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Final

Final Standards for Independently Reasonable Assumptions

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1500 THE WORK

1510 APPROXIMATION

.01 *An approximation is appropriate if it reduces the cost of, reduces the time needed for, or improves the actuary's control over, work without affecting the result.*

1340.02

.02 *If the actuary reports an appropriate approximation, then the report should avoid unintended reservation.*

.03 *If the appropriateness of an approximation is doubtful, then the actuary should report its use with reservation*. [Effective December 1, 2002]

.04 Like materiality, to which it is related, approximation pervades virtually all work and affects the application of nearly all standards. The words "approximation" and "approximate" seldom appear in the standards, but are understood throughout them.

.05 Approximation permits the actuary to strike a balance between the benefit of precision and the effort of arriving at it.

Approximation in selection of a model

.06 Reality is complex. A simple model reduces not only the time and expense of work but also the risk of calculation and data error.

1710.05

.07 The appropriateness of a simplification depends on the circumstances of the case and the purpose of the work. For example, in selecting a model for advice on funding a pension plan, it may be appropriate to allow for indexing by modifying the assumption for a contingency of which the model takes account, such as the investment return assumption, to arrive at a suitable composite assumption.

Approximation in the selection of assumptions

.08 Simplification of an assumption may be an appropriate approximation. For example:

> Deaths occur continuously over a year: for simplicity, assume that they all occur at the middle of the year.
>
> 1720.03.1
>
> Members of a pension plan with early retirement reductions that approximate full actuarial reductions retire at various rates between, say, ages 55 and 65; for simplicity, assume that they all retire at, say, age 62.
>
> If the members of a pension plan who die before retirement are entitled to a benefit which is roughly the same as the present value of the retirement benefit: for simplicity, assume that death rates before retirement are equal to zero.

.09 To make no assumption about a contingency is usually tantamount to assuming a zero rate for that contingency, which is rarely appropriate in itself, but may be appropriate when combined with an adjustment to a related assumption. For example:

> The calculation of the liabilities in a benefits plan using an explicit expense assumption may be approximated by calculating the liabilities without an explicit expense assumption and using a lower liability discount rate assumption than otherwise appropriate.

Approximation by sampling

.10 A well-chosen sample avoids the extra work of an examination of the entire universe.

Approximations respecting data

.11 Data may be defective. For example, a benefit plan's records may lack the date of birth of certain members. In some cases there is an appropriate approximation; for example, sampling, or extrapolation from similar situations for which data are available.

Approximation vs. assumption

.12 A criterion of the appropriateness of an approximation is its effect on the result. If the actuary approximates but is unable to assess the resulting error, then the approximation becomes, in effect, an assumption. For example, data are missing and it is not practical to get them. The actuary would consider whether their lack is so important that a report with reservation is necessary but in any case is obliged to make an assumption about them in order to do the work.

Reporting approximations

.13 To report appropriate approximations in a longer report may provide information useful to users, but such reporting would avoid unintended reservation, as the use of approximations is a usual part of work. The pervasiveness of approximations in work makes their complete reporting impractical.

.14 If the actuary reports an implicit assumption used as an approximation, then he or she would also report the corresponding explicit assumption or assumptions. Similarly, if an actuary reports approximations for two offsetting assumptions which results in the same net effect as the underlying explicit assumptions, the actuary would also report the explicit assumptions.

.15 The actuary would not usually use an approximation whose appropriateness is doubtful. That may be unavoidable, however, if data are insufficient or unreliable or if needed resources are lacking. If the engagement is an appropriate engagement, then the actuary would report with reservation the use of the approximation, so that a user is aware of a limitation to the actuary's work. 1410

1700 ASSUMPTIONS

1710 NEEDED ASSUMPTIONS

.01 *The needed assumptions for a calculation consist of model assumptions, data assumptions, and other assumptions.*

.02 *There is a model assumption for each of the matters that the actuary's model takes into account. Those matters should be sufficiently comprehensive for the model reasonably to represent reality.*

.03 *Data assumptions are the assumptions, if any, needed to relieve insufficiency or unreliability in the obtainable data.*

.04 *The other assumptions are the assumptions about the legal, economic, demographic, and social environment on which the model and data assumptions depend.* [Effective December 1, 2002]

Model assumptions

.05 The model assumptions are quantitative assumptions about

contingent events,

investment return and other economic matters, such as price and wage indices, and

numerical parameters of the environment, such as the income tax rate.

