is accompanied by higher wages. However, there is another way that productivity improves, that is, through the introduction of new and better machinery.

With a better machine, the same worker can produce much more output. It is not intuitively obvious why, if the owner of the firm supplied the new machine, the worker's wage will rise. And yet economists argue that this will occur, given enough time for competitive pressures to operate.

To explain further, let me talk about a specific example. Many of you have in the last couple of years gone through the trauma of switching from typewriters to word processors. Most of the time, with a little training, a secretary can become more productive using a word processor. Looking at the situation from the point of view of a single firm, there is little reason why the secretary should be given a raise, even though she is more productive. For a single firm this is true but note that the firm could, in some sense,

afford to give the raise. Even after the cost of the word processor is considered, there should be some net cost savings. (If there is no net cost savings, then the firm made a mistake in buying the word processor and firms that consistently make mistakes are not on the scene for long.) Thus there will be, for most firms, some cost savings out of which a raise could be given. Thus far, however, it is not clear why the firm will be motivated to give the raise.

Enter competition. As the word processor proves itself, more and more firms will introduce them. The lower cost of secretarial services will actually increase the demand for these services. The labor market for secretaries will get tighter, putting pressure on wages, and, from the firm's side, the resources will be there, through cost savings, to pay higher wages. Competition, in the long run will produce those higher wages.

I have told a stylized story about word processors. Events may not work out exactly as foretold. However, in a larger arena, in the entire economy over long periods of time things work out very much like this. Employees enjoy increases in wages when the introduction of new machinery makes them more productive.

I am now going to talk about productivity and wages interchangeably. Let me tell you what has happened to productivity. From 1947 to 1966, the average rate at which productivity increased was about 3.3%. From 1966 to 1973, it was 2.13%. From 1973 to 1978, it was 1.4%. Recently it has been zero to negative.

In trying to predict the rate of productivity increase, we chose to rely pretty heavily on historic information as opposed to what is going on right now. Our reasons were that productivity in the short run is influenced by a lot of things, and looking at what is going on now and predicting that that same thing will continue to happen for a forty year period is like looking at the rate on Treasury bills right now and predicting 15% interest for another forty years. It is unreasonable to believe that, and it is certainly true that current rates of productivity increase are substantially below historic levels.

Another argument that we made in the same direction is that productivity problems may be self-correcting. It is widely recognized in the United States that we have a productivity problem, and that productivity should be increasing much more rapidly than it is. It is increasing more rapidly in other countries, and the recognition of that problem tends to generate action. We argued that current circumstances are not something that will be tolerated for a long period of time, and that for that reason as well, we should think of the current low rates of productivity increase as an anomaly rather than as a pointer toward the future.

Thus, we looked at the historical rates and said we thought that the overall rate of increase in productivity rates for the next 40 years would be between 2% and 3%. This is equivalent to a prediction of 2% to 3% average real wage increase. The next step in the analysis was to try to relate this average to California state teachers wages. In 1951 the average wage for teachers was 23% above the overall average wage. By 1977, it had climbed to 51% higher. We thought that, in the future, the relative wage of teachers, that is, the amount the teachers were over the average, would probably decline. We had two or three reasons for that thought.

One was hardly an economic argument. The argument is that whatever goes up has to come down. A more sophisticated way of saying that is that in the 1950's there were conditions that made teachers' wages only 23% above the average wage. There is no reason to think that those conditions will not occur again. For a long time, things have been favorable for teachers, and chances are at some point they are going to start becoming unfavorable again.

We had some reason to think that they were becoming unfavorable right at the time. Probably the most important trends were a reduction in enrollments, and consequent oversupply of teachers. In that situation teachers are much harder pressed to negotiate as large wage increases as they might otherwise.

There are also a couple of political or public policy trends to consider. Everyone knows that there is a feeling in the country that public spending ought to be cut and that public budgets ought to be reduced. We have seen this in California before it spread to the rest of the country. California is under a pretty tight budget, which means that public employees are competing for a smaller budget. We thought that would probably affect the teachers in California. Also, there seems to be a general feeling of dissatisfaction with schools and the job they are doing in educating children. That is not very conducive to an increase in teachers' salaries relative to the average.

So with what is really a qualitative analysis we came to the conclusion that teachers salaries would not continue to diverge from the average, but would probably converge over the next forty year period. We needed to arrive at some quantitative estimate of how much closer teachers salaries would come to the average. And actually we turned the question around. Instead of trying to make a prediction, we asked the question instead. Remember, I said we were particularly concerned about the difference between the real rate of return and the rate of wage increase for teachers. Well, we had chosen a real rate of return of 2½% to 3½%, and we had chosen a real rate of wage growth for average wages of between 2% and 3%. So we asked ourselves, with those estimates, what would need to happen for the difference between the real rate of return and teachers' salaries to be as much as 2%.

The difference between real rate of return and average salaries is, given the ranges that we had, between -½% and +1½%. To have a difference of 2% in real return and teachers' wages, we need a relative decline in teachers' wages of at least ½% and perhaps as much as 2½%. If that is the range we are looking for, what does that mean in terms of where teachers are going to be relative to the average in forty years? The answer is, if teachers wages decline by ½% a year relative to the average, and if teachers are about in the same position in 1980 as they were in 1977, by 2020 they will be down to about 24% above the average wage. That compares to 1951 when they were 23% above the average wage. So if teachers' relative wages decline ½% per year, in forty years they will lose everything they have gained since 1951. If teachers' wages were to decline, relative to the average, at a rate of 2½% a year, by 2020 their wage would be slightly more than half of the average wage.

We concluded that it was unlikely that teachers were going to be earning half as much as the average wage earner. In fact, we really did not be-

lieve that teachers would decline below their position in 1951. So it seemed that there were very few circumstances in which the difference between the rate of increase in teachers salaries and the rate of return would be as much as 2%. We felt fairly secure in predicting that the 2% difference that had been used in the previous valuation was too optimistic.

The next step was to develop a set of real rates. We did not do anything very sophisticated. Looking at the rate of return, we took the middle of our estimated range, and said that the real rate of return would be 3%. We did the same thing for the average rate of wage increase and said that it would be 2.5%. Looking at what would be needed in terms of relative rates of decline in the future, we found it hard to believe that teachers would, in forty years time, be in worse shape than they were in 1951. That led us to choose a relative decline in teachers' wages of ½% per year. Our final rates were 3% average real rate of return, and 2% average rate of real wage increase for teachers. The difference is 1%, which is just one-half of what had been used in the previous valuation.

The final step in the analysis was the choice of an inflation assumption. This was the most difficult part for us and the part to which economists can bring little special knowledge. Inflation is largely determined by government policies and political events beyond the realm of economics. For example, in the past several years, the oil producing countries managed to get together and form a cartel, and hang together long enough to raise prices. This is something that has affected inflation quite a bit in the last seven or eight years but it is not something that economists find very easy to derive from empirical research or economic theory. We have trouble portraying ourselves as real expert inflation predictors. Certainly, we think about it a lot, and maybe we have slightly more informed opinions.

The rate that we finally settled on was 6%. This gives us finally the numbers that STRS has asked for: 6% for inflation, 9% for interest on new investments, and 8% for salary increases. Those are averages we predicted over a forty year period.

Let me say briefly one more thing. We were particularly concerned with the difference between rate of return and salary increases. We tried to get some further evidence on the subject. One bit of evidence we had, or one reasonable thing to do, was to determine STRS experience. We discovered that there were only 10 out of 27 years where the difference between rate of return and salary increase was as much 2% and that the average over the period 1950 to 1976 was about .9%. This agrees fairly well with our predictions.

