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SELECT AND ULTIMATE FINANCIAL ASSUMPTIONS
IN PENSION PLAN VALUATIONS

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Discussion of the paper "Select and Ultimate Financial Assumptions in Pension Plan Valuations: An Analysis of the Issues" by the Society's Committee on Pension Principles and Related Research (TSA Volume 37 1985).

MR. T. THOMAS SIMESTER: *The mission of the Society's Committee on Pension Principles and Related Research is to undertake studies in the pension field that would be of service to the actuarial profession. During 1985 the Committee has worked on three separate projects. The most recent of these is a paper addressing the issues regarding the choice of a reasonable interest assumption. Another paper presents several model work forces in the form of age, service, and compensation distributions which could be used as a convenient data base for studies of various alternatives under pension plans. Finally, the Committee has been working on this select and ultimate paper.*

The select and ultimate topic was originally suggested by the American Academy of Actuaries' Pension Committee. The paper examines the advantages and disadvantages of using select and ultimate financial assumptions and discusses some of the technical issues involved.

Some of the possible advantages of select and ultimate assumptions are producing better matching of assets and liabilities, and perhaps minimizing the need to run valuations under several sets of assumptions for different purposes, such as for funding or Financial Accounting Standards Board (FASB) purposes; enhancing communications; and perhaps reducing the likelihood of a challenge to the results of a valuation. Some of the disadvantages are that the actuarial techniques are more complex, and more frequent changing of actuarial assumptions would be required. Also, using these assumptions may imply a greater accuracy than warranted. The paper goes on to explore various technical issues

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involved with select and ultimate assumptions, such as choosing the individual select and ultimate rates, valuation procedures, amortizing unfunded actuarial liabilities, the effect of select and ultimate assumptions upon the choice of funding method and optional benefit factors under the plan.

The purpose of the paper is to study the advantages and disadvantages of select and ultimate financial assumptions--not to advocate using them. The rates used in the examples in the paper are purely arbitrary. The actual choice between select and ultimate rates or level rates depends on the asset mix of a particular plan, the plan's cash flows, and perhaps the feelings of the actuary doing the valuation.

MR. PETER MORGAN: There is little or no use of select and ultimate assumptions for valuation purposes in the United Kingdom. We do use select and ultimate assumptions when looking at projections but rarely for valuations. We have some alternatives to using select and ultimate assumptions.

Initially the paper remarks on the possibility of the Internal Reserve Services (IRS) challenging level actuarial assumptions which are different from prevailing current conditions. As a relative outsider, I should like to know if this actually happens and the extent to which it does. I am not talking about the IRS challenging the use of a 3 percent interest rate but, rather, challenging a rate of 7 or 8 percent, just because it is different from prevailing conditions.

It is also suggested in the paper that the use of select and ultimate assumptions will enhance communications. I am not convinced that explaining to a client that we are using a 14 percent rate for two years, then 11 percent, then 10 percent and so on, is any simpler than explaining to him that we are using an average rate of 8 percent which allows for current rates falling and the effect of reinvestment rates. We all have clients who query why we are not using 12 percent throughout when interest rates are currently 12 percent, but those clients are also going to query the select and ultimate approach.

One advantage of using select and ultimate assumptions is that you can use the same assumptions for many purposes and can avoid using different rates for benefit options and so on. Also you do not have to use different rates when looking at past service liabilities. The paper refers to valuing accrued benefits to comply with FASB requirements. In the United Kingdom most of the problems we get in this area arise when we are involved with mergers and takeovers, and we have to value past service liabilities either with or without allowing for salary increases. Clients get confused when we explain that we are not going to use the valuation rate--we are going to use different rates, because we are looking at just past service liabilities. We are not worrying about future service or reinvestment of future contributions, just the current assets and the reinvestment of income from current assets. That is why we would argue that we can use a higher rate for this purpose than in a valuation. Also, in the United Kingdom we do not have "best estimate" rules for actuarial assumptions. Assumptions are more conservative than current conditions, and that is another reason

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for using higher rates when you apportion funds in the event of a merger or takeover. Using select and ultimate assumptions might reduce the problem of communication in these circumstances.

The paper points out that using select and ultimate assumptions is one approach to achieving consistency between asset and liability valuations using market values and market rates. However, I doubt that this achieves consistency. It is fine if you have dedicated bond portfolios, guaranteed investment contracts (GICs) or cash, but, for example in the United Kingdom, by far the largest parts of portfolios are held in equity investments (i.e., common stock and property). The relationship between the market values of those assets and market rates of interest is far from consistent, at least in the short term. So, in the United Kingdom we achieve consistency by adjusting the asset valuation instead of the liability valuation.

The paper states that the recent volatility of interest rates has damaged the credibility of using level interest assumptions. I believe volatility enhances the credibility of level assumptions in the same way that volatility enhances the use of asset values other than market value. I do not think market values and market interest rates are necessarily well correlated in the short term unless one is looking at well-matched bond portfolios. There is less correlation with equity, real estate, or mismatched bond portfolios.

On the disadvantages of using select and ultimate assumptions, I agree that this use implies too great a degree of accuracy. The paper refers to comparing valuation rates, either level or select and ultimate, with investment returns and the danger of investment managers just "homing" in on the valuation rate as a target. It is up to the actuaries in both the United Kingdom and the United States to stress that managers should be looking at the long term.

There is a question of whether select and ultimate assumptions are more complex to adopt. That is probably becoming less true, although this will make "back of the envelope" gain-and-loss analyses by source more difficult, particularly if you keep changing the assumptions. The use of select and ultimate assumptions will inevitably lead to more frequent changes of assumptions simply because they are purporting to be more accurate. Using level rates which are an approximation to the average long-term rates and which need only be changed if it is thought that long-term conditions have changed, may be better than frequently changing the assumptions, as would be needed under the select and ultimate approach. However, I have heard many people, particularly members of FASB, disagree with that.