.06 A calculation requires a model, simple or complex, into which assumptions are set. The actuary's model depends on the purpose of the report and the sensitivity of the calculation's results to the various matters about which assumptions could be made. The actuary would strike a balance between the complexity needed for reasonable representation of reality and the simplicity needed for a practical calculation. If the model does not take into account a matter, then the result is an implicit assumption about that matter, usually an assumption of zero probability or of zero rate. The actuary may compensate for an inappropriate implicit assumption regarding a matter which the model does not take into account by altering the explicit assumption regarding a matter which the model does take into account. For example, if the model takes account of investment return but does not take account of the risk of asset depreciation, the result, as just noted, is an implicit assumption of zero depreciation. To compensate, the actuary assumes an investment return rate which is, for example, the best estimate assumption of investment return minus 30 basis points (0.3%).

Data assumptions

.07 The available data may be not sufficient or not reliable. For example, files of pension plan members may lack the date of birth of the members' spouses. Based on sampling, or on comparison with comparable data, it may be appropriate to assume a relationship between spouse and member ages; for example, that a male spouse's date of birth is three years before the member's, and that a female spouse's date of birth is three years after the member's.

Other assumptions

.08 The other assumptions are usually qualitative, dealing with the environment; for example,

legislation, like the federal Income Tax Act,

student education,

the medical care system,

government social security systems, and

international treaties.

.09 Those assumptions are needed to the extent that the model assumptions and, in some cases, the data assumptions depend upon them. Such assumptions are numerous and it is not practical to identify all of them.

Needed assumptions

.10 Here are examples of matters about which assumptions may be needed:

Economic

discount rates to calculate present values,

investment return rates earned on the investment of positive cash flow or which affects the price at which assets are sold in order to meet negative cash flow,

investment return rates earned on assets that support liabilities,

risk of asset depreciation (C-1 risk),

risk of changes in the level or term structure of interest rates (C-3 risk),

rate of interest on member contributions to registered pension plans,

price and wage inflation rates,

compensation increases,

compensation base on which increases are to apply,

productivity rates,

number of hours worked by employees,

behaviour of indices to which benefits are linked,

rate of increase in maximum allowable pensions under a registered pension plan, and

trend rate (by type of benefit provided under the plan) – initial rate, ultimate rate and the number of years and grading pattern to reach the ultimate rate.

Social

family composition,

marital status,

age difference between spouses, and

judicial decisions in litigation.

Decrement

termination of coverage voluntarily, or through job loss, death, disability, or failure to maintain eligibility.

Benefit entitlement

rates of death, disability, sickness, accident, unemployment, medical treatment, and early, normal, and deferred retirement,

election of options by members and policyholders, and

impact of benefit maxima.

Increment

rates of future new entrants.

Benefit continuance

death, disability recovery, marriage breakdown, remarriage, termination of economic dependency, and re-employment rates,

post-retirement pension adjustments, and

maintenance expense for a disabled person.

Claims development

reporting patterns,

settlement patterns,

reopened claims,

initial claims cost by type of benefit and age, and

cost-sharing arrangements (such as share of cost borne by members in the form of premiums or contributions, coinsurance, deductibles, annual and lifetime maxima, etc.).

Expense

expenses of marketing, administration, claim adjustment, and investment management.

Taxation

tax rates,

definition of tax base, and

limitations on the funding of registered pension plans.

Other

government benefit plan provisions and their integration with private sector plans, and

portion of claims costs paid under government programs.