In conclusion I have a couple of thoughts. I would hate to have STRS take this prediction, fire their actuaries and come back to me in forty years and ask me what happened. I do not believe that these numbers can justify that at all. I do not think that having an economist look at this question ought to make STRS staff any less or any more sanguine about the condition of the plan. I would think that it is just as important to continue to do actuarial valuations. It is important for every actuarial valuation to reconsider these assumptions.

However, I do think that economists are particularly well trained in this

area. I think that there are some insights that we can bring that will improve the prediction of these assumptions. But again, let me say that I think that bringing in an economist is no substitute for regular valuations and careful consideration of how experience evolves. I would think that STRS ought to be fairly confident that they will not be in really bad shape five years from now relative to these assumptions. That is as much assurance as anyone can give.

Finally, as I said in the beginning, economists have not spent very much time on these questions. There is a lot of theoretical work, but very little empirical work, and not much aimed at the kind of the practical problems that you have. I think that useful insights could be gained if some economists could be convinced that these are important questions and that it would be worthwhile for them to do some work in this area. I think that you as a group stand to gain if economists do that. Although our role in this whole process is very limited, I think this aspect of pension plan management could be improved by a collaboration between actuaries and economists. If there is some way that you, individually or through the Society, can get some economists, academic or otherwise, interested in this, I think it would be helpful for you. I think that it might add a bit to the quality of the work you can do for your client. Thank you.

MR. SMITH: Thanks very much Arden. I am sure that there will be some questions. You may be interested to know that as a result of Dr. Hall's work with STRS, the specific recommendations were 6% for CPI, 8% for wage inflation, and 9% for investment yield. There was much argument, and numerous considerations other than economics, not the least of which was the numerical size of the unfunded liability. There were some on the Board and in State government who were concerned to have the unfunded liability go over $10 billion, and some sets of assumptions carried it over $10 billion. That is not particularly logical but it is what happens in a political environment. The final decision was an assumption of 5% for CPI, 7% for wage inflation, and 8¼% for investment yield. Dr. Hall though it was reasonable, and we did get away from the former 2% difference between investment yield and inflation salary scale.

Our next speaker will draw on a couple of subjects. The Department of Housing and Urban Development gave two grants for studies under the auspices of the President's Commission on Pension Policy. That Commission studied a broad spectrum of problems relating to pensions. These two studies dealt with public plans below the federal level. The question was, "what is the general actuarial condition of these plans?" The plans were all state, city, and county plans. One grant, the largest, was given to the Urban Institute to study the approximately 100 state and local plans that have 1,000 or more lives. Mr. Marks' organization was the actuarial subcontractor for that particular study.

A second study was granted, much smaller in size, using a sampling basis. That grant was to SRI and we were the actuarial subcontractors. I was fortunate enough to be involved in that study and it was both a lot of fun and a lot of work. A sample of 250 plans was taken, and we obtained about 200 actual responses, which is an unusually high return. Dr. Hall, I think, is quite proud of that. The second study was done because, as was pointed out, it is quite possible that the 100 largest plans are not

the ones that are in the worst trouble. The large plans can afford, and probably do obtain, competent actuarial advice. We do not know what kind of actuarial advice is obtained by the very small plans. The SRI study was stratified by plan size so that we ended up with approximately equal numbers of plans that were small, medium and large.

The purpose of both studies was to make an independent actuarial analysis of each plan using economic assumptions which were consistent among all plans and, of course, consistent between studies. The Urban Institute study of larger plans had sufficient funds and access to the actuarial studies and the actuaries themselves to use non-economic assumptions which were essentially the same as those which had been developed by actuaries for those plans. For our study we did not have enough funds to approach the actuaries, so we had to estimate appropriate non-economic assumptions. As a result, our study would not have been an appropriate source for information about an individual plan. We could not be certain enough about the individual plan, the data, or that our assumptions were consistent with the experience of the individual plan. The idea behind our study was that we would combine the plans and make broad comparisons and that errors would hopefully cancel out.

Jim was an integral part of the Urban Institute HUD study, and I hope he will make some comments on that. He has some comments on some other studies that the Winklevoss organization has been doing. Jim's degree is in mathematics from Drexel. He worked for some time with Penn Mutual and for the last few years has been with Winklevoss and Associates. Mr. Jim Marks.

MR. JAMES J. MARKS: The HUD large plan study actually was drawn from a potential sample of about 365 plans that had 1,000 or more lives. We took the largest 35 and then drew 65 on a random basis from the remaining 350 odd plans. This slide (see Table 1) shows the coverage based on active lives, assets and benefits. As you can see, other than for the uniformed workers, we picked up about 3/4 of the action.

Table 1

Coverage Ratios of Final Sample

Universe/Subsets	Plans	Actives	Assets	Benefits
All Groups:	29%	73%	74%	69%
Region:				
Northeast	31	75	79	70
North Central	38	74	71	69
South	23	70	71	68
West	28	73	72	69
Employee Type:				
PERS	30	75	77	71
Teachers	38	72	72	72
Uniformed	17	37	54	42

This slide (see Table 2) will give you some indication as of approximately 1978, what the plan actuary was assuming for interest rate and salary scale. I would have expected to see 6%, 3½% as the mean, and the figures bear this out. I've circled the 10 plans here at 7%, 4½%. All 10 of

these plans were from the same state and the same assumptions were used for all, so this creates a rather large bias to one side.

Table 2

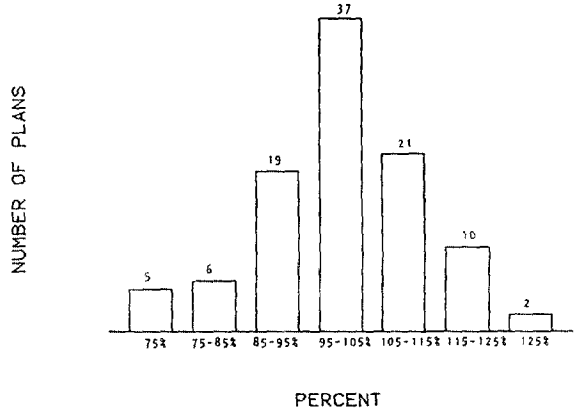
RELATIONSHIP OF INTEREST ASSUMPTIONS
TO SALARY INFLATION ASSUMPTIONS
FOR BASIC SAMPLE PLANS
(NUMBER OF PLANS)

INTEREST RATE ASSUMPTIONS (%)	SALARY INFLATION ASSUMPTION (%)													TOTAL
	> .0 ≤ .5	.5 1.0	1.0 1.5	1.5 2.0	2.0 2.5	2.5 3.0	3.0 3.5	3.5 4.0	4.0 4.5	4.5 5.0	5.0 5.5	5.5 6.0	> 6	
≤ 4.0	1	1	0	0	1									3
4.0-4.5	0	0	1	0	0									1
4.5-5.0	1	0	1	1	4	3	1	2						13
5.0-5.5	1	0	2	4	4	2	0	3						16
5.5-6.0	1	0	1	0	3	4	10	11	2	4				36
6.0-6.5			1	0	1	2	2	0	1	3	0	1		11
6.5-7.0				2	0	2	0	0	0	1	1	1	1	8
> 7.0								1	10	0	0	0	1	12
TOTAL	4	1	6	7	13	13	13	17	13	8	1	2	2	100

As a measure of how conservative or optimistic the funding of these plans was, the population simulation and a cash flow forecast were performed under a uniform set of assumptions for each plan which were, as previously mentioned, 7% interest, 6% salary scale and 5% CPI. This bar chart (see Table 3) shows what we refer to as the asset target or the actuarial liability. The current methodology means the plan actuary's assumptions as well as his funding method. I would say 90% were entry age normal with some variation. You can see the ratio of current methodology asset target to best-estimate (uniform) asset target form almost a perfect normal curve, which was a tremendous surprise to us.

