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**NEW STANDARD NON-FORFEITURE  
AND VALUATION LAWS**

*Moderator: JOHN O. MONTGOMERY. Panelists: PETER A. MARION, GODFREY PERROTT, WILLIAM T. TOZER. Recorder: CHERYL L. P. VIGEN*

1. Status of state approval process.
2. Report of the Task Force on Smoker/Non-Smoker Mortality.
3. Report of the Special Committee on Specifications for the 1980 CSO Tables.
4. Expected impact on product design.
5. Actuarial problems in implementation.
6. Administrative and policy form considerations.

MR. JOHN O. MONTGOMERY: This is the Open Forum on the New Standard Valuation and Nonforfeiture Laws. It is actually a continuation of a similar Open Forum held at the last Annual Meeting of the Society of Actuaries. The New Standard Valuation and Nonforfeiture Laws are dynamic in nature requiring continual attention as to enabling bulletins or regulations covering such items as:

1. New products such as universal life.
2. Problems with older products such as single premium deferred annuities.
3. Approval for the use of special interest mortality tables such as those for smokers versus non-smokers and a methodology for developing unisex mortality tables from sex distinct tables in response to court decisions and possible legislation.
4. Specifications for a consistent approach in calculating various values using the 1980 CSO Mortality Table Assumptions.

A proposal is before the National Association of Insurance Commissioners (NAIC) for enactment at its plenary session next December to revise its constitution and by-laws so as to provide for a standing Subcommittee to the Executive Committee of the NAIC to be known as "The Technical Services Subcommittee". Its membership would consist of the Chairpersons (which are commissioners) of the five standing committees and two of the standing sub-committees (which are responsible for all of the external actions of the NAIC). The current Technical Staff Actuarial Group or TSAG as it is commonly called, which has no present official standing within the structure of the NAIC, would then become a standing task force of this new subcommittee to be known as the Life and Health Actuarial Task Force. The task force would then report to the chairperson of the committee or subcommittee with respect to work on projects under the responsibility of that respective committee or subcommittee. At the present time we are working on material for four different committees and subcommittees of the NAIC.

All of the major topics on our agenda today are extremely timely, and some require urgent regulatory action which will be forthcoming either at the December, 1983 or June, 1984 meetings of the NAIC. We have two panel members from last year's session and one new member.

First, William T. Tozer, Senior Vice President, Product and Risk Management, Kentucky Central Life, will report on the status of the state approval process. Mr. Tozer is the Chairman of the American Council of Life Insurance Task Force on Valuation and Nonforfeiture Regulation for New Products, and he was a member of the committee when the 1980 amendments were developed. He is also a member of the American Academy of Actuaries Committee on Financial Reporting. He will return later, after the other two discussions have concluded, to discuss some other topics. Bill was a member of the panel of last year.

Second, Peter A. Marion, Associate Actuary, State Mutual Life Assurance Company, will present the Final Report of the Task Force on Smoker/Non-Smoker Mortality. Mr. Marion is Chairman of that Task Force and is new to this panel. Since that report concerns only the 1980 CSO Tables, I will present a report by John T. Gilchrist, Senior Life Actuary of the California Department of Insurance, on corresponding mortality rates based on the 1958 CSO Mortality Table using the methodology employed by the Society of Actuaries Task Force. This report, which has not been reviewed by the Society of Actuaries Committee on Papers, is presented here for exposure purposes only because of the urgency of this matter before the NAIC.

Third, Mr. Godfrey Perrott, Senior Vice President of M & R Services, will present the final report of the Society of Actuaries Committee on Specifications for Monetary Values for the 1980 CSO Tables. Mr. Perrott is Chairman of that Committee. He reported last year at this forum on progress being made on this project. I might point out that the board of Governors has decided to hold open on his report, and this may not be the final report depending on what comments we receive. On something like this, until people have had a chance to try it and see what problems arise, we prefer to hold it open a little bit longer before completing our truly final report.

Finally, Mr. Tozer will report on the remaining topics. There may be additional topics relating to the new standard valuation and nonforfeiture values which will not be discussed by one of the panelists here. For this reason we are trying to reserve as much time as possible to answer questions and to bring up other topics of interest as shown in them. As wide a discussion as possible is important for the publication of the Record.

**MR. WILLIAM T. TOZER:** The National Association of Insurance Commissioners adopted in December, 1980 a set of amendments to the Standard Valuation and Nonforfeiture Laws that are the most significant and comprehensive changes since the laws were originally enacted in the 1940's. These model amendments have been enacted with very little modification in 49 states. Legislation is still pending in Alaska and the District of Columbia. In Puerto Rico, the changes can be accomplished by regulation but new rules have not yet been promulgated. Some of the legislation, even though it has been enacted, has not yet become effective. For example, the amendments in

Mississippi are not effective until July 1, 1984. To my knowledge that is the latest effective date of any legislation. A company can elect to have the new amendments become operative at an earlier date; however, generally the law requires that if an earlier date is not elected, the amendments become effective on January 1, 1989. Wyoming is an exception. In Wyoming, these new standards become effective on January 1, 1985. Efforts are being made to move the 1985 date to 1989. The prospects are at best 50/50. There is only one session of the Wyoming legislation coming up between now and 1985. That session is a budgetary session, and as a result, items can only get on the docket if they are worked in by the Governor through the budget channels. The trade associations are going to work hard to try to get that revision done. As I say, it is going to be a very much uphill battle.

MR. PETER A. MARION: Early in 1982, the NAIC Technical Advisory Committee, acting on behalf of the NAIC Technical Staff Actuarial Group, asked the Society of Actuaries to gather the available experience on smoker and non-smoker mortality. The objective was to produce information which could be the basis for developing interim valuation standards for non-smoker ordinary business.

In response, the Society established the Task Force on Smoker/Non-Smoker Mortality. Since its inception, I have been its Chairman, and the other members have been Doug Doll of Tillinghast, Nelson & Warren, Mel McFall of Lincoln National, and Bud Webber of Phoenix Mutual. The Task Force responded to its charge by comparing and contrasting the experience of five companies whose non-smoker mortality experience has been published in the Record or the Transactions. We attempted to highlight the differences among the mortality studies performed by these five companies. These differences should be taken into account when comparing the mortality experience of the five companies.

Last December, the Executive Committee of the Society amended the charge of the Task Force to include the division of the 1980 CSO mortality table into smoker and non-smoker components. The Task Force was now to actually develop interim scaling factors which would produce better valuations than not recognizing the smoker/non-smoker differential at all.