The paper states (1) that investment gains and losses will be minimized and (2) that the use of select and ultimate assumptions based on current market rates will more closely match actual investment experience. I disagree. If you have a GIC or immunized portfolio this may be true, but it may not be true if you have substantial equity and real estate investments. It would be interesting to do an analysis of what would have happened in the past if select and ultimate rates had been used and whether investment gains would have been minimized. However,

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when interest rates are, say, 10 percent, the return on the portfolio is just as likely to be -20 percent as +20 percent, so the difference in the investment gain or loss when you are using a level rate of 8 percent versus when you are using select and ultimate assumptions starting off with, say, 11 percent is not going to be substantial. For the same reasons I am not sure you will end up with a better representation.

With the new method for calculating pension expense, we need to calculate a service cost, the value of the projected benefit obligation, the interest cost, and the investment return credit against the interest cost. The FASB proposals presume the use of age-dependent interest assumptions for calculating the service costs and projected benefit obligation and suggest that we use current settlement rates--possibly the Pension Benefit Guaranty Corporation (PBGC). Presumably, the select and ultimate approach will be equally acceptable to the FASB for calculating service costs or the projected benefit obligation because that essentially is the same approach that the insurance companies and the PBGC are adopting in coming up with their settlement rates. But on the question of the interest cost and the investment cost, the implication in the paper is that most people will use some kind of average composite rate which would be similar to the level assumption equivalent to the average settlement rate. It will be interesting to see if the FASB, in fact, will allow the initial rate under the select and ultimate approach to be used for this purpose.

Turning now to the United Kingdom, select and ultimate assumptions hardly ever are used for normal valuations, although they are clearly used when looking at projections. My own firm considered using select and ultimate assumptions some time ago because we thought it would enhance communications, although I query that now. For the period up to retirement, the gap between the interest and the salary inflation assumption is more relevant than the absolute rates. In the United Kingdom we have a more prevalent practice of awarding postretirement pension increases. When looking at the postretirement period, we are looking at the differences between investment return and price inflation. So it is the difference ("gaps") between total investment return, salary inflation, and price inflation which are important to us. When looking at the select and ultimate approach, we are interested in the select and ultimate assumptions with regard to those gaps. Just as in the United States, in the United Kingdom we will typically use a gap of 1 to 2 percent for the long-term gap between investment return and earnings inflation, and 3 to 4 percent as the gap between investment return and price inflation. If one is going to adopt the select and ultimate approach for the gaps, I am not sure that I would have a clear idea of what the gap is going to be beyond a three-year period. If that is the extent of the period for which you are going to adopt different assumptions, it does not amount to a substantially new approach. One can easily do a normal valuation and say, "If in the next three years, experience is going to be slightly different, this is what the effect on the valuation will be."

It is worth bearing in mind in the connection that, in the United Kingdom, we still have much more flexibility regarding funding. There is no minimum funding contribution; there is no funding standard account;

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there is no maximum contribution within limitations. All we would do in these circumstances is show the short-term variation of assuming slightly different experience from the assumptions, and it may not have any major effect on contributions. It would be treated in the same way as if we were doing a miniprojection.

We do something in the United Kingdom in connection with achieving consistency between assets and liabilities by modifying the asset valuation. We probably use the discounted cash-flow approach more often than it is used in the United States. Another approach for an equity portfolio is to adjust the yield basis on which you are valuing the equity part of the portfolio. In the United Kingdom, we have the Financial Time's Actuaries All Share index which is similar to the Standard & Poor's 500 index. The annualized dividend yield on the index is published every day and if we think it is too high (say the yield is 6 percent, the stock market is undervalued, and we think 5 percent is more consistent with our other financial assumptions), then we would increase the value of the equity assets by the ratio six over five. So when a client comes to us and asks why are we using 8 percent interest when the bond market indicates that you can currently invest at 12 percent, we would say we are anticipating the extra investment return by writing up the assets.

MR. VINCENT AMOROSO: It sounds like actuaries in the United Kingdom enjoy luxuries we don't have here in the United States. In particular, in the United States the IRS and other exogenous forces look over the shoulder of practicing actuaries. The IRS has recently published the Actuarial Audit Guidelines in which there is a determination made of asset gains in which the actual asset performance on a market basis is compared with the expected asset performance using the assumed interest rate. If these numbers don't look consistent to the IRS, that is prima facie evidence that the assumptions used are per se unreasonable. Some members of the Committee felt that there was a credibility issue here in the United States.

The PBGC was established by the Employees Retirement Income Security Act of 1974 (ERISA) as a federal agency that insures private pension plans. PBGC promulgates interest rates and factors each month to be used for plans that terminate within that month. The monthly publication amends an existing regulation, Section 2619. The format of the interest assumption is somewhat curious: one rate is used to value all immediate annuities, annuities that are in payment status at plan termination. It is a level rate that applies throughout the payment period. Since program inception in September 1974, the low point for this rate has been 6.75 percent for terminations that occurred during the nine-month period starting June 1, 1977. The high point of 11 percent was hit twice, once for terminations that occurred during December 1981 and once for terminations that occurred during August and September of 1982. It is currently 9.25 percent.

A second approach is used to calculate the value of deferred benefits, that is, benefits that are not in payment status at the date of plan termination. The value for these benefits is the product of two quantities. The first quantity is the value of the benefit from the assumed

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retirement age forward. That value is calculated using the immediate annuity rate in effect for terminations that occurred when the plan terminated. This present value from the assumed retirement date forward is then reduced using the second quantity as a discount factor. The interest element of the discount factor is accomplished by means of a series of n and k factors. The n factors relate to the duration of the deferral period, and the k factors are the interest rates that apply during the deferral period.

Let me give you an example: n_1 is seven years and n_2 is eight years (those two quantities haven't changed since May 1979); k_1 applies during the deferral duration defined by n_1 ; k_2 applies during n_2 ; and k_3 applies for durations in excess of the sum. Now assume we have an individual who is age 59 with a benefit of \$100 per month starting at age 65. The present value of that individual's benefit under the regulations is determined as the present value of the benefit starting from age 65 forward, assuming that it is in immediate payment status discounted using the immediate annuity rate.