Table 3

DISTRIBUTION OF RATIO
OF CURRENT METHODOLOGY ASSET TARGET TO
BEST-ESTIMATE LPCM ASSET TARGET



I will try to run through the actual project rather quickly. The first thing we did was perform a 50-year population simulation based on the non-economic assumptions that the plan actuary was using. The economic environment was 7% yield on assets, 6% salary inflation plus an empirical merit scale we derived from looking at the actual population for each plan, 5% CPI and population growth characteristics that were distinct for every city and state, blending into the national growth rate over a 25 to 30-year period.

When we were done with the initial results, we were grossly unhappy with them. Let me mention that ad hoc cost of living improvements (COLAs) were not assumed in the initial forecasts, and, therefore, the cash flow forecasts showed the aggregate universe plan costs nosediving over the 50-year period. Funded ratios approached 90% even under current methodologies. Ratios of assets to Plan Continuation Liabilities were over 100%. At that time it was decided, and possibly Bill knows much more about that than I, that we re-forecast and assume that all plans would provide ad hoc COLAs up to a total of 5%. Now let me explain. If the initial plan forecast was done with no COLA, then than plan would now be run with a 5% ad hoc COLA each year. However, if a plan was already assuming a 3% COLA, for instance, as many did, then we would forecast with an added 2% ad hoc COLA on top. Therefore, all were going at 5%.

After the population simulation was run, there were two sets of valuations or forecasts that were done on each of those 50 populations. One used the plan actuary's assumptions and the actuary's funding method. The second set of forecasts were run using the same economic assumptions used in the population simulation. These uniform forecasts were run using all the typical cost methods (i.e., Aggregate, FIL, and Entry Age normal and the

various benefit-unit type methods). We assumed 30-year level percentage supplemental costs for the initial unfunded at 6%, and 15-year level percentage supplemental costs at 6% for gains and losses. The next set of slides I would like to show were the final forecasts that were run, using the ad hoc COLAs. When it says aggregate universe (see Table 4), this means we took the results for the 100 plans and blew them up statistically, so that the 9 million actually represents the more than 350 plans with over 1,000 lives. There were not too many unexpected results here. Both the active and non-active memberships matured a little, and of course the payroll and benefits explode which is what everybody is probably getting used to seeing.

Table 4

AGGREGATE UNIVERSE

FORECAST OF PLAN MEMBERSHIP

YEAR	ACTIVE PLAN MEMBERS				PLAN ANNUITANTS			
	NUMBER	AVERAGE AGE	AVERAGE SERVICE	AVERAGE PAYROLL	NUMBER	PCT OF ACTIVES	BENEFITS (MILLIONS)	PER ANNUITANT
1979	9,073,865	40.32	8.47	13,084	2,324,056	25.61	12,620.10	5,430
1989	9,622,104	41.05	9.66	22,900	3,123,856	32.47	33,429.87	10.701
1999	10,231,701	41.24	10.06	40,219	3,654,071	35.71	75,193.71	20,578
2009	10,755,163	41.27	10.06	71,000	4,041,669	37.58	156,679.54	38,766
2019	11,182,490	41.19	9.91	126,705	4,388,156	39.24	294,001.14	66,999

FORECAST INCLUDES AD HOC COLAS

This next slide is the current methodology forecast (see Table 5).

Table 5

AGGREGATE UNIVERSE

FINANCIAL FORECAST OF PENSION PLAN
UNDER CURRENT METHODOLOGY
(DOLLARS IN MILLIONS)

YEAR	ACTIVE MEMBERS	VALUATION PAYROLL	ASSETS AT B.O.Y.	EMPLOYER CONTRIBUTIONS				EMPLOYEE CONTRIBUTIONS		BENEFIT PAYMENTS	
				NC		TC					
				$	% OF PAY	$	% OF PAY	$	% OF PAY	$	% OF PAY
1979	9,073,865	118,724	162,505	12,768	10.8	15,370	12.9	5,377	4.5	12,620	10.6
1989	9,622,104	220,345	434,724	24,676	11.2	29,179	13.2	10,079	4.6	33,430	15.2
1999	10,231,701	411,506	907,843	48,029	11.7	55,990	13.6	18,800	4.6	75,194	18.3
2009	10,755,163	763,617	1,709,581	88,919	11.6	103,247	13.5	34,808	4.6	156,680	20.5
2019	11,182,490	1,416,881	3,014,382	171,990	12.1	195,305	13.8	64,721	4.6	294,001	20.7

FORECAST INCLUDES AD HOC COLAS

Here I am highlighting the employer normal costs and total costs. With the ad hoc COLAs you can see that the employer contributions go up from about 13% to 14% over the common 45 years. This certainly is in contrast to the initial forecast, where employer costs dropped from 13% down to 8.6% over the same period. The next slide (see Table 6) shows, even with ad hoc COLAs, the funded percentage still climbs from 53% up to 64% and then levels off. This was a surprise to most of us, as it was expected that we would see funded ratios start at even a lower point than 53% and become smaller thereafter. This happened for a dozen plans or so out of the 100; but the vast majority of the plans actually had an increase in funded percentages throughout the forecasts even with ad hoc COLAs.

Table 6

AGGREGATE UNIVERSE
FORECAST OF ASSET ACCUMULATION
UNDER CURRENT METHODOLOGY
(DOLLARS IN MILLIONS)

YEAR	PLAN ASSETS	ACTUARIAL LIABILITY	
		$	FUNDED %
1979	162,505	308,233	53
1989	434,724	703,525	62
1999	907,843	1,425,886	64
2009	1,709,581	2,703,009	63
2019	3,014,382	4,888,014	62

FORECAST INCLUDES AD HOC COLAS

The one comment I personally would like to make here from my conversations with some of the plans' actuaries is predicated through this study and the Social Security study we also did. Many plan actuaries said "Well, yes, this is the current methodology that I have to show in the actuarial report but the city, county or state just does not put that much money into the plan." And I think this is one of the, I do not know if you can call it 'flaws', but the picture might not be as rosy as these forecasts show. I know, for instance, in one particular plan, the recommended contribution was $4.5 million the previous year and the actuary told me they put in about $200,000.

This slide (see Table 7) shows what the rest of the talk will cover. I have tried to highlight a few plan features that seem to have a great deal of impact on pension actuary's rules of thumb, i.e., 1) the 'two for one' rule for interest and salary scale and 2) a 1% change in the interest rate will reduce costs by 20%, while a 1% change in the salary inflation rate will increase costs by 10%. Some of these slides that I have for you will show how these rules of thumb can really fall apart when you have plan features such as Social Security offsets or profit sharing offsets. This is mainly because of the leveraging in benefits.