The Task Force split the 1980 CSO Basic Mortality Table into smoker and non-smoker components using a procedure which requires two assumptions at each age: 1) The proportions of smokers in the experience underlying the table, and 2) the ratio of the level of smoker mortality to non-smoker mortality. Once these two assumptions have been made, the solution of two simultaneous equations produces a division of one aggregate mortality rate into its smoker and non-smoker components. The Task Force developed numerical values for these two assumptions from the available intercompany experience, and also from studies contained in the 1979 Report of the Surgeon General. These numerical values varied by age and by sex.

In order to produce tables appropriate for valuation purposes, margins must be added to the separate smoker and non-smoker basic mortality rates. The Task Force added the actual margin contained in the 1980 CSO to both the smoker and the non-smoker basic mortality rates. This ensured that the resulting loaded rates, when recombined using the assumed proportions of smokers and non-smokers, would reproduce the 1980 CSO loaded mortality rate. The Task Force then developed four mortality tables: Male smoker,

male non-smoker, female smoker, and female non-smoker. We then simply divided the loaded smoker and non-smoker mortality rates by the corresponding 1980 CSO mortality rate to develop scaling factors.

These four tables were included in the March 1, 1983 Report of the Task Force which was presented to the NAIC Technical Advisory Committee, the NAIC Technical Staff Actuarial Group, and the Executive Committee of the Society of Actuaries. Since the initial reactions were positive, the Executive Committee approved the distribution of the report to all Society members in the form of an Exposure Draft. As with all Exposure Drafts, comments were invited; about a dozen were received. There were no criticisms regarding our comments on intercompany experience, but there were a number of criticisms regarding the development of the separate smoker and non-smoker mortality tables. Some of these criticisms related to technical points which the Task Force had studied prior to the release of our Exposure Draft; thus, we felt confident that such criticisms were not warranted. For example, one criticism was that, for males age 25 to 47, our assumption of over 40% smokers is not in line with the fact that only about 30% of current issues are to smokers. The Task Force had investigated this question as part of the development of the tables in the Exposure Draft. We concluded that it is technically correct to use the percentage of smokers in the data underlying the table which is being split. Since the 1980 CSO is based on experience of the early 1970's, and not the early 1980's, the percentage of smokers used by the Task Force is appropriate even through it is significantly higher than shown on current issues.

The Task Force did receive some very useful comments. For example, one individual thought that our ratios of smoker to non-smoker mortality levels at the higher ages were too low. This comment included some unpublished data developed by the American Cancer Society regarding the relative mortality of smokers and non-smokers at ages 65 and above. Based on this data, the Task Force modified the assumptions regarding the relative mortality of smokers and non-smokers at the higher ages. The reserves based on the resulting tables are only slightly different from those contained in the Exposure Draft.

The Task Force also received comments about the margins in the smoker and non-smoker tables. In the tables in the Exposure Draft, we used the exact margin in the 1980 CSO for both the smoker and the non-smoker tables. While the alternative of applying the 1980 CSO margin formula to the smoker and non-smoker tables separately produced margins which were not significantly different from the 1980 CSO margin, the resulting tables would not reproduce the 1980 CSO when they were recombined. We received one comment which included a new method of determining margins which would reproduce the 1980 CSO while still allowing larger margins in the smoker table than in the non-smoker table. The Task Force reviewed this method in detail and found that the differences in margins between the two tables were far in excess of that justified by the differences in life expectancies. The Task Force believes that these smoker margins are excessive and the corresponding non-smoker margins are inadequate. We have, therefore, continued to use our original margin procedure, using the actual 1980 CSO margin in both the smoker and the non-smoker tables.

Another topic on which we received comments was the recognition of the effects of selection. The 1980 CSO includes ten-year selection factors, which the Task Force believes could be used for both smokers and non-smokers. One individual commented that the selection factors should be lower for smokers than for non-smokers. While the Task Force recognizes the possibility that the effects of selection might not be the same for smokers as for non-smokers, there is so little published experience on smokers and non-smokers beyond the tenth policy year, the development of separate selection factors for smokers and non-smokers is, for all practical purposes, impossible. In addition, since the use of selection factors in valuation mortality tables is a very new and not yet fully developed procedure, any attempt to produce a useful set of selection factors which vary by issue age, policy year, sex, and smoking status does not seem justified.

These are some of the more important comments which we received on our Exposure Draft. In our Final Report, The Task Force has included a detailed response to every comment. In some cases we rejected the comment, and in other cases we agreed with the comment and modified our report as appropriate. As indicated previously, we did make some minor changes, at the higher ages, in the smoker and non-smoker tables which were included in the Exposure Draft. The tables in our Final Report include these changes. The Final Report also includes our split of the 1980 CSO Age Last Birthday Table, and our split of the 1980 CET Tables on both age nearest birthday and age last birthday bases.

The Exposure Draft was presented to the NAIC at its meeting in June. Our Final Report was completed last week and was presented to the Board of Governors of the Society at its meeting here in Hollywood this past Sunday. The Board accepted our report and voted to submit it to the NAIC. It is our hope that the NAIC, at its December meeting, will accept these tables as alternative valuation standards for smokers and non-smokers.

The Task Force would like to emphasize that our charge has been to develop interim valuation standards which will produce better valuations than not recognizing the smoker/non-smoker differential at all. There does not currently exist a large enough volume of mortality experience on insured smokers and non-smokers to justify a highly-sophisticated, time-consuming development of separate smoker and non-smoker valuation standards. We believe that we have used procedures which are appropriate given the limited availability of data and time. Thus, our Report is not the definitive statement with regard to separate valuation standards for smokers and non-smokers. Rather, it is an attempt to quickly produce interim standards, appropriate for use until more sophisticated procedures are justified by the existence of a significantly larger volume of data than is currently available. Realistically, this will not occur for several years.

MR. MONTGOMERY: The work I want to report on now, which was done by John Gilchrist, is different from what we had distributed before for the following reasons. His first approach to this used the same distribution of smokers and non-smokers as was used in the 1980 distribution, rather than the basis which went into the 1958 CSO. We have since adjusted to take that into account. He also used the loadings for the 1980 CSO, so that the report does not include the experience distributed as it was for the underlying data at the time the 1958 CSO tables were developed which

was during the early 1950's. A study of the distribution of smokers and non-smokers showed a considerable difference from what it was in the early 1970's when the 1980 CSO tables were developed. The other thing was, of course, to use the 1958 CSO loadings. I think I have told you the basic features of his work. The tables are included in the Record. They are for the 1958 CSO and 1958 CET tables. We have yet to decide whether or not the 80 CSO and 58 CSO tables can be used for mortality charges on universal life policies. I think that may be more of a matter of an NAIC action than the work of the committee.

MR. JOHN T. GILCHRIST: Abstract

The 1958 CSO tables are composite smoker and non-smoker tables. The lesser mortality being experienced by non-smokers permits lower gross premiums; however, the lowering of gross premiums is inhibited by deficiency reserve requirements. Separate tables are needed. The 1958 CSO table has been accordingly separated into its components, and the results are presented herewith.