The present value at the date of plan termination is that value discounted by the factor

$$\left(\frac{1}{k_1}\right)^6.$$

If the individual is age 55, the factor would be

$$\left(\frac{1}{k_1}\right)^7 \text{ times } \left(\frac{1}{k_2}\right)^3,$$

and if the individual is age 40, it would be

$$\left(\frac{1}{k_1}\right)^7 \text{ times } \left(\frac{1}{k_2}\right)^8 \text{ times } \left(\frac{1}{k_3}\right)^{10}.$$

Since May 1979, k_3 has always been 1.04; k_1 has always been 1 plus the immediate rate minus 0.75 percent so that when the immediate rate is 9.75 percent, k_1 is 1.09; and k_2 has always been k_1 minus 1.25 percent.

Two basic questions have been asked about this method: (1) Why does this structure make any sense? (2) How can the level and relationships of the various rates be related to reality? Let me answer those questions by answering four related questions: (1) What are the rates used for? (2) How are they used? (3) How were they developed? (4) How might they change?

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What are the rates used for?--Section 4062 under Title IV tells us that an employer that maintains a plan is responsible for any asset shortfall upon plan termination. So the first objective is to determine the value of plan benefits so that when the value of plan assets is subtracted, the PBGC knows how much to bill the employer. The analogous situation for a private insurance company doing business in the insured annuity closeout market would be determining how much to bid for this package of benefits assuming that the plan sponsor will pay roughly half of that price at plan termination (which is PBGC experience) and then pay the rest of it through negotiations that will start sometime later and result in little of that being paid.

The PBGC single-employer rates were developed to value the amount of the asset shortfall after wrestling with the notion of exactly what standards should be used. The first proposed regulation was published on December 12, 1975. That regulation said that the interest rates should reflect market opportunities. (A proposed regulation has no effect although it does provide guidance for affected parties.) Subsequently, on November 3, 1976, the PBGC published an interim regulation which typically does have effect and remains in effect until superseded by a final regulation. The interim regulation said that PBGC interest rates are obtained from price data obtained from private insurance companies. The objective is that, when PBGC interest and mortality assumptions are combined, the resulting values are in line with industry annuity prices. That principle still applies today.

How are the rates applied?--When the PBGC first set up business in late 1974, there were a few pencils and some tabular sheets and maybe a few calculators and not much else--certainly nothing like computer equipment. So the objective was a structure that would be sensitive to market fluctuations and also lend itself to being applied by hand calculations. The result was the procedure I described--a single immediate rate that applies for all annuities that are in payment status at date of plan termination. For deferred benefits, the same immediate rate and a series of discount factors that are a function of the deferral period are used. Each time the interest rates change, a manageable set of tables is produced so that they are available for hand calculations. Since that time, the PBGC has joined the computer age, and one of the reasons for having the structure I described may be quickly evaporating.

How are the specific rates developed?--The rates that will apply in November should be published in the October 15 Federal Register. Those rates were based on the October rates with an adjustment factor. That is, the October immediate rate is adjusted to reflect observed changes in the fixed-income markets in September, so the late August/early September rates drove the October rates and likewise the late September/early October rates drive the November rates. Quarterly, the PBGC conducts a survey of annuity prices from insurance companies engaged in the single-sum closeout business. By late November, the results of the October survey will be analyzed, and the underlying interest rates will be inferred. Those interest rates will then be compared to the rates that were published for October. To the extent there is a significant discrepancy, the adjustment factors will be calibrated.

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Finally, several times a year there is a unit at the PBGC that does a final check on the whole process. When a plan terminates, it submits a ream of information dealing with the cost and the benefits for each individual. Interest rates can be inferred from the submitted price data. Periodically, ten to fifteen cases are selected and reviewed to see how the underlying interest rates for sufficient plan terminations (that is, plans that PBGC is not responsible for, but instead are closed out in the annuity market) compare with PBGC interest rates. Annuity prices depend on the interest rates and the mortality assumption. The difference in the mortality assumption between PBGC mortality and typical insured-annuity mortality adds something on the order of 50 to 75 basis points to the PBGC rates. Also, the rates that are observed for closeouts tend to be the lowest bid, so they define the low end of the market. Nevertheless, it shouldn't be surprising that PBGC rates would imply higher prices for larger plan terminations and lower prices for the smallest terminations.

How might all of this change?--That brings me to the interest rate contained in the regulation proposed in February 1985, dealing with the valuation of assets and benefit liability for multi-employer plans following a mass withdrawal. From the standpoint of Title IV, multi-employer plan mass withdrawal is similar to a single-employer plan termination. The determination of withdrawal liability and its allocation in the event of a mass withdrawal is the last thing that stands between PBGC and a claim. The mass withdrawal valuation regulation is different from the corresponding single-employer regulation that applies upon plan termination. The principal difference is that the interest assumption used in the mass withdrawal regulation has been reformatted and that it more closely resembles a select and ultimate assumption. The string of multi-employer rates varies with time. The initial rate reflects current fixed-income yields. Rates drop during the select period until they hit an ultimate rate, and then they remain level thereafter.

Why wasn't the single employer rate reformatted? The single-employer structure wouldn't work for multi-employer plans. The primary difference is that, in the single-employer case, there is only one objective for that interest assumption--to put a price tag on the plan benefit liability in the aggregate. If payments status annuities are understated or overstated but they are compensated by the deferred annuities, the objective can still be met. In the multi-employer case, it is likely that a significant portion of plan assets will be comprised of future withdrawal liability receivables. Withdrawal liability receivables are nothing more than a series of payments of known amounts and known due dates that will constitute an income stream into the plan. In the single-employer assumption, the value of a given monthly benefit will be different depending on whether or not that benefit was in payment status at plan termination. For example, a benefit that will be paid 15 years following the date of termination for an annuity that is in payment status at termination will have a different value from a deferred annuity. PBGC decided that it was essential from a multi-employer standpoint that all payment amounts, whether they are receivables or payables, had to have the same value so that a single assumption had to be used for all valuation purposes.

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The proposed regulation lists the multi-employer interest rates that would have applied if it had been in effect for September 1984. Just for comparison purposes, during September 1984, the average prime rate as compiled by the Federal Reserve Bank was 13 percent. Quality long-term bonds were yielding 13-14 percent, and the single-employer set was as follows.

The immediate interest rate was 10.5 percent; k_1 was 1 plus 9.75 percent; k_2 was 1 plus 8.5 percent and k_3 was 1 plus 4 percent. The multi-employer string that corresponds to that time was 13.25 percent for the first year, dropping 0.5 percent for each of the next four years until it hit 11.25 percent for the fifth year, then dropping to 10 percent for years six through ten, 8 percent for years eleven through fifteen, and remaining level at 6 percent for years beyond fifteen.