Table 7

SENSITIVITY OF PLAN COST TO ECONOMIC ASSUMPTIONS

PLAN CHARACTERISTICS IMPACTING COST SENSITIVITY:

- RELATIVE IMPORTANCE OF EMPLOYEE CONTRIBUTIONS
- COST-OF-LIVING INDEXING PROVISION
- OFFSETS TO GUARANTEED BENEFITS:
  - SOCIAL SECURITY OFFSET
  - PROFIT SHARING OFFSET
- FUNDED RATIO
- RELATIVE SIZE (AND COST) OF THE ANNUITANT GROUP

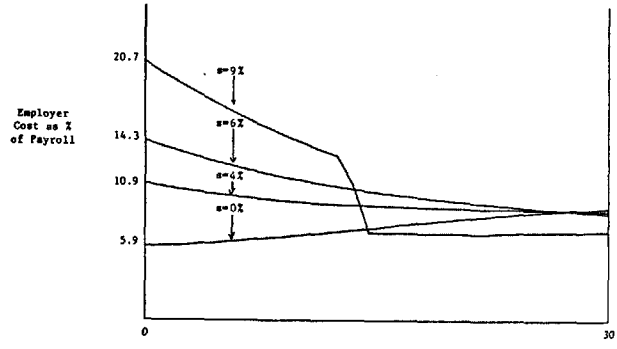
These next three slides come from the final report that will be put out with the HUD study. They are sensitivity analyses based on a representive general member plan as designed by us from average characteristics seen in the 100 plan sample. This particular slide (see Table 8) illustrates what happens to total costs based on different valuation assumptions, given the same experience. The 14.3% is the baseline cost, that is using our 6% assumption. The alternative salary rates produce wide swings in initial year costs, but after 30 years the cost streams pretty much come together. Note the changes in initial year costs exceed that predicted by our second rule of thumb; this is caused by the leveraging of the employee contributions.

Table 8

REPRESENTATIVE GENERAL MEMBER PLAN

*ALTERNATIVE COST PATHS WITH DIFFERENT SALARY ASSUMPTIONS**

Valuation Assumptions: i = 7%; s = see chart
Experience Assumptions: i = 7%; s = 6%



*Entry Age Normal with 30 year funding of gains and losses

This is a similar slide (see Table 9). The experience assumptions are the same for all three cost curves, but the valuation interest assumption is changed. Note again, the changes in initial year costs exceed those predicted by our second rule of thumb. However, the changes here are approximately double that shown in the previous slide for the same change in valuation rate.

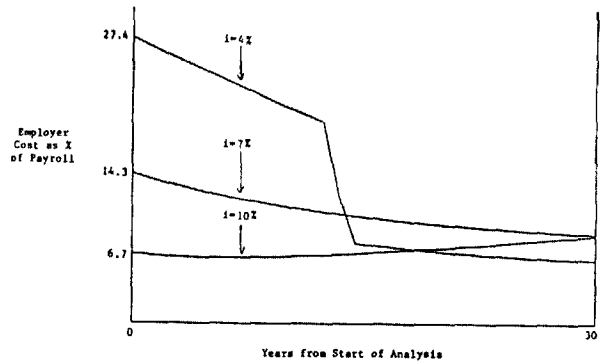
Table 9

REPRESENTATIVE GENERAL MEMBER PLAN

ALTERNATIVE COST PATHS WITH DIFFERENT INTEREST RATES*

Valuation Assumptions: s = 6%; i = see chart

Experience Assumptions: s = 6%; i = 7%



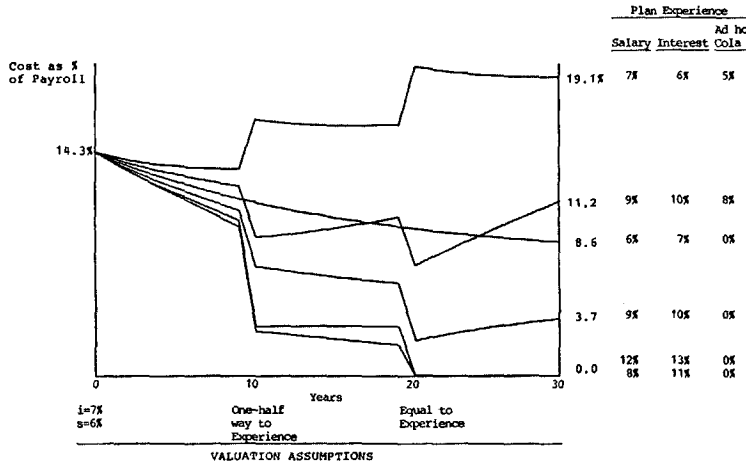
*Entry Age Normal with 30 year funding of gains and losses

This third slide (see Table 10) shows 6 cost curves based on different experience rates, but using the same initial valuation assumptions. After ten years, the actuary moves the valuation assumptions half-way to the experience, while after twenty years, the valuation assumptions are set equal to the experience rates over the prior 20 years. This slide attempts to show how valuation assumptions can tend to dampen the effects of even dramatic swings in experience, as well as how sensitive costs are to the subsequent changes in valuation assumptions.

Table 10

REPRESENTATIVE GENERAL MEMBER PLAN

DYNAMIC SIMULATION OF PENSION COSTS*



*E.A.N./30 LPSC and AD-HOCs not advance funded

In the next portion of this talk, I would like to use data from two private plans on which I have worked. They both have profit sharing plan offsets as well as Social Security offsets. Both plan sponsors look at the pension plan as a floor of protection for the profit sharing plan. What I would like to show using these two plans is the potential impact of using what is typically called implicit economic assumptions. The leveraging in pension benefits that can be seen in a plan like this is very severe. In other words, for the majority of entry ages, very few participants will come out with a projected benefit in a plan like this. This produces cost sensitivity that is quite unusual. I would like to show you the effects here. Our typical analysis is not confined to illustrations of total plan cost. We usually start an analysis by looking at an individual's benefit and cost stream. This is a case example (see Tables 11 and 12) using the plan actuary's assumptions: entry age 30, $25,000 starting salary, 5% salary inflation with a 7% interest rate.

Table 11

CASE EXAMPLE FOR ILLUSTRATING BENEFIT FORMULA

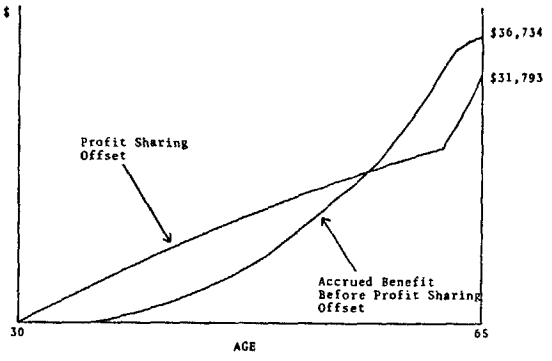
ENTRY AGE IN 1980:	AGE 30
STARTING SALARY:	$25,000
SALARY INCREASE:	5% PER YEAR
INVESTMENT RETURN:	7% PER YEAR
PROFIT SHARING CONT.:	$4 PER UNIT

SUMMARY OF 1980 PLAN DESIGN

- RETIREMENT
  - ELIGIBILITY: AGE 65
  - BENEFIT: 1.5% FAS PER YEAR (TO 50%) - 58.74% OF PIA - 100% OF PROFIT SHARING BENEFIT
- EARLY RETIREMENT - UNREDUCED
  - ELIGIBILITY: 30 YEARS SERVICE OR AGE 55 WHEN THE SUM OF AGE PLUS YEARS OF SERVICE EQUALS 85
  - BENEFIT: ACCRUED BENEFIT
- EARLY RETIREMENT - REDUCED
  - ELIGIBILITY: AGE 55 WITH 10 YEARS SERVICE
  - BENEFIT: ACCRUED BENEFIT REDUCED BY FORMULA REDUCTION FACTORS
- VESTING: 10 YEARS SERVICE
- DISABILITY:
  - ELIGIBILITY: AGE 50 WITH 15 YEARS SERVICE
  - BENEFIT: ACCRUED BENEFIT
- DEATH:
  - ELIGIBILITY: ELIGIBLE FOR EARLY RETIREMENT
  - BENEFIT: 50% JOINT AND SURVIVOR ANNUITY
- PROFIT SHARING UNIT: 2 FOR EACH YEAR OF BENEFIT SERVICE PLUS 1 FOR EACH $100 IN BASE EARNINGS

Table 12

ILLUSTRATION OF BENEFIT FORMULA
FOR AGE 30 ENTRANT



$4 per unit can be estimated by about 4% of salary. You can see the actuary's assumptions, in this first plan, at about age 58 we have a cross-over and thereafter there is a residual pension benefit. As an aside, one of the key features which affects costs in a plan like this is the retirement rates. It is a shame we cannot go into that here. Both of these plans' actuaries assume all retire at age 65. The second example for this first plan is based on what our client considers as best estimate assumptions, which I am sure is going to raise some eyebrows. The next slide (see Table 13) shows the details.