#### The Approach

The approach used is the same as that of the Task Force of the Society of Actuaries on smoker/non-smoker mortality. Their methods for the separation of the 1980 CSO tables have been applied to the 1958 CSO table. A ratio of smoker/non-smoker mortality is required together with a ratio of smoker/non-smoker participants. These ratios permit a separation of the composite table into its parts. The formula is applied to the Basic table, which is then loaded.

#### II Assumptions

Two approaches to the selection of the ratios have been considered. One approach is to use the distribution prevailing at the time the table was prepared, another the ratios at the time when the policies are to be issued. The former would seem to be appropriate for separation of the table into the underlying experience, the latter would produce aggregate reserves more in keeping with the aggregate reserves on the composite table for the current distribution of business. Both arguments are persuasive, only one can be used, but the former was chosen since that represents more closely the experience contributing to the construction of the 1958 CSO Tables. Use of the smoker/non-smoker distribution at date of issue will bring out aggregate reserves and minimum nonforfeiture values differing from the 1958 CSO tabular reserves and values due to the shift in smoker/non-smoker distribution since the tables were developed. In real life the distribution of smokers will differ from the assumptions in developing these tables since they will be the current and future distributions, so that any expectation of reproducing aggregate reserves on current issues is inappropriate. Decisions are required about the loading formula. Loadings of the form of the reciprocal of an annuity serve to maintain the same dollar reserve, the only effect of the loading being to increase or decrease deficiency reserves. Another approach could be to use the same dollar loads for both the smoker and non-smoker tables as was used in deriving the composite table. The latter approach was used by the Society Committee for the 1980 CSO tables, and this precedent has been followed here, using the 1958 CSO loads. It should be pointed out that no

studies have been disseminated on deficiency requirements, although there are hints of such work in the Guertin Reports of the 1940's. Until such studies are made, the determination of what constitutes an appropriate load is quite an arbitrary matter, and can be argued interminably as long as the basic facts are not available.

The basic and final 1958 CSO tables used are those published in the Proceedings of the National Association of Insurance Commissioners 1959 Volume I, pages 224 and 225. The ratios selected were applied to the basic table and the margins as published were added to the result.

Ratios applicable to the 1958 CSO experience do not seem to be directly available. The best estimate seems to be to use general population experience. Tables 2 and 4 in the Appendix to the 1979 Report of the Surgeon General were involved in the determination of the 1980 split by the Society of Actuaries Special Committee which used the data from the 70's for the split. Data from the same source for the 1950's set of ratios was developed for the 1958 CSO tables.

#### IV Construction of CSO Tables

The separate tables were derived from the composite table using formulae developed as follows:

Let  $a$  = the ratio of smokers in the total populations involved  
 $b$  = the ratio of smoker to non-smoker mortality  
 Then the non-smoker  $q$  equals the composite  $q$  divided by  $(1 - a + (a \times b))$   
 And the smoker  $q$  equals the non-smoker  $q$  multiplied by  $b$ .

These formulae were applied to the basic  $q$ 's published in the 1977 Proceedings of the National Association of Insurance Commissioners. A loading equal to the composite loading used in developing the 1958 CSO Tables was then added to each of the resulting tables.

#### V Construction of CET Tables

These tables were derived from the loaded 1958 CSO smokers, non-smokers, male and female tables by applying to each table the loading formula used for the 1958 CSO and 1980 CSO composite tables viz. the greater of 75 deaths per thousand or 30% of the CSO Table.

#### VI Construction of Age Last Birthday Tables

Somewhat different processes were used in deriving age last birthday tables from the age nearest birthday tables for the 1958 CSO and 1980 CSO tables. The 1958 CSO process was followed here. The formula assumes a uniform distribution of deaths and is as follows:

$$q_x = (q_x + (1 - q_x) q_x + 1) / (2 - q_x)$$

This formula was applied to each of the four age nearest birthday tables independently of each other.

VII Sex

The 1980 procedure was to use sex-distinct valuation tables and then distribute the mortality rates according to the separate male and female ratios of smokers to non-smokers and smokers to the composite. This method was considered for the 1958 tables. However, the original tables are not sex-distinct, but rather rely on age set-back procedures. These age set-back procedures are also incorporated into the Standard Nonforfeiture and Valuation Laws. Current controversies over the use of unisex rates will also be averted by not having separately prepared tables which would add to the various situations which can be introduced into unisex arguments. Under these circumstances it seemed more appropriate to sacrifice some actuarial purity and maintain consistency with the present 1958 CSO procedures. Accordingly only male tables are presented. Female tables can be generated by using whatever age set-back might be desired.

VIII Tables

There are four tables attached.

Table I shows a selection of the proposed rates, along with those for the 1958 CSO Table for comparison purposes.

Table II shows the basic data and the derivation of the basic smoker/non-smoker tables.

Table III shows the loadings, and the resulting loaded rates for smoker/non-smoker classifications.

Table IV shows for comparison minimum cash values @5½% and reserves at 4½% separate and composite.

Table V shows the 1958 CSO loaded table for smokers and non-smokers, the loadings used to develop the 1958 CET Tables, and the resulting CET Tables.

Table VI shows the four age nearest birthday (ANB) tables and the four age last birthday (ALB) tables derived from the four age nearest birthday tables.

IX References

Report of the Committee for the Preparation of Monetary Table: 1958 CSO and CET Tables on the Age Last Birthday Basis TSA XIII page 607.

Report of the Industry Actuarial Advisory Committee TSA X page 693.

Report of the Industry Actuarial Advisory Committee Proceedings NAIC 1959 Volume 1 page 213.

1980 CSO and 1980 CET Mortality Tables on an Age Last Birthday Basis TSA XXXIII page 671

Society of Actuaries Task Force on Smoker/Non-Smoker Mortality Report - October 3, 1983.

MR. GODFREY PERROTT: Good morning. As John has told you, I am the Chairman of the Committee on Specifications for Monetary Values for the 1980 CSO Tables. This Committee was formed in October, 1981 and substantially completed its work by the Washington, D.C. meeting in October, 1982. Since I described in Washington what we had done up until that point, I do not plan to bore you by describing it again. If you are interested in it, you can read the Washington edition of the Record. I will read the principal conclusions that appear in the Record, then describe what we have done since then, and then answer questions during the question and answer period.