The preamble to the proposed regulation explains how the assumption string was crafted. There were four criteria listed:

1. The initial rate should reflect current yields.
2. The ultimate rate should reflect long-term expectations.
3. There should be a smooth transition from initial to ultimate rate.
4. The resulting multi-employer string used to value a typical benefit liability distribution should produce essentially the same present value as the corresponding single-employer rate set, i.e., it is a reformatting of the interest assumptions used for single-employer terminations. This is the criterion that drove the result more than anything else.

Once this regulation is issued in final form, multi-employer interest rates, I assume, will be published monthly along with the single-employer rate sets. It is my guess that the general shape of the rates will not change appreciably unless prevailing rates change dramatically. Of course, the absolute level of each of the select rates is subject to change. As an assumption used for mass-withdrawal liability purposes, the multi-employer structure is certainly interesting from an intellectual curiosity standpoint. But there is also some possibility that it may be adopted for single-employer terminations. If that should come to pass, it will then find its way into a number of valuations that pension practitioners are confronted with, and in particular, it would be used for the Retirement Equity Act \$3,500 comparison test and might also find its way into plan documents that point to PBGC rates for purposes of determining lump-sum distributions.

MR. STEPHEN CHARLES GOSS: Select and ultimate financial assumptions have been used for many years in Social Security valuations. I would like to share with you some of what we have learned by addressing three separate topics: (1) the characteristics and risks of select assumptions; (2) Social Security experience since 1975 in choosing select financial assumptions; and (3) methods for developing select and ultimate assumptions.

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I. CHARACTERISTICS AND RISKS

The paper written by members of the Committee on Pension Principles and Related Research does an excellent job of raising many issues related to select and ultimate assumptions, particularly the advantages of (1) reflecting the current position in the business cycle, which should diminish the magnitude of experience gains and losses and (2) consistency between valuations of assets and liabilities. I am sold on the idea of using select assumptions, but I would like to point out some cautions and risks.

The Committee's point concerning enhanced communications with plan sponsors as a result of using select assumptions should be approached with some caution. Select assumptions tend to result in more communication with plan sponsors but not necessarily enhanced communication. Because select assumptions are viewed as specific predictions which can be compared readily to econometric forecasts and later evaluated against actual experience, the emphasis on particular early-year assumptions may grow out of proportion to their importance in the valuation.

Emphasis on select assumptions is appropriate and necessary for Social Security valuations because the program is financed on an essentially pay-as-you-go basis with generally little trust fund accumulation, and thus, every effort must be made to minimize experience losses which could rapidly exhaust the funds. This is less true for more fully funded private plans, for which experience gains or losses are relatively easily amortized over many future years. In fact, if select assumptions are used in private pension valuations, effort may be required to insure that emphasis on the select assumptions does not overshadow the significance of the ultimate assumptions in determining the relationship between plan design and contribution rates.

The significance of the ultimate assumptions is demonstrated in tables 1 through 8 of the Committee's paper. Consider the examples where the valuation interest rates equal those experienced. A select and ultimate pattern starting at 10 percent grading down to 6 percent is compared to a flat 8 percent interest rate. Even with the high initial interest rate, the select and ultimate pattern yields larger contribution rates for all years because of the dominance of the ultimate assumption.

These examples suggest what might be one of the fundamental rules for choosing select assumptions, pick the ultimate assumptions first. The choice of ultimate assumptions should be influenced little, if at all, by the select assumptions that will be used, if any.

Actually, the fact that select assumptions will be used is helpful in the development of the ultimate assumptions as long as the ultimate assumptions are developed first. The select period separates recent experience from the ultimate period, making it easier for both the actuary and the plan sponsor to focus on long-term average past experience and trends as a basis for long-term average future, or ultimate, assumptions.

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Another risk in using select assumptions occurs when recent experience has been more favorable than would be ultimately assumed. For example, consider recent experience in which real interest rates exceed real average wage gains by far more than has been typical. In such cases, select assumptions would generally be more optimistic than the ultimate assumption and, thus, would yield a less conservative valuation than if only ultimate assumptions were used. Even though using select assumptions can be expected to decrease the magnitude of experience gains and losses, it is likely to increase the probability of a loss when recent experience has been favorable.

Although financial parameters vary somewhat erratically on a year-to-year basis, they tend to follow cycles of relatively large amplitude and long duration. The long duration of such cycles tends to make next year's experience closer to this year's experience than to the long-term average. As a result, gradually grading into the ultimate assumption will usually produce assumptions that are closer to actual experience for the first few years than if the ultimate assumption were used for all future years.

II. SOCIAL SECURITY EXPERIENCE SINCE 1975

Social Security valuations for Annual Trustees Reports have been based on select and ultimate financial assumptions since 1973. Prior to 1973, the primary long-range valuations were based on assumptions of no further increase in average wage levels, consistent with the then unindexed benefit formula. As early as 1947, illustrative long-range valuations were presented based on a constant rate of increase in average wages, with select and ultimate assumptions appearing in the 1961 Report. Short-range projections for the first five valuation years have reflected select wage increase assumptions since 1941. Interest rate assumptions have evolved similarly.

The primary financial assumptions that ultimately influence all pension valuations are the annual percentage change in average wages for participants, the average annual interest rate, and the rate of inflation, which is a component of the other two. As Mr. Morgan indicated, the gap between the interest rate and the rate of change in average wages is the most critical aspect of financial assumptions for private pension plans. For Social Security, the gap between the rate of change in average wages and the inflation rate (i.e., the real-wage change) is more critical. The interest rate is of less importance for Social Security because of the relatively low funding level and the fact that the present value of future benefits is not directly involved in our method of valuation.

Tables A, B, and C provide comparisons of Social Security select assumptions with actual values for average-wage changes, interest rates, and the changes in the consumer price index (CPI), using assumptions from Trustees Report valuations made in years 1975 through 1985.