Table 13

CASE EXAMPLE OF ILLUSTRATING BENEFIT FORMULA

BEST-ESTIMATE ASSUMPTIONS

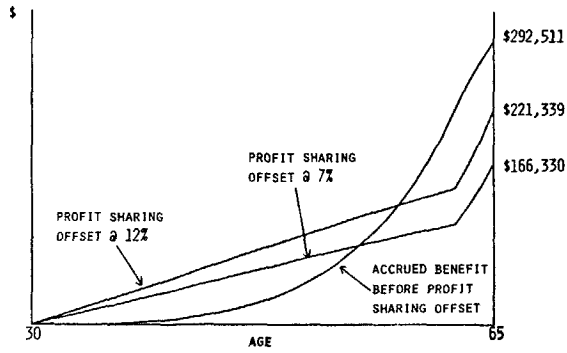
ENTRY AGE IN 1980:	AGE 30
STARTING SALARY:	$25,000
SALARY INCREASE:	8 1/2% PER YEAR + MERIT SCALE
INVESTMENT RETURN:	12% PER YEAR (PENSION) 11.25% PER YEAR (P-S)
ANNUITY PURCHASE RATE:	12% (CURRENT 7% ALSO)
PROFIT SHARING CONT.:	$4 PER UNIT

Table 14

ILLUSTRATION OF BENEFIT FORMULA

FOR AGE 30 ENTRANT

(BEST-ESTIMATE ASSUMPTIONS)



As you can see in this slide (see Table 14), the relationships between guaranteed benefits and profit sharing offsets are not that much different than in the first slide that I showed. Using drastically different sets of assumptions, though the actual dollars are very different, the pattern of benefits are much the same. As it turned out in this particular plan, the best estimate costs were almost identical to the plan actuary's. However, there were so many things going on in the best-estimate valuation, that were different than in the actuary's, that this was merely chance.

This is the second plan (see Tables 15 and 16) that I want to display. As you see, it is very similar to the first, e.g., the 1.6% per-year accrual, the Social Security offset, the 100% offset for the profit sharing plan. Here we have 6% per year of salary for the profit sharing benefit versus the first plan which was 4%. That turns out to be the key difference here.

Table 15

CASE EXAMPLE FOR ILLUSTRATING BENEFIT FORMULA

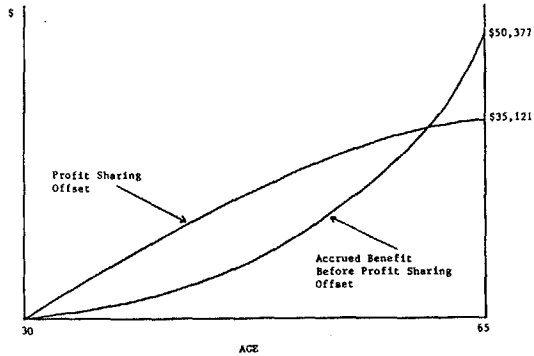
ENTRY AGE IN 1980:	AGE 30
STARTING SALARY:	$25,000
SALARY INCREASE:	5% PER YEAR
PROFIT SHARING CONT.	6% OF SALARY
INVESTMENT RETURN:	6% PER YEAR

SUMMARY OF PLAN DESIGN

- RETIREMENT
  - ELIGIBILITY: AGE 65
  - BENEFIT: 1.6% FAS PER YEAR − 1.5% OF PIA PER YEAR (TO 50%) − 100% OF PROFIT SHARING BENEFI
- EARLY RETIREMENT
  - ELIGIBILITY: AGE 55 WITH 10 YEARS SERVICE
  - BENEFIT: ACCRUED BENEFIT WITH 5% REDUCTION FOR EACH EACH AGE BELOW 62 AND 7% REDUCTION FOR EACH AGE BELOW 60
- LATE RETIREMENT: ACTUARIAL INCREASE IN AGE 65 BENEFIT
- VESTING: 10 YEARS SERVICE
- DEATH BENEFIT:
  - ELIGIBILITY: ELIGIBILITY FOR EARLY RETIREMENT
  - BENEFIT: 50% JOINT AND SURVIVOR ANNUITY

Table 16

ILLUSTRATION OF BENEFIT FORMULA
FOR AGE 30 ENTRANT



Beginning with an individual analysis based on the plan actuary's assumptions, which are not drastically different from the first plan, you can see that the pattern of accrued benefits are pretty much the same as for the first plan. The problem is, we can get comfortable assuming at this point that we do not have to look at a comparable best-estimate example. There is not that much difference between the plans and the initial assumptions were almost identical. As you can see here (see Table 17), this client's set of best-estimate assumptions are not that much different from the first.

Table 17

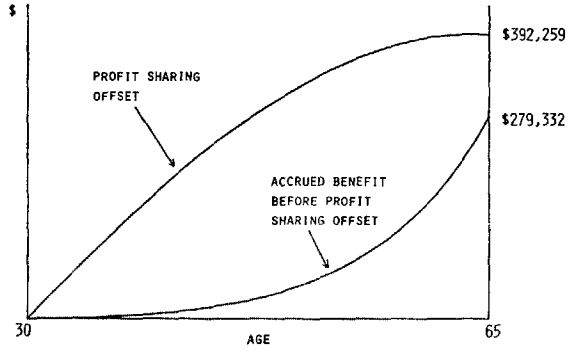
CASE EXAMPLE FOR ILLUSTRATING BENEFIT FORMULA

BEST-ESTIMATE ASSUMPTIONS

ENTRY AGE IN 1980:	AGE 30
STARTING SALARY:	$25,000
SALARY INCREASE:	8.5% PER YEAR + MERIT SCALE
PROFIT SHARING CONT.:	6% OF SALARY
INVESTMENT RETURN:	13% PER YEAR
ANNUITY PURCHASE RATE:	13% PER YEAR

Table 18

ILLUSTRATION OF BENEFIT FORMULA
FOR AGE 30 ENTRANT
(BEST-ESTIMATE ASSUMPTIONS)



But please notice in this next slide (see Table 18) that an individual in this second plan does not accumulate a residual benefit under these best-estimate conditions. The net pension benefits are extremely negative. As it turns out, there is also no plan cost here. In fact, plan costs are zero at 11% interest, as well.

This is my last slide (see Table 19). I have about 20 just like this, but we will stop with this one. This one is for the first private plan we discussed. The current funding method for this plan was actually FIL, but I am illustrating entry age normal cost here because it is a little more enlightening. The new assumptions that we had expected the plan actuary to use in 1980 were going to be 8% interest and 6% salary plus a merit scale, explaining the 100% at 8%/6%. This slide shows that the two-for-one rule still holds reasonably well if we move to 9/8 or 10/10. But moving horizontally or vertically, you will see our one percent change producing a 10% or 20% change-in-cost rule respectively does not hold. If you move from 8/6 to 9/6, you see a 40% decrease in cost instead of 20%. If you go from 8/6 to 8/7, you can see a 30% increase in cost. The sensitivity of the second plan is even more drastic.