The major points of our report are that:

- \* We started from the 1958 CSO specifications instead of starting from scratch.
- \* There are some areas of technical concern that are not covered in the law, and two of these are included in the report, although we did not include them in the specification. The two areas are how reserves should be calculated for plans with non-level benefits (the model law is surprisingly ambiguous on what the appropriate method is) and whether or not the CRVM reserves can be less than the expected present value of benefits for the balance of the policy year.
- \* The optional select factors should be applied to the age nearest birthday  $q$ 's and that we should not try to make any interpolation of them.
- \* The age last birthday  $l_x$ 's should be calculated directly from the age nearest birthday  $l_x$ 's, and we should not attempt to work backwards to get a set of  $q$ 's and then work forward again.
- \* The  $l_x$ 's,  $c_x$ 's, and  $d_x$ 's, whether select or ultimate, should be calculated starting from a radix of 199 and working backwards.
- \* Even though the 1980 CSO table is not Makehamized, a workable table of uniform seniority can be developed and one is in our report.

We completed our report and submitted it to the Research Policy Committee before the Vancouver meeting. They approved it and submitted it to the Board. The Board approved it for exposure, but decided it was too long and would lack enough interested readers to justify mailing it to all members. Instead, a notice was mailed out to all members saying that it was available from the Society. To date, 250 copies have been requested from the Society.

So far, I have received seven letters of comment on the report, some requesting clarification and some with suggested changes. Those suggested changes concern:

- \* the use of floating point in the specifications.
- \* allowing an "actuarial certification of substantial compliance" to cover calculations that are not made literally following the specifications, but which are sufficiently close to be usable.
- \* the size of the radix.

I expect to continue to receive letters but have been requested to submit a final report to the Board at its January meeting. To do this we will need to consider and respond to any comments by about the first of December. If you are nurturing a comment that you have not given to us, I would encourage you to do so quickly.

That is all I have to say about the report. I will be happy to answer questions during the question period.

MR. TOZER: An insurance company can elect to implement the 1980 changes on a plan-by-plan basis. As of September 13, fifteen states had no restrictions on this implementation. Thirty-three states had some restrictions. Wyoming requires that the entire portfolio be done at once. In December 1982, the National Association of Insurance Commissioners adopted an actuarial guideline for plan-by-plan implementation. This guideline has five requirements. First, sales must be discontinued of like 1958 CSO plans in the filing state. Second, sales must be discontinued of like 1958 CSO plans in other states that have passed the 1980 amendments. Third, once the 1980 CSO is elected for one plan, the 1980 CSO must be used for all subsequent plans of the same generic form, unless the company can satisfactorily demonstrate the need to continue the 1958 CSO plan. Fourth, "like plans" are plans with the same benefits, including cash values, and with the same premium paying period and pattern of premiums. Fifth, "generic form" are generic groups, such as ordinary versus group, term versus permanent, flexible cash values versus fixed cash values, and separate account versus general accounts.

The 1980 Amendments permit (1) the Commissioners 1980 Standard Ordinary Mortality Table, or (2) the Commissioners 1980 Standard Ordinary Mortality Table with a ten year select mortality factor, or (3) any other ordinary mortality table adopted by the National Association of Insurance Commissioners. The 1980 CSO Table helps reduce deficiency reserves. In addition, the 1980 CSO Mortality Table with ten year select factors further reduces deficiency reserves. It is interesting to note, however, that at this time, the 1980 CSO Mortality Table has not been selected by a large number of companies.

The 1980 CSO Mortality Table is a sex distinct table rather than a male table with a setback for females. This table appears to be in conflict with the recent Norris decision. As a result, the National Association of Insurance Commissioners at its recent meeting in Tampa last September adopted a "blended" 1980 CSO Table as a unisex table. The blend can consist at the company's option, of from 0% to 100% female mortality. Since the 1980 amendments permit the insurance department to use any mortality table adopted by the NAIC, this blended unisex table can be implemented by regulation rather than requiring legislation. To speed implementation, President Day is being encouraged to send a letter to each insurance department with a suggested model regulation. In the future, hopefully, all new mortality tables can be implemented by regulation rather than by statute. The 1983 Individual Annuity Mortality Table, for example, is being implemented by regulation. A new Group Annuity Mortality Table is expected to be adopted in December. As Peter Marion has reported, a set of smoker and non-smoker tables has been developed. A technical advisory committee has made a series of recommendations to the NAIC on the subject of smoker/non-smoker mortality. These recommendations are, first, the 1958 CSO Mortality Table and CET Mortality Table adjusted for smokers and non-smokers (about which John was just talking) be acceptable for issues

before January 1, 1989. This will enable companies to handle the smoker/non-smoker situation without adopting the 1980 Mortality Table. Second, the 1980 CSO smoker/non-smoker tables with or without the ten year select factors be permitted as an alternative to the 1980 CSO Table on a plan-by-plan basis. Third, a 1980 CET smoker/non-smoker table be permitted. Fourth, if a company charges different premium rates for smokers and non-smokers, they be permitted to use the same reserves and cash values for both smokers and non-smokers. Fifth, if a company charges different rates for smokers and non-smokers, even though they use the same cash values and reserves, deficiency reserves are based upon smoker/non-smoker mortality. Sixth, these recommendations should apply to policies issued on or after January 1, 1984.

One of the revolutionary features in the 1980 amendments is the introduction of a dynamic interest rate. The maximum interest rate for nonforfeiture values is 125% of the maximum valuation interest rate. Maximum nonforfeiture and valuation interest rates are now annually re-determined based upon the Moody's Corporate Bond Yield Average. As a result, the maximum nonforfeiture interest rate on life insurance with long-term guarantees has increased from 6¼% for 1981 issues to 7¼% for 1984 issues. However, interest rates do not always increase.

For example, single premium immediate annuities had a maximum interest rate for 1981 issues of 11¼%. This increased to 13¼% for 1982 issues and decreased to 11¼% for 1983 issues. There is a series of valuation interest rates for deferred annuities. These interest rates vary by (1) the availability of a cash settlement option, (2) the length of guarantee of any fixed interest rates (3) any restrictions that are placed upon withdrawal of funds, and (4) whether the basis is an issue year basis or a charge in the fund basis.

Another major change in the law affected guaranteed interest contracts. In the past, the Standard Valuation Law did not establish minimum valuation standards for guaranteed interest contracts. The 1980 amendments require guaranteed interest contracts to meet the deferred annuity standards. Another feature of the amendments permits insurance companies to offer greater paid-up insurance benefits than cash surrender benefits, without requiring increased cash surrender values for the increased paid-up benefits.

The 1980 amendments make several changes in the calculation of first year expense allowances for minimum cash values. First, the average amount of insurance for the first ten policy years is used instead of the equivalent level amount. Second, the first year expense allowance is changed to 125% of the nonforfeiture net level premium plus 1% of the average amount of insurance. The nonforfeiture net level premium cannot exceed 4% of the average amount of insurance. Third, additional expense allowances are provided for future policy changes. Fourth, cash values are not required for term insurance of 20 years or less and expiring before age 71. Fifth, cash values are not required if they would be less than 2¼% of the average amount of insurance. The 1980 amendments generally produce lower minimum cash values.