1720 SELECTION OF ASSUMPTIONS

.01 *The assumptions that the actuary selects or for which the actuary takes responsibility, other than alternative assumptions selected for the purpose of sensitivity testing, should be appropriate in the aggregate. These assumptions should also be independently reasonable unless the selection of assumptions that are not independently reasonable can be justified.* 1310 1320 1610

.02 *The actuary should select each needed assumption except for those, if any, which are stipulated by the terms of the engagement.*

.03 *If the actuary does not take responsibility for an assumption, then the actuary should so report. If the actuary considers it practical and useful to do so, the actuary should report the result of an alternative assumption.* [Effective March 1, 2009] 1530.12 1610.02

.03.1 The actuary would select independently reasonable assumptions. For example,

> for a typical defined benefit pension plan valuation, the actuary would adopt an explicit investment assumption, as well as an explicit expense assumption rather than using implicit assumptions incorporated within a net discount rate. However, for a small defined benefit pension plan, the actuary may choose to use approximations for the investment expenses, in accordance with subsection 1510, and
>
> for a typical non-participating life insurance portfolio where experience is not passed on to policyholders, all assumptions would be established independently. However, for a typical participating life insurance portfolio where experience is passed on to policyholders through changes to the dividend scale, a reasonable representation of reality would be to assume that the current dividend scale and current experience persist into the future, as long as any implicit offsets in assumptions simplify the valuation and do not materially affect the amount of the valuation.

.03.2 The requirement for independently reasonable assumptions regarding contingent events would not require a test of reasonableness within an assumption. For example, a mortality assumption would need to be reasonable only as an independent assumption in total, even though there may be offsets between ages, sex and smoking status within the assumption.

.03.3 The reasonableness of an assumption does not depend on the manner in which an assumption is expressed as long as the assumption would be a reasonable representation of reality over the entire period to which the assumption applies. For example, a life insurance administrative expense assumption would not be reasonable if it were expressed entirely as a proportion of premium, even though it may represent the current reality but would not represent reality if all policies were to become paid up and administrative expenses were to continue to be incurred.

.03.4 A reasonable assumption would reflect current conditions as of the calculation date but would not necessarily have to continue to reflect current conditions persisting into the future. For example, if current interest rates are extremely high or low in relation to past rates or future expectation, it would not be unreasonable to assume that interest rates change over time.

.03.5 The actuary's use of independently reasonable assumptions may result in the assumptions not being reasonable in the aggregate. In such event, the requirement for assumptions to be appropriate in the aggregate would be more important than the requirement for independently reasonable assumptions. Certain assumptions may then be modified and may not be independently reasonable. However, when an assumption is prescribed, it would not be appropriate to compensate for this prescription by modifying other assumptions. Subsections 1310 and 1320 provide additional guidance for these situations. 1310 1320

.04 If the use of assumptions that are not independently reasonable could be justified, inappropriateness in a particular assumption could be offset by the inappropriateness in another – for example if one is conservative and the other is not conservative – then they may be appropriate in the aggregate. For example, in a pension plan valuation, group annuity purchase costs may be calculated using mortality and interest rates that would be different from the rates used by an insurance company to price the annuity, but may still provide a reasonable cost for the annuity.

.04.1 There would be justification for not using independently reasonable assumptions when the assumption

- is prescribed by law or regulation, or is required by a court or by legal precedent in which case the actuary would set assumptions as allowed by subsection 1310, 1310
- is in conflict with or is impractical under the terms of an appropriate engagement in which case the actuary would set assumptions as allowed by subsection 1320, 1320
- is required in unusual or unforeseen situations in which case the actuary would set assumptions as allowed by subsection 1330, 1330
- has no material impact on the results of the work in which case the actuary would set assumptions as allowed by subsection 1340, 1340
- is an appropriate approximation in which case the actuary would set assumptions as allowed by subsection 1510, 1510
- is a model assumption that reasonably represents reality, as described in subsection 1710, or 1710
- is consistent with accepted actuarial practice.

.04.2 The use of independently reasonable assumptions implies that each assumption is explicitly defined. However, there would be no requirement to use explicit assumptions in the method for calculation, as long as the result of using that method does not produce a material error. For example, for pension valuations, use of a discount rate net of expenses may produce a value very close to the value obtained by using explicit assumptions. In this case, the actuary would disclose both the gross investment rate assumption and the expense assumption.