Table 19

PERCENT OF BASELINE E.A.N. NORMAL COST
UNDER ALTERNATIVE INTEREST AND SALARY INFLATION ASSUMPTIONS

Salary Increase	Interest						
	7%	8%	9%	10%	11%	12%	13%
6% + Merit	153.6%	100.0%	60.2%	31.4%	13.2%		
7% + Merit	191.0	129.3	82.5	47.6	22.9	8.7%	
8% + Merit		162.4	108.3	67.2	36.9	16.1	5.4%
9% + Merit			137.6	90.1	54.0	27.8	10.9
10% + Merit				116.0	74.3	42.8	20.2

MR. SMITH: Hopefully, we are going to have time for some questions. I would like to see some discussion of interest rates above 10% and salary inflation below 8%. Our next speaker is Mr. Charles Nightengale. Charles majored in mathematics at the University of Minnesota and he worked for a number of years at our Pacific Mutual Life. A few years ago he moved to the Zischke Organization in San Francisco which just recently joined Wyatt.

MR. CHARLES E. NIGHTENGALE: Thank you Bill. It is the Wyatt Company. In addition to Arden's presentation this afternoon, there have been a number of papers published in the Record and Transactions of the Society, as well as in the Proceedings of the Conference, which deal with the theory behind establishing salary scale and interest assumptions for valuations of pension plans. Therefore, rather than expound on the theory for adopting assumptions, I will review with you the results of a survey of actuarial assumptions so that we can see what actuaries around the country are actually doing, as opposed to what they talk about. In addition, I will discuss what I consider to be the non-economic forces affecting the interest assumptions used in actuarial valuations. By non-economic forces, I have in mind such things as the requirements of Schedule B, FASB 35 and 36, and the Multiemployer Pension Plan Amendments Act of 1980. When I talk about actuarial valuations, I mean the entire valuation process, including the calculation of various actuarial present value figures for whatever purpose they are to be used, and not just the development of the contribution requirement for funding purposes.

First of all, I would like to review with you the survey of actuarial assumptions which the Wyatt Company has conducted. This annual survey has been conducted for a number of years and it reviews the actuarial assumptions for plans covering more than 1,000 active participants. The survey includes hourly, salaried and multiemployer plans providing benefits that are unrelated to pay, career average benefits, and final average benefits. The survey covers plans for which Wyatt actuaries do the work and non-client plans as well. I think it reflects a good cross section of plans in the United States as well as a valid sample of thinking among both actuaries and plan sponsors. This conclusion is reinforced by the results of another survey which Peat, Marwick, Mitchell & Co. recently conducted of some 180 final average plans. The results of this survey were very comparable with the results of the Wyatt survey with respect to the average interest and average salary scale assumptions.

As one would expect, the results of the Wyatt survey indicate that the interest assumption has been increasing over the past few years. In Table I, we see that the average interest assumptions for all plan types was 6% in 1979, based on a sample of 580 pension plans. This compares to an average interest rate of 5.4% in 1975, which was for most plans the last plan year before ERISA minimum funding requirements. Probably a more interesting series of numbers to look at is the cumulative distribution of plans using an interest assumption greater than a given rate as illustrated at the bottom of Table I. In 1975, only 29% of the plans used an interest assumption in excess of 5.5% whereas for 1979, 68% of the plans were using an interest assumption greater than 5.5%. Although not shown in Table I, if we went back to 1970 we would see that only 13% of the plans surveyed had assumed an interest rate over 5.5%. In 1979 about 14% of the plans increased the interest assumption from the prior valuation. These changes range from .25 of a percent to as much as 2.75%.

Table II provides an interesting breakdown of the average interest assumption by type of benefit formula and plan size. You will notice that there is some variation by type of plan; the final average plan has a higher average interest assumption than either the career average plan or those plans where benefits are unrelated to pay. The 1979 average of 6.1% for final average pay plans, regardless of size, is slightly higher than that found in the Peat, Marwick, Mitchell & Co. survey of 180 plans. Their survey indicated an average interest assumption of slightly under 6%. Looking at the average interest rates by size of plan, we see that there is very little correlation between size and interest assumption. About 75% to 80% of the plans in the survey are in the 1,000 to 4,999 participant category. Each of the other two categories contain about 10% to 12% of the plans.

Table III presents results of the 1979 survey on 294 final average plans and reflects the distribution by valuation rate of interest and the corresponding salary scales. The average salary scale was 4.2% and the average interest rate was about 6.1%. The Peat, Marwick, Mitchell survey reflected an average salary scale assumption of about 4.25% and an interest rate of just under 6%. Of all plans with pay-related benefits, about 90% used a salary scale; however, only half of the career average plans used a salary scale, compared with 99% of the final average plans. This reflects the fact that about 45% of the career average plans used a unit credit funding method.

A common measure of the relationship between the interest assumption and the salary scale assumption is what is often referred to as the "spread", that is, the difference between the assumed rate of interest and the salary scale. Table IV presents what the spread has been during each of the 5 years 1975 through 1979. As might be expected, the spread has declined from an average of 2.3% in 1975 to an average of 1.9% in 1979.

In summary, we have seen that both the interest rate and salary scale assumptions have been increasing over the past few years. I am sure that this comes as no great surprise to anyone, but I think it is of interest to see what the absolute levels are. I guess you could say that we have substituted "demonstrations for impressions". I think it is safe to say that this increasing trend will continue in the near future.

TABLE I

VALUATION RATE OF INTEREST

(All Plan Types)

Interest Rate	1975	1976	1977	1978	1979
4.5% or less	14%	7%	5%	4%	3%
5.0%	36	29	23	18	15
5.5%	21	20	23	19	14
6.0%	24	32	34	41	43
6.5%	1	3	4	5	7
7.0%	3	6	8	9	12
Over 7.0%	1	3	3	4	6
Average Rate	5.4%	5.6%	5.7%	5.9%	6.0%
Number of Plans	424	462	478	557	580

CUMULATIVE DISTRIBUTION

Interest Rate	1975	1976	1977	1978	1979
Greater Than 5.0%	50%	64%	72%	78%	82%
Greater Than 5.5%	29	44	49	59	68
Greater Than 6.0%	5	12	15	18	25
Greater Than 6.5%	4	9	11	13	18

TABLE II

AVERAGE INTEREST RATES BY BENEFIT FORMULA AND PLAN SIZE

FINAL AVERAGE PLANS

Plan Size	1977	1978	1979
1,000-4,999	5.8%	6.0%	6.1%
5,000-9,999	6.1	6.1	6.2
10,000 or more	5.7	6.0	6.2
All	5.8%	6.0%	6.1%

CAREER AVERAGE PLANS

Plan Size	1977	1978	1979
1,000-4,999	5.5%	5.6%	5.7%
5,000-9,999	5.4	5.4	5.5
10,000 or more	6.1	6.1	6.1
All	5.6%	5.7%	5.7%

UNRELATED TO PAY PLANS

Plan Size	1977	1978	1979
1,000-4,999	5.6%	5.7%	5.8%
5,000-9,999	5.7	5.9	6.1
10,000 or more	5.7	5.8	6.0
All	5.6%	5.7%	5.8%

TABLE III

INTEREST RATE - SALARY SCALE ASSUMPTIONS

1979 Survey

294 final average plans

	Valuation Rate of Interest						
Salary Scale	5.00%	5.50%	6.00%	6.50%	7.00%	7.01% More	TOTAL
2.00% or less	3	3	2	-	-	-	8
2.5%	6	3	5	-	1	-	15
3.0%	9	9	9	2	2	1	32
3.5%	5	5	6	-	-	-	16
4.0%	5	13	57	3	6	-	84
4.5%	-	2	19	5	2	-	28
5.0%	2	1	34	6	20	-	63
5.5%	1	-	1	3	5	2	12
6.0%	-	1	2	3	4	6	16
More than 6%	-	-	2	3	2	13	20
Total	31	37	137	25	42	22	294