The model amendments do not require policies to be refiled with the insurance departments if the only change is the change in interest rate or mortality rate. The Standard Nonforfeiture Law contains a new Section 8 that limits changes in the Nonforfeiture factor and, consequently, smooths the development of actual cash values. Companies that have had erratic cash values in current policies will need to revise those cash values in future policy forms.

An important feature of the amendments permits the commissioner to establish minimum reserves and nonforfeiture requirements for products not covered by the law. As a result, an advisory group has developed a set of minimum nonforfeiture and reserve requirements for universal life. These requirements are currently under discussion by the National Association of Insurance Commissioners, and it is hoped that they will be adopted in December. The reserve requirements define a Net Level Premium Reserve and a Commissioner's Reserve. The calculation is on a prospective basis. Accumulations and projections of future benefits are based upon company guaranteed rates. Discounts and present values are based upon rates in the Valuation Law. Projections are made using a Guaranteed Maturity Premium. This Guaranteed Maturity Premium is the premium at issue that would mature the policy using the company guarantees. Company guarantees include guarantees in the policy and guarantees declared by the company for the period of time of the company guarantee. The regulation includes a ratio that reduces the reserve if the premiums paid in the past are less than the Guaranteed Maturity Premiums. If premiums greater than the Guaranteed Maturity Premiums have been paid in the past, the reserve is increased, because the increased premium increased the present value of future benefits. The Commissioners Reserve method is the Net Level Reserve method less the unamortized first year expense allowance. The first year expense allowance is that allowance defined by the Valuation Law for a plan of insurance defined at issue by the Guaranteed Maturity Premium. A structural change in the policy can generate an additional expense allowance.

Company declared rate guarantees in excess of policy rate guarantees are not structural changes. If these company declarations exceed the maximum valuation rates, an added reserve must be established immediately for the present value of the excess for the total period of the guarantee. This added reserve is then released over the period of the guarantee. If the valuation premium at issue is greater than the Guaranteed Maturity Premium, the Guaranteed Maturity Premium is substituted for the valuation premium, creating a reserve that includes an item similar to a deficiency reserve.

The minimum universal life nonforfeiture standard differs for flexible premium and fixed premium plans. The flexible premium version is a retrospective calculation, whereas the fixed premium version is a prospective calculation. The regulation controls surrender charges indirectly. The cash value, after the surrender charge, must not be less than the minimum cash value in the regulation. The recommendation does not require a paid-up nonforfeiture benefit but states the minimum basis for that benefit should it exist.

If riders have separate premiums, they do not affect the minimum cash values; however, if the cost of the rider is deducted from the policy value, the minimum cash value must consider the rider. As a result, you may want to use attained age term charges for your rider charges rather than level issue age rates. Fixed premium plans are handled very similarly to traditional plans since the premiums and benefits are known at any current time. Any company declared guarantees in excess of the policy guarantees do not increase the cash value at declaration time but instead generally increase the cash value over the period of the guarantee.

The flexible premium plans accumulate the premiums, less the accumulated (1) benefit charges, (2) administrative expense charges, (3) first year expense charges, (4) service charges, and (5) partial withdrawals. Accumulations are at the actual credited interest rate. Interest cannot be credited conditionally for more than twenty-four months. The minimum cash value is the net accumulation, less the unamortized unused first year expense charge. First year expense charges are limited to the averaged administrative expense charge plus first year expense allowance. The averaged administrative expense charge is the average of the charge that would be made for the second through the twentieth year. The first year expense allowance is the expense allowance provided by the Standard Nonforfeiture Law for a fixed premium, fixed benefit endowment policy for the initial face amount with premiums payable for the maximum period and maturity at the maximum date. Any increase in the amount of insurance generates an additional expense allowance. Unused expense allowances are amortized over the maximum premium paying period.

The regulation has additional requirements for interest indexed universal life. With the initial filing of the policy form, the company must describe (1) how interest credits are determined, (2) the company's investment policy, (3) the method used after expiration of any index period, (4) any minimum interest guarantees, and (5) any maximum premium limitations. In addition, the company must file (1) annually, a description of the amount and type of assets held for this plan, (2) before they're used, any material changes in the investment policy, and (3) annually, an actuarial opinion. This actuarial opinion can rely on the expected investment cash flows provided by the chief investment officer. The actuary provides an opinion of the adequacy of future investment and insurance cash flows to meet the contractual obligation of the company under this plan.

Because the 1980 amendments are so revolutionary and the insurance market is changing so dramatically at the present time, it is impossible for me to cover all the possible implications. Since this is an open forum, I believe it would be more productive to limit my comments and permit you to discuss the topics you feel are most appropriate.

MR. ANTHONY SPANO: Bill Tozer referred to the ACLI efforts in the state of Wyoming to try to get some legislation next year so as to extend the January 1, 1985 compliance date. We would appreciate all the help that any of you could give us. For that reason, I am asking that if any of you feel that your company would have a problem; or for the consultants, if any of you are clients would have a problem in complying with this January 1, 1985 effective date, then please call me or Bill Carroll at the Council offices. But do it this month; time is really urgent. The legislature meets at the beginning of next year. Those of you who have worked with legislation in

any way know that there are a few months of preliminary effort that are always necessary if one wants to have legislation enacted. So we (and the lawyers at the Council who are working on this) feel that we really need to move on this on a very urgent basis. So we must hear from you at the latest by the end of this month.

MR. MONTGOMERY: Tony, is the Wyoming Department still in existence? The reason I ask is that they have a Sunset Law. I do not know if they went out of business on the first of July of this year or next year.

MR. SPANO: I am not sure John, but I am familiar with that legislation. I would think that the Department in some form would stay in existence, but I am not really sure about the mechanics. I do know that Sunset Legislation is common in some states. Arizona is one state that comes to mind that typically has a Sunset Legislation.

One thing that I can say definitely is that the Wyoming Insurance Department very recently (and by that I mean within the last two weeks or so) came out with a bulletin over the signature of Tom Power (who is the Chief Examiner and the Chief Actuary) in which he indicated that the Wyoming Department was going to impose the same requirements that the California Department will be imposing with respect to showing of market value of bonds.

MR. MONTGOMERY: It must be next year then.