The fact that the average-wage assumption is actually the combination of a real-wage assumption and an inflation assumption and the attempts

Table A.--Select and Ultimate Assumptions 1/ and Actual: Annual Percentage Changes in Average Annual DASDI Covered Wages for the 1975 through 1985 DASDI Trustees Reports

Experience Year	Year of Trustees Report											Actual
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	
1975	6.2											6.7
1976	9.0	7.7										8.5
1977	11.0	8.5	8.4									7.2
1978	8.8	9.4	8.1	7.2								9.6
1979	7.7	8.5	7.8	7.9	8.3							9.2
1980	7.0	7.7	7.1	7.9	8.0	9.6						9.1
1981		6.7	6.4	7.4	9.1	9.5	10.2					9.3
1982			6.0	7.4	7.4	10.9	9.6	6.6				6.2
1983			5.75	7.1	6.0	9.9	9.7	8.1	4.6			4.1
1984				6.1	5.4	9.4	8.8	8.1	4.6	5.9		5.3 2/
1985				6.0	5.3	9.1	8.1	6.9	5.5	6.1	3.9	
1986					5.4			6.8	5.6	6.4	5.8	
1987					5.7			6.8	5.7	6.3	6.5	
1988					6.0			6.6	5.4	6.1	6.2	
1989								6.4	5.4	5.8	6.4	
1990								6.0	5.6	5.6	5.8	
Ultimate	6.0	5.75	5.75	5.75	5.75	5.75	5.5	5.5	5.5	5.5	5.5	

1/ Assumptions are those used for the intermediate projection (Alternative II or II-B).

2/ Estimated.

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Table B.--Select and Ultimate Assumptions ^{1/} and Actual: Average Annual Interest Rates ^{2/}
for the 1975 through 1985 OASDI Trustees Reports

Experience Year	Year of Trustees Report											Actual
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	
1975												7.5
1976		7.5										7.3
1977		7.6										7.2
1978		7.6		7.4								8.4
1979	NA	7.6	NA	7.4	9.1							9.3
1980		7.6		7.4	8.8	10.5						11.3
1981		7.6		7.4	8.4	9.9	11.8					13.8
1982		7.1		7.4	7.6	9.5	9.9	13.0				13.2
1983				7.4	6.9	9.2	9.1	11.4	9.8			11.3
1984				6.8	6.6	8.9	8.4	9.3	7.3	11.1		12.4
1985				6.6	6.6	8.5	7.9	8.0	6.9	10.3	10.9	
1986								7.1	6.6	10.6	10.8	
1987								6.8	6.4	10.2	10.7	
1988								6.6	6.3	9.4	10.4	
1989								6.5	6.3	8.4	9.6	
1990								6.4	6.2	7.5	8.5	
Ultimate		6.5		6.5	6.5	6.0	6.0	6.0	6.0	6.0	6.0	

^{1/} Assumptions are those used for the intermediate projection (Alternative II or II-B).

^{2/} The average annual interest rate is the average of the nominal interest rates, compounded semiannually, for special public-debt obligations issuable to the OASDI trust funds in each of the 12 months of the year.

Table C.—Select and Ultimate Assumptions ^{1/} and Actual: Annual Percentage Changes in the Consumer Price Index (CPI) ^{2/} for the 1975 through 1985 OASDI Trustees Reports

Experience Year	Year of Trustees Report											Actual
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	
1975	9.0											9.1
1976	6.6	6.3										5.7
1977	6.5	6.0	6.0									6.5
1978	5.7	6.0	5.4	6.1								7.6
1979	4.6	5.5	5.3	6.1	9.4							11.4
1980	4.0	5.0	4.7	5.7	7.4	14.2						13.5
1981		4.5	4.1	5.2	6.6	9.7	11.1					10.3
1982		4.0	4.0	5.0	5.5	9.0	9.4	6.9				6.0
1983				4.7	4.5	8.6	9.0	7.9	3.1			3.0
1984				4.1	4.0	8.2	8.2	7.4	4.4	4.7		3.4
1985				4.0	4.0	7.8	7.4	6.6	5.3	5.3	3.9	3.5 ^{3/}
1986								5.8	4.8	5.5	4.7	
1987								5.5	4.4	5.2	5.3	
1988								5.3	4.1	4.7	5.0	
1989								4.9	4.0	4.3	4.6	
1990								4.5	4.0	4.0	4.2	
Ultimate	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	

^{1/} Assumptions are those used for the intermediate projection (Alternative II or II-B).

^{2/} Consumer Price Index for Urban Wage Earners and Clerical Workers.

^{3/} Estimated.

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to project business cycles in the first few years results in a non-monotonic movement toward the ultimate assumption for some years.

For the first valuation year, the select average-wage change assumption was closer to actual than was the ultimate assumption for all Trustees Reports except 1984. (The actual value for 1984 is only estimated at this time.)

The interest rate assumptions for new investments in table B exhibit less business cycle influence than the wage-change assumptions and grade monotonically to the ultimate for all years. The recent high interest rates caused our select assumptions to be closer to actual than were the ultimate assumptions for all years in all valuations.

The inflation rate assumptions shown in table C were graded to the ultimate assumption monotonically until the 1982 valuation. Starting in 1982, a brief swing back to higher inflation rates has been assumed to occur before reaching the ultimate assumption. The persistency of relatively low inflation since 1982 has clearly surprised us and has resulted in a bigger difference between select and actual rates than between ultimate and actual rates for valuation years after 1982, whereas the opposite was true for earlier valuation years.

Table D summarizes the preceding tables by presenting differences between select assumptions and actual rates for the first five valuation years, individually and cumulatively. Also shown are the cumulative differences between the ultimate assumption and the actual rates for the same years.

For average-wage changes, the cumulative differences using select assumptions were far smaller than those based on ultimate assumptions for 1975 through 1979 valuations. While cumulative differences for the 1980 through 1982 valuations are larger using the select assumptions, it can be seen that a major portion of the error was due to the CPI assumption. If cumulative differences are compared for just the real-wage-change assumption, then those based on select assumptions are smaller for the 1980 and 1981 valuations.

Not surprisingly, the cumulative differences for the average annual new-issue interest rate are smaller when based on select assumptions than when based on ultimate assumptions for all valuations.

The cumulative differences for inflation based on select assumptions are lower or about the same as those based on ultimate assumptions for all but two valuations. The trend toward positive differences for recent valuation years in both wage-change and inflation assumptions is largely the result of the lower than expected inflation.