Average Rate of Interest 6.1%

Average Salary Scale 4.2%

TABLE IV

SALARY SCALE SPREAD

Final Average Plans Only

Salary Scale Spread	1975	1976	1977	1978	1979
Negative (Salary Scale exceeds Interest Rate)	2%	3%	2%	2%	1%
Zero	1	1	1	2	3
.5%	2	*	*	*	2
1.0%	12	13	12	14	17
1.5%	15	11	13	17	19
2.0%	20	27	31	35	35
2.5%	16	11	12	12	10
3.0%	11	18	15	10	7
3.5%	8	7	7	3	2
4.0%	5	8	6	3	3
4.5% or more	8	1	1	2	1
Average "Spread"	2.3%	2.2%	2.2%	2.0%	1.9%
Number of Plans	200	223	234	291	294

Now I would like to talk about what I call non-economic forces affecting the interest assumption used in the valuation of pension plans. Typically, we talk about an underlying rate of return and an inflation element. Generally, a range is presented for each, e.g., 0% to 3½% as the underlying rate of interest with inflation running from about 3% to 8%. This results in a combined range of 3% to 11½%. I presume that most actuaries have a much narrower "comfort zone" when it comes to choosing the interest assumption that they would call their best estimate; at least I do. By "comfort zone" I mean a range of interest rates within which one would feel comfortable choosing a rate and labeling it a best estimate. The specific rate chosen would depend on such factors as (1) desires of plan sponsor, (2) plan design, (3) investment philosophy, etc.

The premise I am going to start with is that the range of this comfort zone is narrowing and has been for several years. In general, this comfort zone of interest rates has narrowed because there are more and more audiences to whom we must address ourselves and these audiences are becoming more attentive. We must have a greater degree of consistency and a higher level of realism so that we maintain some credibility with these audiences. When possible, we should use the same assumptions for all purposes for an ongoing plan and not have different values for the same thing. Since the various audiences may have different objectives we must move closer to a middle ground that will be acceptable to nearly all. Even though it is theoretically possible to justify a different interest rate for different purposes, from a practical standpoint, I think it is generally undesirable to do so.

The first of these non-economic forces that we saw was ERISA, with its requirements for Schedule B of Form 5500. For purposes of calculating the present value of accrued benefits (item 6), Schedule B requires the actuary to use a best estimate for each significant assumption, including, of course, the interest assumption. On the other hand, for purposes of minimum funding charges, the actuary can use actuarial assumptions which, in the "aggregate" are reasonable and reflect the actuary's best estimate. As a practical matter, if for no other reason, I think the assumption should be the same for both purposes. As a result of having to show the present value figures on the Schedule B, the interest rate comfort zone has narrowed, primarily by increasing the lower extreme. A further implication here is that we cannot implicitly fund for future benefit increases under career average or non-pay related plans to the same degree that we might previously have done.

The next event that placed pressure on the interest assumption was the publication of FASB 35 and 36. The increase in the disclosure requirements is bringing more awareness of pension plans. The accounting profession is considerably more interested in the assumptions being used for the actuarial present values. Also, the plan sponsor may be concerned about the level of unfunded liabilities that are reflected in the footnotes of the Company's financial statements and in the plan's financial statements. As the audience grows, more questions are going to be asked. We in turn will have to be more consistent if we expect to maintain credibility with the public. I think, in general, the value used for FASB 35 and 36 should be the same as that used for Schedule B. There certainly is no requirement that they be the same, but, to avoid misunderstanding and to maintain the credibility of the values for either purpose, I think it is desirable.

The next major force having impact on the interest assumption is the withdrawal liability question under the Multiemployer Pension Plan Amendments Act of 1980. Although this applies only to multiemployer plans, I think its effect on the interest assumption will have some carryover to single employer plans. In general, the Act requires that the employer who withdraws from a multiemployer pension plan must continue making contributions until that employer's share of the unfunded vested benefits is paid off. A significant issue is what interest assumption is appropriate for the calculation of the plan's unfunded value of vested benefits.

Section 4213 of the Act provides that the actuarial assumptions used to determine the unfunded value of vested benefits may either be (1) assumptions set forth in PBGC regulations, or (2) assumptions which in the aggregate are the actuary's best estimate.

Since the interest assumption is probably going to be the single most controversial item, assumptions set out in PBGC regulations would seem to be a "safe harbor" approach. These regulations have not been issued and it does not seem likely that they will be issued very soon. I think it is safe to assume that the PBGC assumptions for purposes of withdrawal liability under multiemployer plans will not be the same as the assumptions PBGC uses for assigning liability for single employer plan terminations. The reason for the difference would be that the liability under a terminated plan is an amount due and payable immediately, whereas the multiemployer withdrawal liability is an amount payable over a period of years. The period is at most 20 years but in most cases will fall between 5 and 10 years. The actual period is very dependent on the ratio of the normal cost to the total contributions being made to the multiemployer plan since the withdrawing employer's contribution is fixed at basically the same level as was being paid immediately prior to withdrawal. There has been some indication from the PBGC that they do not intend to issue a single set of assumptions but rather some formula adjustment to the plan's funding assumption. I do not know exactly how this adjustment would work, but it seems to me that the PBGC would have to assume that the plan's funding assumptions were somehow ideal and that unless they were you would probably lose the "safe harbor". We will just have to wait and see on this issue.

The second alternative for choosing assumptions to determine the unfunded value of vested benefits is use of the actuary's best estimate. The best estimate requirement here is the same as the requirement for minimum funding purposes under IRS Code Section 412. However, since on Schedule B the present value of vested benefits must be based on individual best estimate assumptions it seems to me that the actuary is forced to use individual best estimate assumptions for withdrawal liability purposes also. To do otherwise would result in two different values for the same item, both of which are supposed to the actuary's best estimate. I think it would be difficult to defend such a position. This argument suggests, then, that the same interest assumptions be used for purposes of funding, withdrawal liability calculations, and present value of vested benefit calculations for Schedule B.

I think that as the actuary, you have to keep in mind (1) the interest of the plan participant, (2) the interest of the withdrawing employer, (3) the interest of the employers remaining in the Trust, and (4) your own personal liability. Somehow the actuary must attempt to satisfy all

these parties. I think that if an assumption is equitable to both the withdrawing employer and the remaining employers in the trust, then it naturally will be equitable to the plan participants, and so the actuary will not have to worry. That is a tough order, however.

I think that in general, most multiemployer plans, as well as a lot of non-salary related single employer plans, in the past have used interest assumptions which have implicitly provided for some degree of future benefit improvements. If the funding interest assumption is going to be used for determining withdrawal liability, and I think it should, I believe that this practice will have to change. The Act is fairly clear on the point that a withdrawing employer is not to be assessed the liability for benefit improvements occurring after withdrawal. It would therefore seem to me that any actuarial assumption which made allowance for future benefit increases would be considered unreasonable.

I think one of the principal considerations for the actuary and the trustees is to avoid litigation if possible without giving away the store. There certainly is a point, however, at which litigation may be cheaper than using too liberal actuarial assumptions. We probably will not be able to avoid arbitration and/or litigation if any significant withdrawal liability is involved, but I think it is important that the interest assumption at least appear to be a good faith attempt at being reasonable. As I mentioned previously, I think funding assumptions and the assumptions used for withdrawal liability should be the same. If, as a result, the actuary increases the interest assumption for funding purposes, this process will influence what the same actuary does for single employer non-pay related plans.