.05 Use of an assumption stipulated by the terms of the engagement is use of the work of another person.

.06 If the stipulated assumption is appropriate but near the end of the accepted range, then it may be useful to report the result of an alternative assumption near the other end of the accepted range, especially in an external user report. Similarly for a stipulated assumption that, for example, the federal Income Tax Act continues as is when an amendment to it is virtually definitive.

.07 In assessing the utility of reporting the result of an alternative to an assumption for which the actuary does not take responsibility, the actuary would consider the dependence of external users on his or her work. For example, utility in actuarial evidence work would be assessed in the context of the adversarial system in tort litigation, which expects each side to develop its own case without help from the other side, and to identify and expose any flaws in the other side's case. It is therefore consistent with that system for the actuary engaged by one side not to report the result of an alternative assumption if the lawyer for the other side is able to compel the actuary (or engage his or her own actuary) to calculate the result of a desired alternative. On the other hand, if members of a pension plan receive a copy of the actuary's report that uses an assumption for which the actuary did not take responsibility, the reporting of the results of using an alternative assumption may be useful to those members.

1730 APPROPRIATE ASSUMPTIONS

.01 *The appropriate model or data assumption for a matter is the best estimate assumption of that matter, modified, if appropriate, to make provision for adverse deviations, and taking account of*

> *the circumstances of the case, past experience data, the relationship of past to expected future experience, anti-selection, the relationship among matters, and*
>
> *in the case of assumptions on economic matters for calculation of liabilities in a balance sheet, the assets which support those liabilities at the calculation date and the expected policy for asset-liability management after that date.*

.02 *The appropriate assumption for other matters is continuation of the status quo, unless there is none or unless it will change, and the actuary so reports.* [Effective December 1, 2002]

Acceptable range

.03 Variability in the circumstances of cases is significant and calls for a significant variation in assumptions among cases. Usually, therefore, the actuary who is familiar with the circumstances of a case makes the best selection of assumptions for that case. Two actuaries, each familiar with the circumstances of a case, may select different assumptions for that case. That is acceptable if the range of their selections is appropriately constrained by standards of practice.

.04 In other words, the crux of the matter is the selection of assumptions appropriate to a particular case from the relatively wide range of assumptions applicable to all cases. A relatively narrow range of assumptions among actuaries each selecting assumptions for a particular case is less important.

.05 Sometimes, however, it is desirable that actuaries produce results within a relatively narrow range that the profession and the public perceive to be reasonable and consistent. It is then appropriate for the profession to supersede the actuary's selection by a prescription in the practice-specific standards that is within the range of assumptions otherwise considered acceptable.

Circumstances of the case

.06 An assumption about a matter would take account of the circumstances of the case if those circumstances affect that matter.

.07 The circumstances of the case affect experience on most matters other than economic matters. In the case of salaries, however, both the circumstances of the case and the economy affect experience.

Familiarity with the case

.08 In selecting assumptions, the actuary would have knowledge of the case. That may involve consultation with the persons responsible for the functions which affect experience. 1450 1610

.09 For example, if the calculation is to value the assets or liabilities of a benefits plan, then the actuary would consult the persons responsible for investments, administration, and decisions on plan changes. If the calculation is to value the policy liabilities of an insurer, then the actuary would consult the officers responsible for investments, underwriting, claims, marketing, product design, policyholder dividends, and policy servicing.

Past experience data

.10 The available and pertinent past experience data are helpful in the selection of assumptions.

.11 Other things being the same, pertinent past experience data are data

relating to the case itself rather than to similar cases,

relating to the recent past rather than to the distant past,

that are homogeneous rather than heterogeneous, and

that are statistically credible.

Usually, however, those criteria conflict with each other.