Overall, the use of select assumptions seems to have improved the accuracy of our projections relative to what would have been achieved using ultimate assumptions only. The comparison, however, is closer than might be expected.

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Table D.—Differences Between Assumptions and Actual: Percentage Change in Average Annual OASDI Covered Wages, Average Annual Interest Rate ^{1/}, and Percentage Change in the CPI for the First Five Valuation Years for the 1975 through 1984 OASDI Trustees Reports

	Year of Trustees Report										
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	
Average Covered Wages											
1st year		-5	-7	+1.1	-2.2	-8	+5	+8	+4	+5	+6
2nd year	+5	+1.2	-1.4	-1.2	-1.0	+2	+3.2	+3.8	-7		
3rd year	+3.5	-2	-1.3	-1.1	-2	+4.4	+5.4	+2.7			
4th year	-7	-6	-1.8	-1.7	+1.1	+5.6	+3.3				
5th year	<u>-1.4</u>	<u>-1.3</u>	<u>-2.7</u>	<u>+1.1</u>	<u>+1.8</u>	<u>+3.9</u>					
Cumulative ^{2/}	+1.4	-1.6	-5.9	-5.0	+9	+15.3	+13.3	+7.0	-2	+6	
Cumulative ^{2/} if Ultimate Rate were Assumed	-9.9	-12.9	-13.6	-12.7	-8.1	-4.7	-2.6	+9	+1.5	+2	
Average Annual Interest Rate ^{1/}											
1st year		+2		-9	-2	-7	-1.8	-2	-1.3	-1.2	
2nd year		+4		-1.7	-2.2	-3.4	-2.9	+1	-4.5		
3rd year		-7		-3.5	-4.7	-3.3	-2.0	-2.8			
4th year		-1.6		-5.6	-4.9	-1.9	-3.6				
5th year		<u>-3.3</u>		<u>-5.1</u>	<u>-4.0</u>	<u>-3.1</u>					
Cumulative ^{2/}		-5.0		-15.9	-15.1	-11.8	-9.8	-2.8	-5.8	-1.2	
Cumulative ^{2/} if Ultimate Rate were Assumed		-9.7		-19.4	-21.5	-25.4	-21.7	-15.9	-10.2	-5.7	
Consumer Price Index											
1st year		-1	+6	-5	-1.4	-1.8	+6	+7	+8	+1	+1.3
2nd year		+9	-5	-2.0	-4.8	-5.4	-5	+3.2	+4.8	+1.0	+1.7
3rd year		.0	-1.5	-5.5	-6.9	-3.4	+2.8	+5.8	+3.9	+1.7	
4th year		-1.8	-5.3	-7.8	-4.6	-5	+5.4	+4.6	+3.0		
5th year		<u>-6.1</u>	<u>-7.5</u>	<u>-5.6</u>	<u>-9</u>	<u>+1.5</u>	<u>+4.6</u>	<u>+3.8</u>			
Cumulative ^{2/}		-7.1	-13.6	-19.8	-17.4	-9.3	+13.5	+15.1	+9.7	+1.1	+1.3
Cumulative ^{2/} if Ultimate Rate were Assumed		-17.4	-20.6	-23.9	-23.5	-20.1	-13.9	-6.1	-.4	+1.6	+6

^{1/} The average annual interest is the average of the nominal interest rates, compounded semiannually, for special public-debt obligations issuable to the trust funds in each of the 12 months of the year.

^{2/} Through 5th year or 1984, whichever is earlier.

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III. METHODS FOR DEVELOPING SELECT AND ULTIMATE ASSUMPTIONS

The ultimate assumptions are of far greater significance than are select assumptions in determining the required contribution rates for a private pension plan that is highly funded. Although ultimate rates may often be dictated or at least constrained by regulation and past practice, some effort should be made to study the long-term average past experience of both the plan in question and broader, more diversified, groups.

Where plan experience is available for few prior years or fluctuates because of group size, a number of alternative historical indexes are available. In addition to the well-known published interest rates, there are a number of published average-wage indexes available from the Bureau of Labor Statistics. One of the most interesting is the relatively new Employment Cost Index (ECI) which covers both wages and benefit costs. The ECI is adjusted so that it does not reflect changing distributions of workers by occupation within industry groups and comes closer than any other published index to representing pure changes in salary scales.

A number of Actuarial Studies have been written by the staff of the Office of the Actuary at the Social Security Administration relating to various demographic, financial, and programmatic assumptions. These may be of interest not only for the results presented but also for the analysis of underlying data and past trends. Copies of these studies are available upon request.

Once ultimate assumptions are chosen, select assumptions may be set by simple interpolation from recent experience. This method has the advantage of projecting near future experience at levels close to the recent past while minimizing the implication that select assumptions are precise year-by-year predictions.

Theoretically, more precise assumptions can be obtained by modeling past relationships between plan experience and values of various related parameters for the industry or the economy as a whole. Of course, any model requires choosing basic assumptions at some level. Therefore, a model is useful only if it relates those required parameters, average-wage changes, and interest rates to other parameters for which assumptions can be chosen with more confidence. Projections of the broadly based industry- and economy-wide parameters reflecting business cycles and longer-term trends are widely available and can be altered as desired to reflect personal expectations. Once made, these broadly based projections can be used to produce projections of future plan experience using the relationships based on past data. The select financial assumptions for Social Security valuations are developed in this way by starting at the basic level of the gross national product (GNP), labor force, and so on for the total U.S. economy. While this approach is clearly not practical for determining select assumptions for every private pension plan, smaller models relating a few key parameters are possible and may be practical if projections of economy-wide parameters are used to help project experience for several plans through their separately determined past relationships.

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An additional alternative is to use directly the projections of industry- or economy-wide wage and interest parameters available from existing surveys and models, as suggested in the Committee's paper. Data Resources, Chase Econometrics, and Blue Chip Indicators are good examples and are among the services that have influenced Social Security select financial assumptions in recent years.

MR. THOMAS P. BLEAKNEY: I spend much of my time dealing with public employee plans, and credibility is a major element in dealing with some public bodies. The use of select and ultimate assumptions can enhance credibility, even though the end result may be minimal. The key is that our assumption agrees with what the client thinks is right.