In summary, we can see that there are forces other than purely economic forces which have had their impact on increasing the interest rate assumed in pension plan valuations. I think we have to keep practical considerations in mind as well as the scientific and theoretical considerations when we deal with economic assumptions for pension plans.

MR. SMITH: Thanks very much to all our panel members. We do have time for questions.

We have had a discussion of the interrelationship between wages and investment yields on pension plans, and I jotted down what appears to me to be the range. SRI in their studies thought that the difference between wage inflation for teachers and the yield rate should be no more than 1%. The teachers also have a longevity and merit component, and for the California teachers, that is something like 2%. For an individual teacher over that individual's working lifetime, wage increases were about 1% greater than the assumed investment yield for a portfolio having about 25% in common stock.

Mr. Nightengale's study shows that the total salary assumption is, on average, 2% below the yield assumption for the particular group of plans that were studied. Mr. Marks showed some studies where apparently the yield rate assumption is more than 4% greater than the total wage assumption. We are seeing a range of something like -1% to +4%. One has to ask how this can be. Can the real world actually produce results differing that much between various plans, or is this just a disagreement among actuaries

about what the assumptions ought to be. If it is a disagreement about assumptions, we should be asking ourselves if that range is not too great.

Now is the time for questions. Please identify yourself and state your company affiliation.

MR. JOHN H. BARATKA: The question is for Dr. Hall. It has been suggested that with high inflation rates you do not have a real rate of return. Would you comment on the possibility that as you get to a higher assumed rate, that you ought to have a smaller difference, and perhaps no difference or a negative difference at very high rates.

DR. HALL: We have seen negative rates of return in some circumstances recently, and this is a phenomena that is not revolutionary; it is something that can happen. However, for the purpose of making projections over a long period of time, I think it is unlikely that a negative rate of return would be appropriate, whatever the inflation assumption. Negative rates of return come about because of unexpected increases in inflation. People are investing with some expected rate of return, and circumstances produce a higher rate of inflation than they expected, producing a negative rate of return. That can happen to individuals and it can happen in particular periods of time. If it continues for a long period of time, then you can reduce the argument to an impossibility. If it were really true that we could expect a negative rate of return, people would not be investing. The capital market would fail. It is hard to think of an economy where people consistently go about losing their money for long periods of time. The observation of negative rates of return in the short run is not inconsistent with the idea that predictions over a long period ought to include a positive rate of return.

I think that the long run real rate of return after inflation is independent of the level of inflation. The only circumstance where that may not be true is if it were possible, for longer periods of time, to have an accelerating inflation rate. If the rate of inflation were getting higher and higher, presumably people would be consistently guessing too low about what the future rate would be. In that case, they could be experiencing long term rates of return that were negative for quite a long period of time. However, there is no example of that that I know of in economic history. So, I do not think that alternative ought to be given a lot of weight.

MR. SMITH: There are some countries that have experienced extremely high levels of inflation for long periods of time, mostly in South America. Do you know of any studies which indicate that they can actually get a positive rate of return?

DR. HALL: I know from discussion with other economists that what happens is a lot of things get indexed to a much greater extent than we have indexation in the United States.

MR. JOHN W. WOOD: Mr. Nightengale, I must say that I thoroughly disagree that there should be any close relationship between termination assumptions and long range assumptions. I think they are entirely different things. They might be close, but there is no reason for them to be close as far as I can see. As a profession we ought to be able to explain that these are two very different things. We are predicting investment returns

forty years into the future for the one purpose, and for the other purpose we determine the current investment yield and calculate the value.

There is something else you said that I just did not understand. Do you feel that the coming together of assumptions of all actuaries is a desirable thing?

MR. NIGHTENGALE: I am not suggesting that all actuaries should use the same assumptions. I am just making the point that the range that any particular actuary is using is getting narrower. I would not encourage that all actuarial assumptions be the same for all actuaries.

MR. WOOD: Should the same actuary use the same assumptions in all cases?

MR. NIGHTENGALE: I think the actuary is going to want to stay within what I referred to as his "comfort zone".

MR. WOOD: He should probably use the same internal logic in arriving at the rates but they could be very different. For instance, the difference between the salary scale and the interest rate depends very much on the relative funding of the plan. For a new plan, I think everyone would say that the difference ought to be less than it is on a mature plan or an over funded plan.

MR. SMITH: Would you care to give us some logic behind that?

MR. WOOD: The logic is that if you have a very large fund, and you have a lot of retired people, then you can tolerate a much larger difference from the actives. If you have a plan with no funds in it with which to earn excess interest, and all your liabilities are growing, then you need a closer differential between the two.

MR. NIGHTENGALE: I would just like to make one comment. I did not intend to imply that I suggest the same interest assumption for a plan termination as for an ongoing plan. For purposes of FASB 35 and 36 and Schedule B the intent is to assume an ongoing plan and you do not value it as if it is terminating.

MR. GORDON W. CLARKE, JR.: We have struggled with the issue that was just discussed. Moving from the accounting Opinion 8 requirements to the FASB requirements, FASB makes it very clear that you must use market value rather than the asset value that you use in the valuation. There is automatically a change on one side of the equation, and so the actuary seems to have a logical reason to say, well, I can use the PBGC assumptions for example. Some of the actuaries in our firm are doing that. Mr. Nightengale, is your opinion that those interest rates ought to be the same shared throughout Wyatt or are there some differences?

MR. NIGHTENGALE: I can assure you that my opinion is not universal within the Wyatt Company, in fact, I may be the only one who has that opinion. I have not taken a poll or survey. Within the Wyatt Company, there are probably as many opinions on the question as one would find in this room today.

There are situations with particular clients, particularly if the unfunded

liability is high, which would dictate using two different assumptions. In general, however, I would encourage use of the same assumption for both purposes.

MR. CLARKE: When you get into using the PBGC rates, those rates change quarterly. We have told each of the accountants that we are providing FASB information for, that comparability will be a problem when we hit the second round of this thing.

MR. MARTIN J. ZIGLER: Seeing the range we have seen in assumptions, do you think there is a possibility that the IRS will step in and dictate proper assumptions? Along the same line, do you think we might be moving toward the situation where a change in actuarial assumptions will have to be approved in advance by the IRS?

MR. NIGHTENGALE: I would like to be optimistic and respond in the negative to that. There may be some movement to put some bounds on our assumptions, but I would hope there would be enough opposition to prevent it.

MR. SMITH: I think that we have to be made nervous by the range that we are seeing in these assumptions.

MR. DONALD E. FUERST: The question is for Dr. Hall. You made an interesting comment about increases in wages resulting from capital investments. You used the example of secretaries increasing productivity because of word processing equipment. Our experience with that very example was that when we installed the word processing system, we were able to reduce the number of secretaries by 20% over a 12-month period. If every actuary did the same thing in his office, we would increase the supply of secretaries, and reduce the demand. This would tend to lower salaries rather than increase them.

DR. HALL: Secretaries are not the only people who are benefitting from better capital equipment and increases in productivity. It may be true that there are some innovations that reduce the demand for certain occupations. However, in the aggregate, this effect that I am talking about still happens. It is certainly true that in the aggregate there has been no decrease in the demand for labor. If we really believe that improvements in capital equipment really reduced the demand for labor overall, we would all be unemployed by now. That clearly has not happened. The example that you are using is a reallocation of labor, and certainly that occurs.

It seems to me that the level of skill and training of industrial workers has not really increased that much in, say, the last 50 years. Yet clearly, in the aggregate, their wages have gone up quite a bit and that is because they are more productive than they used to be. The reason that they earn more is that they are working with much better equipment.