MR. SPANO: The second comment that I have relates to the famous 1980 CSO Specifications. It is interesting that we at the Council sent out these specifications with the many, many pages that are involved to our actuarial committee and to other interested people and there was complete silence. There is concern that some companies would not be able to reproduce the values that one would get by using the specifications along with very sophisticated computer equipment. As a result of this, these companies that do not have the advantages of the most sophisticated equipment might get involved in squabbles with regulators, for example, about whether or not their non forfeiture values comply with minimum requirements. You can see how this could develop if two people are using different types of equipment. As a result of his letter, the committee decided to send a letter to Godfrey and to Ted Becker, the Chairman of the Technical Staff Actuarial Group, pointing out the existence of this problem and hoping that some solution could be achieved whereby these potential arguments over trivial differences in values could be avoided. The committee was not sure as to exactly what the best procedure would be, but two things that occurred to them were (1) perhaps an NAIC interpretive guideline or (2) the certification of the type that Godfrey had indicated.

MR. GODFREY PERROTT: I have not read Dick's letter yet because it arrived at my office after I left, but I did read the original letter, and I think your description of the categories of computers is much too strong. It would be possible to program the specifications on practically any computer. It might be more work than not using rounding rules at all, and I agree that I do not want anyone getting into arguments over trivial differences. But the specifications are not limited to sophisticated computers.

MR. MONTGOMERY: I also might point out that when the NAIC does make these specifications, the matter of triviality will be considered in whatever guidelines we put out for their use, and we will get advice from Godfrey's committee on that.

MR. ROBERT J. CALLAHAN: As I read the Tampa resolution, regarding the blending of the 1980 CSO male and female rates, it appeared to me that it could be a nightmare to administer. However, I will hold my comments with respect to that resolution until we meet tomorrow with John's committee. At that time, I would hope that we could get some modification to it so that it could be truly workable.

I frankly am a proponent of allowing companies to use a unisex table on all their individual policies even if their individual policies are not used in a Title VII situation. As I read the Norris decision, there is no necessity at this time for a company to adopt a unisex table if it does not use individual policies in a Title VII situation. However, because we want to be prepared for any federal legislation that may mandate the use of unisex tables, I think that we should adopt unisex tables as permissible as soon as possible.

Yesterday, I referred to ERISA very frequently as the full time employment act for actuaries. Perhaps I should say that the 1980 NAIC Standard Valuation and Nonforfeiture Laws could also be referred to as the full time employment for actuaries act, as it certainly puts a great deal of work upon industry actuaries as well as State Insurance Department actuaries. One of the things for which the NAIC committee should be commended is the adoption of the dynamic rate of interest. However, as the law now reads, that dynamic rate of interest cannot be used for either nonforfeiture or valuation until a company makes an election of the 1980 CSO Table for nonforfeiture purposes. We in New York this past year revised our valuation laws so that the dynamic rate of interest could apply to the 1958 CSO tables as well as the 1980 CSO tables, by permitting it for issues of January 1, 1982 and later. You made mention of the fact that you could adopt other mortality tables through the NAIC, and then in turn have the states adopt them by regulation rather than legislation. I frankly feel at times, that it is just as difficult to get regulation through insurance departments as it is to get legislators to act. We in New York do not require a regulation to adopt the new tables for either cash value or reserve purposes. I would suggest that perhaps the NAIC look at that law and make the mortality tables automatic by the states instead of requiring that a state adopt them by regulation. I think the situation regarding unisex is an example of where action is required immediately. Even if the NAIC adopts unisex tables in December, it could be a considerable length of time before all the various states adopt such unisex tables by a regulation.

We in New York wanted to go along with the plan-by-plan implementation of the 1980 CSO. However, our law in New York read a little bit differently than the NAIC Standard Nonforfeiture Law. This past year, legislation was passed to permit a plan-by-plan implementation, but it does have a cutoff date such that a complete switch over to the 1980 table must be made within two to three years, namely by January 1 of the third subsequent calendar year, but not later than January 1, 1989. The law does not prohibit the filing of plans on the 58 CSO in the meantime, but I do not think that that is a practical thing to worry about.

MR. DAVID LEE: I would like to know the status of the laws in Alaska and in the District of Columbia. What is being done to try to get the legislators to act in those laws? I would like an informed opinion as to the probability that we will have the 80 legislation there by January 1, 1985.

MR. SPANO: Your last question was what the prospects are for January 1, 1985? I am reminded of a favorite expression of Lyndon Johnson which was, "We will do our dead level best". Regarding these jurisdictions, the problem is not one of any organized opposition of the legislation. The problem is one of getting political movement. So often whether or not a measure gets enacted, depends not on the sheer merits of the measure, but rather on the special political situations. I will not take the time to describe what these special political situations are, but I will say that we did introduce the legislation in Alaska this year. The bill did not proceed forward because of other legislative items that were more important to the politicians that preempted this piece of legislation. The measure automatically carries over to next year's legislature, so that we will definitely get a crack at it next year. The same is true in the District of Columbia. In Puerto Rico, as Bill Tozer had mentioned, legislation is not required. That is the one jurisdiction where the commissioner can adopt these provisions by regulation. We went to see the commissioner back in the summer of 1981. We are in touch with the current commissioner (there has been a change) and check with him periodically. We will make every effort.

MR. SPENCER KOPPEL: First, I would like to express a bit of culture shock. It has been about ten years since I have concentrated on life insurance issues. You cannot imagine, if you have not looked at life insurance issues for ten years, the significant differences that exist right now. Before, you would worry about whether your product was going to be Whole Life, Term, Endowment, or whether it was going to be participating or non-participating. Now you have to worry if it is going to be a smoker/non-smoker, male/female, interest rate sensitive product or variable benefit, etc. I would like to express some concern. Frankly, I am not sure what is going to have more impact, the NAIC or IRS, on product designs over the next several years. But I would like to express a concern. Our company and many other are in the small policy marketplace where simplicity is still the name of the game. We cannot afford to have all the variations that might be thought to exist in the more sophisticated marketplace. I would hope that the committees will all keep in mind the fact that there must be the ability to keep products in the marketplace that have the simplicities, so that the administrative expenses can be kept to a minimum, so that the costs do not get too high.

MR. TOZER: These regulations and rules are establishing minimum standards, and it is hopefully not necessary that a specializing company would have to make their products as complicated as the regulations. You must check that their products are not violating those regulations, but hopefully you can use an approach that would not entail a complicated valuation. We are trying to build various options into the regulation to permit as much flexibility as possible, to meet the needs of the marketplace, and to keep the insurance industry competitive with other institutions. So I think that when you look at regulations and see very complex situations, do not assume that you are going to have to build all those complications into your own day-to-day operation. These are minimum standards; these are not recommendations on how you should do you business.

MR. DOUGLAS DAHL: I have three questions for Bill regarding the universal life Valuation Nonforfeiture Model Regulation. The first question is, as I read the regulation, there are no limits to the cost of insurance charges that you can have for nonforfeiture requirements for universal life. Is this true or false?