Primarily I will discuss investment return and how one chooses and applies the actual select assumptions. My approach to select assumptions is to base all calculations on the ultimate rate (6 percent in the paper), with special treatment of the select rates in the select period. Obviously, select rates lead to the expectation of more assets than I would have had if I had used level interest assumptions. The paper's approach is that the amount of assets I am going to have is the same as if my funds were in a savings account earning 10 percent for the first year, 9 percent for the year after that, and so forth until finally four years from now we are into the ultimate 6 percent environment. The paper also states that the money coming in (contributions, investment income) less the money going out (benefits, expenses) is essentially going into that savings account and earning the appropriate rate.

The problem I have with that is that some of the assets that funds invest in don't behave like savings accounts. For common stocks valued at market, this select and ultimate scenario can work. The assumed market increase is just enough, when added to the dividend yield, to produce a 10 percent overall yield for the first year, 9 percent the year after that, and so on.

I tend to view my assumptions in terms of what the fixed-income market is going to do, recognizing that nobody knows what the equities are going to do. When you consider fixed income--bonds or mortgages--I think this concept breaks down. If I am valuing bonds at market, then the change that has to occur in a year to generate a yield of 10 percent on an existing portfolio is peculiar.

As an example, in the last year of the select period, I have 7 percent for one year and then 6 percent for all future years. Just to make it easy, suppose that my entire portfolio is 6 percent annual coupon bonds. That would correspond comfortably with my assumed long-term rate. Also, assume that all of the money in and out is going to be invested in that same kind of a bond. Now, according to the assumption, my expectation is that, one year from now, those bonds will be valued at par because then I will be into a 6 percent environment. But I am now in a 7 percent environment. If I were to value a 6 percent, 20-year, annual-coupon bond in a 7 percent environment, I would have a price of 89.4. In other words, for \$1 million par value I would have to spend \$894,000. Next year it's going to be valued at \$1 million,

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because of the magic of the declining yield rate. That is something like a 12 percent gain, which doesn't tie in at all with the assumptions that I am making.

Having gone through that analysis in the past, I began to think there was something wrong with select and ultimate assumptions applied to bonds. However, let me suggest a solution: think of that ultimate point where the 6 percent environment will be in effect. The process I use is to measure the effect of yields different from 6 percent and translate the differences into anticipated "gains." These are not really gains at all, but they are part of my actuarial assumptions. So, for my example, if I am now in the third year, I will anticipate that the market will change from the 7 percent environment to 6 percent and that \$894,000 of bonds will become \$1 million. If that happens exactly, then I have no gain or loss other than the one I had already anticipated and included in my assumptions.

An important aspect of this approach is that I make all of the liability calculations at the ultimate rate and then make the select adjustments on the asset side. The adjustment depends upon how I value those assets. For example, if I value bonds at market, my adjustment is whatever it takes to discount the effect of the market moving from 10 percent next year to 9 percent the year after and so forth. If I am valuing bonds on an amortized book basis, I have to adjust that basis into whatever would yield a 6 percent basis and discount any gains realized.

I regularly use the discounted cash-flow approach used in the United Kingdom. That is, looking at my 6 percent bond example, I wouldn't value it at \$894,000, but at \$1 million because my long-term assumption is that any income derived from that bond will offset liabilities that are being discounted at 6 percent. In effect, I am matching bond cash flows with future liabilities. Although this is separate from the select and ultimate concept that we are talking about, it also simplifies the select and ultimate determination. If bonds are valued at the ultimate rate, I can forget about any adjustment for anticipated gains or losses on the existing bond portfolio.

Another thing related to the select and ultimate process is the importance of spread. In the public sector, it is common to have salary-related plans and plans with postretirement cost-of-living increases. Thus, the spread between investment return and either wage increase or price increase is an important consideration. One client for which we used a select and ultimate assumption was a city that had actually negotiated its general wage increases for two years following the valuation date. Therefore, the general wage increase portion of future wages was known to be quite low while we were having high investment return on the city's portfolio. So we had the peculiar situation of a large spread in the first year based on a high current interest rate and no general wage increase. The ultimate spread was 2 percent, based on a long-term general wage increase assumption of something in the neighborhood of 5 percent. The resulting spread looked like a funnel. By using the select and ultimate approach, we were able to reflect the current spread, as well as the historical investment earnings/wage growth spread, in the ultimate period. This method was much more

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credible to the city than our previous constant assumptions, and the adjustment had a fairly significant effect on the results.

MR. SIMESTER: Further reading on this topic is contained in the Society Record for two 1983 meetings, one in Vancouver and one in Chicago, and also the 1981 meeting in San Diego.

MR. DONALD S. GRUBBS, JR.: With respect to those rates published by PBGC in its proposed regulation to be used for determining withdrawal liability in the case of a mass withdrawal, would those same interest rates also be appropriate for determining withdrawal liability in the case of a single-employer withdrawal from a multi-employer plan?

MR. AMOROSO: I've said so in print in a June 1985 issue of the International Foundation of Employee Benefits Journal. I would also add that I think that it is one of several possible solutions to that problem.

MR. DAVID R. KASS: It strikes me that within bounds we are victims of our nomenclature. If we adopt the right nomenclature, we may be half way through solving the problem. Select and ultimate has to do with an underwriting process that allegedly anesthetizes the risk of debt for a period of time. I have also heard the nomenclature "year-based" investment returns or "year-based" economic assumptions.

By dealing with year-based interest rates, for example, we might satisfy ourselves that we are in a blip right now--that today's 10 percent is on its way to tomorrow's 6 percent, or perhaps today's 10 percent (if one has a contrary view) is on its way to as far as 15 percent. It is year-based, and the interest in it stems from the fact that we perceive that today's outlook in the investment area is different from tomorrow's. I further suggest that Mr. Bleakney's remarks about dealing with the asset side of the equation in the same environment, namely in anticipating a moving change of prevailing interest rates, could best be described as an extension of what our British friends do, namely, discounting future cash flow as an asset valuation method, using a year-based method of discount rates. I would welcome any thoughts as to how the asset side correlates here. Does it reinforce the intellectual content of a year-based or select and ultimate treatment of liabilities, or is it, in fact, at cross purposes?