.12 Consider, for example, claims experience data of a property and casualty insurer. Homogeneous claims are those for similar policy benefits having similar

emergence patterns (for example, property insurance claims tend to be reported more quickly than liability insurance claims),

settlement patterns (for example, claims for glass damage tend to be settled more quickly than claims for bodily injury), and

frequency/severity since high frequency/low severity claims tend to be more stable than low frequency/high severity claims.

.13 Combination of data, for example, a combination of the insurer's personal lines and commercial lines claims, or a combination of the insurer's claims on primary and excess coverages, make the data less homogeneous. Greater homogeneity requires separation into more groupings, each with fewer data and hence less statistical credibility.

.14 To be statistically credible, the data may have to include data for the distant as well as the recent past. For example, as a result of periodic revisions to the insurer's policies, the available data may be for claims whose benefit dollar limits are lower than those limits for the claims being valued. Those data lack pertinence.

.15 Similarly, the insurer's experience data may be unreliable or not statistically credible and the only available data may be intercompany experience data, which may lack pertinence to the insurer.

.16 The actuary would be prudent in adjusting the available data to take account of the circumstances of the case. For example, without explicit justification, the actuary would not select a best estimate assumption that is more favourable than intercompany experience data in valuing an insurer's policy liabilities.

Expected future experience vs. past experience

.17 To extrapolate pertinent past experience and its trend to the near future is often, but not necessarily, appropriate. The appropriateness of the extrapolation depends on the matter assumed; for example, pertinent past mortality experience is a better indicator of the outlook than is pertinent past investment return experience. Moreover, any extrapolation would take account of a change that affects the outlook; for example:

adoption of a subsidized early retirement option in a pension plan may affect retirement rates,

a change in an insurer's case estimate practices may affect its claims development,

an insurer's discontinuance of a line of business may affect its expense rates allocable to the remaining lines, and

a change in judicial practice may affect the settlement of claims.

Anti-selection

.18 Each assumption would normally take account of potential anti-selection.

.19 One party in a relationship may have the right (or the administration of the relationship may give the privilege) to exercise certain options. That party may be expected to exercise those options to the detriment of the other party in the relationship if it is to the first party's advantage to do so. The first party may be an insurer's policyholder, a benefits plan's member, a borrower, a lender, or a shareholder.

.20 Examples are the right or privilege of a

pension plan member to select his or her retirement date when the pensions at various retirement ages are not actuarially equivalent,

policyholder to renew term life insurance at its expiry for a stipulated premium,

mortgagor to prepay principal, or an issuer to call a bond or redeem a preferred share, and

a shareholder to retract a share.

.21 A particular policyholder or plan member exercising a particular option may not be sure that the chosen option is the most advantageous. It is plausible, however, and experience has shown, that policyholders and plan members who can profit from doing so tend to exercise those options to the detriment of the insurer or plan. In the above example of a policyholder's right to renew term life insurance, the stipulated renewal premium to an unhealthy policyholder is less than the premium for a new policy whose purchase is subject to underwriting; the healthy policyholder may be able to purchase replacement insurance for less than that renewal premium.

.22 Anti-selection also occurs when price does not take proper account of risk classification and the customer is free to buy or not, or to select among sellers. For example, the conversion at retirement of an employee's accumulated fund in a defined contribution pension plan tends to be more attractive to a female than a male if the conversion basis is the same for both. Similarly, automobile collision insurance tends to be more attractive to a young single male than to other members of the driving population if the premium is uniform.

.23 The extent of anti-selection depends on

the size of the advantage from each exercise of the option (for example, anti-selection is dampened if the advantage to each policyholder is small even when the aggregate potential detriment to an insurer is large),

the concomitance of exercise of the option (for example, election of a favourable early retirement pension may force the plan member into unwanted unemployment, or a policyholder in ill health may be unable to afford to continue an insurance policy with a low premium),

the policyholder's or plan member's difficulty in making the required judgment (for example, everyone knows his or her age, but a person in ill health may be unable to gauge its effect on longevity), and

the sophistication of the policyholder, plan member, borrower, lender or shareholder.

Related assumptions

.24 Assumptions may be interrelated. For example,

interest rates and inflation rates may be related,

investment policy affects the risk related to interest rate swings, and

voluntary termination rates may affect death rates through anti-selection.