MR. TOZER: Not directly. The regulation establishes minimum cash values and minimum reserves, and it is possible through creative work, I presume, to develop a formula, or a product design, that would have mortality charges that are above those in the law. There are, however, compensating factors in the formulas that would keep cash values and reserves above those minimums.

MR. DAHL: Specifically, for flexible premium universal life, the minimum cash value is on a retrospective basis. Therefore, if you have cost of insurance rates which are higher than the valuation mortality rates, it seems that that would apply.

The second question concerns the valuation for flexible premium universal life. As I read it, if you had a no-premium-load universal life product, the CRVM reserve would be less than the accumulated fund, and there would be no requirement for deficiency reserves on the side. Is that true?

MR. TOZER: It is possible, as it is possible today, to develop minimum reserves that are below the cash values in your product. The annual statement instructions state, I believe, that whenever you have a product where your cash values are less than your reserves, you must carry reserves up to the minimum level of the cash surrender values. Yes, it is possible that the CRVM method will generate a reserve less than the cash value, but you would have to meet the cash value minimum then.

MR. DAHL: But it could be less than the accumulated fund if you had surrender charges?

MR. TOZER: Yes.

MR. DAHL: The third and final question is on the fixed premium universal life nonforfeiture requirement. There appears to be no limit on the first year expense loading that you can charge. Is that true or false?

MR. TOZER: No, you have a first year expense allowance that basically matches the one that is given traditional products.

MR. DAHL: I think that is for surrender charges.

MR. TOZER: The regulation does not talk about surrender charges, instead, it talks about minimum cash values.

MR. MONTGOMERY: The minimum cash values should turn out to be the same as they are for traditional products. That is the limitation. I want to point out that we do not intend to regulate rates on this. We are only trying to abide by the basic principles and philosophy underlining the standard valuation and nonforfeiture laws.

MR. DAHL: You were speaking earlier about the 1958 CSO smoker/non-smoker tables, and whether or not you would allow those for cost of insurance charges. If this model regulation is passed, then that would be academic.

MR. MONTGOMERY: That would be academic, yes.

MR. CLAUDE PAQUIN: I have some comments which are addressed to the area covered by Godfrey Perrott concerning the specifications for the 1980 CSO Tables. Everyone in this room knows that the formula for  $1000 c_x$  is  $1000 q_x / (1 + i)$ . That is the most basic formula. However, the 1958 CSO books published by the Society of Actuaries have used the formula  $1000 C_x / D_x$  which is equivalent to the other formula. However, it turns out that once you have reached the third decimal, you are off if you use the  $1000 C_x / D_x$  formula as opposed to using the basic principles formula of  $1000 q_x / (1 + i)$ . This arises when you calculate your CRVM reserve. The first year net premium is, in many cases, the full preliminary term  $1000 c_x$ , and you can calculate it one way or the other. The Society calculated it with the  $1000 C_x / D_x$  and the last three decimals are generally off. We find an instance of delusive exactness, where you have something that looks exact, but it is not. And I am concerned that the committee on specifications for the 1980 CSO Table is about to embark on the same sort of project because it is looking too much at the 1958 CSO Table. In preparing the 1958 CSO commutation functions, ten significant digits were used in preparing the values for  $l_x$  and  $d_x$ , and they went from there. As a result, people have tried to program a computer using basic principles which involve basically using  $q_x$  and  $i$ . That is all you really need if you start from basic principles. You can go out of your way to do things wrong by complying with the specifications booklet of the Society of Actuaries, or you can do it in a natural way where things always provide the same result depending upon the number of significant digits the computer can carry. Most of them can carry more than ten significant digits now.

I want to bring this up because the Society of Actuaries has developed a new textbook on life contingencies. This textbook emphasizes the application of basic principles, and it deemphasizes commutation functions. Thus, I am somewhat concerned that the committee on specifications is going in a direction opposite the direction the people who developed the textbook (and mathematics) are going. With respect to Age Last Birthday calculations, I am concerned because the technique of using  $l_x$ 's basically ends up producing  $q_x$ 's. The  $q_x$ 's for Age Nearest Birthday typically have two decimals, except with annuity tables where three decimals are used. That is the typical pattern that one finds. But for Age Last Birthday one has to use four decimals, and once you start using  $l_x$ 's and work your way backwards, you find that the last two decimals are 49 or 51 fairly often. The basic concern that I have is that somebody who tries to program these things in the most intelligent way possible (using basic principles) is handicapped by all these artificial rules that are thrown in by going back to  $l_x$ 's and commutation functions which, as I have indicated, appear to be on their way out.

MR. PERROTT: The committee was asked to provide specifications. Any time you provide specifications, if they are to produce an unique set of results, you have to develop some kind of order of calculation and rounding rules. They are not exact; they are not perfect; the only purpose was to produce something that could be reproduced. Secondly, if you read the committee report, we recommend that Age Last Birthday not use  $q_x$  at all, but avoid the artifice of going from  $l_x$  to  $q_x$  to  $l_x$ . Using L's D's and commutation functions are nothing more than computational shortcuts, whether they are done manually or whether they are done on a computer. But there is nothing magic about them, and they do not change the actuarial logic.

MR. MONTGOMERY: Claude, I happen to be on that committee of which Godfrey was Chairman, and we did discuss all of this. Our problem was to get something that was a definite specification. That is the reason why I mentioned triviality prior to this. And I think once we have established these limits of what is trivial and what is not, I do not think you will have a problem.

MR. ANDREW P. JOHNSON: So far the discussion has focussed on the model law's application to ordinary insurance. With regard to Group Pensions, the law is particularly suitable for currently "hot" products such as "GIC" funds, for purchase of single premium and terminal funding annuities, and for other annuities purchased from unallocated active life funds. Many valuation actuaries will welcome it.

However, the dynamic interest rate provisions create some technical problems in keeping track of reserves for recurrent purchases of deferred annuities under older contracts. We have a straightforward solution for controlling the myriads of valuation assumptions for all those little pieces of purchased annuities, but like many straightforward solutions, it is cumbersome.

Whether they hold such reserves on the minimum or above it, many actuaries will want to calculate minimum reserves as part of surplus management. I'd be interested in learning what other actuaries are doing now to keep track of all those little slices into the future.

MR. MONTGOMERY: It does not look like you are going to get much help. But I hope we have it for the Record because maybe somebody should be looking into that.

MR. EARL MAGNUSON: While the 1980 amendments have been quite revolutionary from an actuarial standpoint, I would like to bring to the attention of everyone that there are certain archaic provisions in the policy form sections of many of the state statutes. I would encourage those that have the opportunity, to use a more dynamic interpretation, and not to require us to refer to mortality tables in our policies if possible.

MR. JERRY ENOCH: In getting some forms approved in Texas, we were surprised to learn that we had to specify in the policy form a description of the calculation of nonforfeiture values for all years in which they did not appear in printed form in the policy. This could be a problem.