DR. ETHAN E. KRA: In the single-employer realm, we find that the average benefit is larger than in the multi-employer plan that terminates, and as a result, the multi-employer plan is more expensive to administer. Whereas in the single-employer plan there is about a 60 basis point spread built into the rates to anticipate an expense load, we would have anticipated a much larger spread built into the multi-employer rates to allow for the greater anticipated expenses in administering the plan.

MR. M. DAVID R. BROWN: I was interested in Mr. Bleakney's comments because my firm has gone through some similar experiences in dealing with large public employee systems where some of the constraints that might be present in a private system are not present and where most often you don't have to cope with equity investments. We

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are now disenchanted with the whole approach of select and ultimate assumptions. I would perhaps extend some of his remarks in describing the experience we had. We did the same kind of thing in doing all the calculations at the ultimate rate and adjusting the asset side for the effects of the short-term higher interest rates, and then we carried it a step further. The adjustment is based on the additional investment earnings generated by the net cash flow of the plan in each of the years during the select period. When you look at the net cash flow expected in each of those years, you find that for every \$1.00 you put in the plan, suddenly you've got \$1.50 or \$1.80 in assets. Credibility with the client becomes very difficult because it can't understand how that's possible even though the other \$.50 or \$.80 may be accounted for as anticipated gains in the way Mr. Bleakney expressed it.

We got into this a few years ago with the development of cash-flow projections for these plans. The clients may not be subject to the same funding constraints, and they want to know what to expect down the road in terms of benefit cash flows and what kind of funding program should be used with them. So we produced these cash-flow projections and then, as a matter of consistency, attempted to make valuation results mesh with them. The difficulty is that you lose some of the advantages of stability in your actuarial bases. There is a lot to be said for not messing around with the assumptions too much. We use them as a benchmark against which the experience of the plan unfolds. Most clients like that too; they say, "How did we do last year and why? What were the sources of the gains and losses?" It becomes much more complicated trying to explain that when you get into a select and ultimate scenario. I am not convinced that there is that big a reduction in the gains and losses which take place as a result of these apparently more refined assumptions. If you don't get much reduction in the volatility, then you might be better off with a somewhat arbitrary but more stable set of long-term assumptions and just monitor the experience as it comes out.

I have quite a bit of trouble with entry-age-normal method assumptions, and it may be because we approach it a little differently in Canada than it is approached in the United States. Our model for the normal cost is to look at a recent cohort of new entrants and say the object of the method is to produce a normal cost that will be self-supporting for new people entering in the future. The best measure of that is to look at the characteristics of a recent cohort. As a result, you get a different normal cost for each cohort because your select and ultimate assumptions affect each one differently. So one of the attractive attributes of the entry-age-normal method goes away in that you don't have the sort of stable funding as a basis for the normal cost, and you also have compounded some of your credibility problems in that you are now saying that this year's crop of new entrants is relatively cheap but next year's is going to be more expensive, and the year after is going to be more expensive still. The only way that we have found technically to get away from that is to use just the ultimate set of assumptions in calculating the normal cost. This is also mentioned in the paper as a possible solution.

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If you are approaching the select interest assumption as a new-money rate, there is a theoretical argument (which we have applied in practice in some cases) for using a different select period for the interest rate than for the salary scale. The interest rate presumably reflects anticipated future inflation, whereas the salary scale reflects current inflation. That again can result in some lengthy explanations to the client.

I would like to support Mr. Kass's comments about the terminology "select and ultimate." We slip into these things subconsciously. It's a classic piece of actuarial jargon which non-actuaries are nonplussed by. The Canadian Institute of Actuaries recommendations for the valuation of pension plans refers to select and ultimate assumptions and some non-actuary said, "What does that mean? Can you not tell me in the English language exactly what it is you are talking about?" It would help us clarify some of these difficulties if we step back from some of these terms once in a while.

MR. BLEAKNEY: You mentioned the discomfort that came from trying to explain the peculiarities arising when you treat select assumptions as I described. That was one of the reservations I had in using them in the first place. However, the credibility gap is greatest with the client who thinks he understands the most about what his next year's interest rate or his general wage increase is going to be. If you are talking about using a 10 percent yield, you have made one step forward. It may be a bit of actuarial legerdemain, but it still does sell.

You may prefer to restructure your liabilities instead of your assets. That's a simple thing to say and an all but impossible thing to do. When you tell a client, "These bonds that you just bought for \$800 thousand are really worth \$1 million or \$1.3 million," it just doesn't make sense. What you are saying is that the liabilities to be paid off by those bonds have been valued at \$1 million, but they should really be valued at only \$800 thousand.

MR. MICHAEL COHEN: I agree with a lot of what Mr. Brown said. I think the select and ultimate assumptions are a way of bridging the gap between what we know today (interest rates, inflation rates, and so on) and what we feel through our actuarial training, through economic analysis, and so on, must happen in the future. We have this vision of the ultimate future, the pots of gold at the end of the rainbow and everything working out actuarially correct. We have this bridge, and there is no question that there are many applications for which this kind of actuarial technique is ideal. It's the sort of thing that Mr. Amoroso was talking about, creating a quasi market for immediate and deferred annuities. There are many cases where plan sponsors in the private sector want to know how much a pension reform item is going to cost, for example, paying market rates of return on employee contributions. If you are using a traditional valuation method it is difficult to calculate the real cost, but in using a more realistic select and ultimate valuation, you are playing with quicksilver. Each year's investment rate must change. The stance in 1985 has got to be different from the stance in 1986 and different from 1987; each year you must change your whole structure of interest rates. In valuing

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public sector pension plans, we've been under a bit of pressure to use select and ultimate rates in order to capitalize the known gains we are going to have in the next few years. One phenomenon that we've noticed is that it is extremely difficult to determine what the unfunded liability is now because, as you change the stream of interest rates, the value of the payments you are using to amortize the unfunded liabilities changes. So you find that you are chasing a shimmer, whereas the level interest rates and other assumptions do give a much greater degree of actuarial feel, although they are probably not as realistic and they are more difficult to visualize in terms of bridging the here and the hereafter. You can feel them, heft them, and can explain what's going on.