Supporting assets

.25 The investments which support the liabilities at the calculation date and the expected policy for asset-liability management after that date determine matters on which assumptions are needed. For example,

> if those investments include bonds rated A–, then an assumption of asset depreciation of those bonds is needed. That depreciation is usually expressed as a deduction from the assumed gross yield.
>
> if the investment policy includes purchase or sale of such bonds with a particular remaining term, then an assumption of yield on those bonds with that term is needed.

Indexing of benefits

.26 In most cases where benefits are indexed to inflation, use of an explicit gross rate of return and an explicit inflation rate would be appropriate for valuation of these benefits. In some cases, where the result of the valuation is only sensitive to the "net" or "real" rate of return, an explicit gross rate of return and an explicit inflation assumption would not be required. There may be no need for separate assumptions of investment return rates and of inflation rates, however it may, in some cases, be preferable to report them separately.

.27 The indexing may be partial; for example, benefits may be indexed to inflation, subject to a maximum increase of 3% during any year. In such cases, the separate assumptions of investment return rates and of inflation or wage rates are needed in a refined assumption, but a "net" or a modified "net" assumption may be a satisfactory approximation. The approximation techniques for partial indexing in the calculation of transfer values from registered pension plans may be useful.

Assumptions other than model and data assumptions

.28 Continuation of the status quo is usually the appropriate assumption for other than model and data assumptions; for example, an assumption that the fund of a registered pension plan continues not to be taxed or that the capital markets remain more or less as they are. Users may infer that assumption except where the actuary reports otherwise. The actuary would report an assumption

> that is different from continuation of the status quo, and
>
> regarding a matter for which there is no status quo, for example, a student's assumed occupation after completion of education.

.29 The actuary would also report an assumption of continuation of the status quo whose outlook is doubtful; for example, enactment of a change in tax rates whose proclamation is doubtful or likely to be deferred. It may be useful to report the result of two assumptions without opining on their relative appropriateness and to recommend that each user select that which meets his or her needs.

.30 An extreme assumption may be appropriate, but in that case the actuary would also report the result of the opposite extreme.

1740 PROVISION FOR ADVERSE DEVIATIONS

.01 In this subsection, "provision" means "provision for adverse deviations".

.02 *A calculation should not include a provision if the related work requires an unbiased calculation.* 1740.06

.03 *Otherwise, if a provision promotes expectations for financial security, then the calculation should include a provision that*

> *strikes a balance among the conflicting interests of those affected by the calculation, and* 1740.09
>
> *takes account of the possibility to offset the effect of adverse deviations by means other than a provision.* 1740.11

.04 *The amount of that provision should*

> *take account of the effect of the uncertainty of the assumptions and data for the calculation on the financial security of those affected by the calculation,* 1740.13
>
> *not take account of the possibility of catastrophe or other major adverse deviation which is implausible in usual operations, except when the calculation specifically addresses that possibility, and* 1740.17
>
> *in the case of a provision in respect of uncertainty of assumptions, result from selection of assumptions that are more conservative than best estimate assumptions.* 1740.20 1740.27

.05 *The margin for adverse deviations in each assumption should reflect the uncertainty of that assumption and of any related data*. [Effective March 1, 2009] 1740.37

Unbiased Calculations

1740.20 1740.46

.06 A provision is contrary to the purpose of the work if the work requires an unbiased calculation, as it does, for example, in splitting the value of a pension benefit fairly between two parties.

.07 The purpose of a provision is to promote financial security, but it does not follow that there should be a provision simply because financial security is thereby promoted. A provision is used when the entity benefiting from the enhanced financial security has a reasonable expectation that such enhanced security exists. For example, inclusion of a provision for one party in a calculation designed to value a benefit fairly between two parties would promote the financial security of one party at the expense of the other party.

.08 An unbiased calculation may be described in a variety of ways: "neutral", "even-handed", or using "best estimate assumptions", or "best estimates".