MR. MONTGOMERY: Yes, there is a reason for that. When you get the very old forms, it is very difficult to go back and find out what they really intended for the nonforfeiture values. That is the reason that was put in there. I have had to struggle with some of those old forms when there has been a contest on nonforfeiture values and they have gone beyond twenty years. The company may have lost their records, and all sorts of things can happen.

MR. BRIAN FORMAN: I would like to go back to something that Doug Dahl was asking a little bit ago about the universal life model regulation. I think the point was clear that the CRVM reserve could be less than the accumulation value, however, I do not think the question was answered clearly about the annual statement. I think, in one of the later sections, it says that any excess of the cash value over the reserve has to be held. Does that really mean the cash value, the accumulation value, or the surrender value? That is the basic question; if the accumulation value is in excess of the CRVM, does something extra have to be held in that section?

MR. TOZER: It is the feeling of the Task Force that you look to the cash value. You look to the benefits in the policy, not the policy value. In fact, my Task Force feels that too much emphasis has been placed on policy values or account values in the past because of the limited amount of regulation that was available, and the account value was a handy thing to use. We feel, however, that the account value is strictly an intermediate step to get to a series of benefits to the policyholder. It should be those benefits to the policyholder, whether it be cash surrender values or whether it be insurance values, that should have reserves set up for them, and not necessarily the account value. In some policies they would be very similar, but in other policies they may not be.

MR. PAUL UREY: I would like to ask you to put back into perspective some comments you made the other day relative to the blending process. You said that 0% or 100% would perhaps be frowned upon by state insurance departments; that something was being done with 25-75, 50-50, and 75-25; and demonstrations would be made to show that it did not make much difference if you were in between. Who is doing this relative to 0-100?

MR. MONTGOMERY: The committee that did the 83 annuity tables has been reassigned to work out these blended tables, to study them, and to come up with a report on the feasibility of using such tables. At this point, we do not know where the answer is going to be until we have some figures to look at it.

MR. CALLAHAN: One of the technical aspects which I want to discuss tomorrow is the fact that I think you are going to have to specify the mortality table in the policy.

MR. MONTGOMERY: I agree.

MR. CALLAHAN: Perhaps you can take the 100% male table, and show that your actual cash values would be above minimum regardless of blend. The problem then is to convert from the actual, not minimum, cash value to the amount of paid-up insurance or the amount of extended term insurance, using the actual cash value to convert, not the minimum cash value. It is at this point where I feel you are laying yourself open to lawsuit by

some groups that are looking for publicity. They may say that this 100% male table does not give adequate periods of extended term insurance or adequate amounts of reduced paid-up. Even if a blended table were used, such groups may challenge the blend, the periods of extended term, and amounts of reduced paid-up.

MR. MONTGOMERY: These are all things that we have to discuss and bring out in our final recommendations to the NAIC, and it is quite important that we get this all together before we have them act on it finally. Right now I want to point out that this is an emergency measure. This blended table that was adopted in Tampa was adopted by the Executive Committee of the NAIC. It is not really official until it is adopted by the plenary session, and it is understood that we are working on this problem and we have some research to do. We will have some preliminary results by then, but I do not think we are going to have the final answer by San Diego because it will take a lot more study. But we do have to do some work on what you are talking about.

MR. TOZER: I might add a comment here. The unisex problem is primarily a 1980 CSO problem. The 1958 CSO male table is an acceptable table for both males and females, so the problem we are discussing here is primarily a 1980 CSO problem, not a 1958 CSO problem. Is that not right John?

MR. MONTGOMERY: Right.

MR. DAVID W. GROATHOUSE: The "Report of the Committee on Specifications for Monetary Values - 1980 CSO Tables" as published May 25, 1983 differs from the 1958 CSO Specifications in that the radix of 200 lives is defined for attained age 99 instead of the radix of 10,000,000 lives for attained age 0 as defined in the 1958 CSO tables. This causes two differences in the calculation procedures.

1. The 1980 CSO  $l_x$  values are generated by starting at the top of the table with  $l_{99} = 200$  and calculating the preceding  $l_x$  values by use of the formula  $l_x = l_{x+1} / (1 - q_x)$

The 1958 CSO  $l_x$  values are generated by starting at the bottom of the table with  $l_0 = 10,000,000$  and calculating the succeeding  $l_x$  values by use of the formula  $l_{x+1} = l_{xx} (1 - q_x)$

If we calculate the 1980 CSO  $l_x$ 's using a radix at age 0 of 10,000,000 and use the 1958 CSO method,  $l_{99}$  will equal 10,757. This does not agree with the 1980 CSO  $l_{99}$  of 200.

If we calculate 1980 CSO  $l_x$ 's using a radix at age 0 of 185,890 lives and use the 1958 CSO method,  $l_{99}$  will equal 200 and each  $l_x$  is exactly as calculated when you start with an  $l_{99}$  equal to 200 and use the 1980 CSO method.

Therefore, as long as  $l_0$  or  $l_{99}$  are the same, it does not make a difference as to which method of calculation we use. This is apparent from the formulas used. Since lives are truncated to near integer lives, rounding errors could have existed, but they do not.

2. One problem that does exist is when we try to calculate commutation functions for 1980 CSO using an  $l_0 = 10,000,000$  and a separate set of functions with  $l_0 = 185,890$ . Values which do not ratio the  $l_x$ 's such as  $D_x$ ,  $N_x$ ,  $C_x$ , &  $M_x$  will be different because of the larger  $l_x$  values calculated from  $l_0 = 10,000,000$ . However, I would expect that any ratio of these values, such as  $A_x$  or  $a_x$ , would be equal. This is not true; 1000  $A_x$  values develop differences in the third decimal place.

I do not think that a significant difference in cash value or reserve values will be generated. However, in doing a Statement of Actuarial Basis, unless the  $l_0$  used is known, you will not be able to reproduce another actuary's work. My concern is whether the state insurance department will find either approach acceptable or whether they will require a specified approach.

There are three solutions to this problem as I see it.

- 1) The state insurance department could write a regulation defining the radix to be used.
- 2) The actuary could disclose the radix used in calculating his values.
- 3) Allow either approach and account for any discrepancy as insignificant.

Solution three seems the least attractive to me since it basically ignores consideration of the problem. Solution two will allow reproduction of values but may require state insurance departments to maintain more than one set of 1980 CSO commutation values.

Solution one would be the best if a single radix could be agreed upon as the standard.

In order to avoid future complications in communicating with state insurance departments and other actuaries I feel that a universal standard should be recognized. I would appreciate your comments on this.

MR. PERROTT: It seems to me that the Committee report is explicit and specifies a radix of 20 at  $l_{99}$  for Age Nearest Birthday functions.