Conflicting interests

.09 A provision in a calculation is a bias which may affect two conflicting interests in opposite ways. Hence there is a need to strike a balance. 1740.30 1740.32 1740.36

.10 In some cases, the conflicting interests are those of separate users of the actuary's work. In other cases, the conflicting interests are internal to a single user of the actuary's work. For example,

> provision in an insurer's scale of premium rates promotes financial security of its shareholders, but any provision makes the scale less competitive in the marketplace and so militates against another interest of those shareholders, and
>
> provision in funding a pension plan lessens the likelihood that the contributor will be obliged later to increase contributions, but increases the likelihood of surplus emerging later in the plan that may be unavailable to the contributor.

Offsetting adverse deviations by other means

.11 There may be means other than a provision to offset the effect of adverse deviations. If they exist, those other means tend themselves to involve uncertainty but, to the extent that they are credible, the actuary would approximately reduce the provision, thereby avoiding the distortion caused by the provision. Healthy skepticism is appropriate in assessing their credibility.

.12 One example of other means is a retrospective rating, when a policyholder is insured at a premium calculated from best estimate assumptions but with an undertaking to reimburse the insurer for adverse deviations in experience. 1740.23

Uncertainty

.13 If assumptions could be made with complete confidence, if there were no statistical fluctuations, and if data had no defect, then there would be no need for a provision. But assumptions are virtually always uncertain; the exceptions, such as the assumption of the probability of getting a head when tossing a coin, are rarely encountered in practice. Some, especially those about events long after the calculation date, may be conjectural. Even when an assumption can be made with high confidence, the result may be subject to statistical fluctuation; one may not get 5 heads when tossing a coin 10 times.

.14 Uncertainty in an assumption results from the risk of

> misestimation of the best estimate assumption (sometimes referred to as "misestimation or deterioration of the mean") in the case of all assumptions, and
>
> statistical fluctuation in the case of aleatory assumptions.

.15 The risk of defective data also creates uncertainty. Data, especially voluminous or complex data, are rarely without defect.

.16 That uncertainty of assumptions and data may militate against the financial security of those affected by the calculation. A provision reduces the potential adverse effect of that uncertainty.

Catastrophe or other major adverse deviation

.17 The provision would not exceed the amount needed fully to offset the effect of adverse deviations which are plausible in usual operations. The provision would only partially offset the effect of catastrophe or other major adverse deviations which are not plausible in usual operations.

.18 It is difficult to quantify the distinction between adverse deviations which are, and which are not, plausible in usual operations. For each situation, the actuary would adopt a distinction that results in a provision that is not excessive. The intent of the provision is to enhance financial security, but provision for 100% security is excessive.

.19 The recommendation not to take account of the possibility of catastrophe or major adverse deviation does not apply to a calculation that specifically addresses that possibility; for example, calculation of the minimum capital that an insurer needs in order to have a satisfactory financial position, or a calculation with respect to stop-loss reinsurance, for which catastrophe is the event insured against.

Selection of conservative assumptions

.20 To make provision in respect of uncertainty of assumptions, the actuary would in some cases select assumptions that, either individually or in the aggregate, are more conservative than best estimate assumptions. Testing may be needed to assure that a contemplated assumption is in fact more conservative than the corresponding best estimate assumption.

.21 Examples of the use of conservative assumptions are

a best estimate assumption combined with a margin for adverse deviations, and

scenario testing of a range of assumptions and selection of a scenario (or a point between two scenarios) that produces a result that is toward the conservative end of the range of possible results.

.22 One actuarial cost method may be more conservative than another. For example, other things being the same, the entry age normal actuarial cost method, when applied to a group, usually results in higher contributions to a pension plan than the unit credit actuarial cost method. If the unit credit method is the appropriate method, then it would not be appropriate to make provision for adverse deviations by using the entry age normal method and best estimate assumptions. The reason is that there is no assurance that the amount of such a provision is appropriate. The better practice is to make the provision through selection of conservative assumptions.

Adjustments to policyholder dividends, premium rates, contributions, and benefits

.23 Those adjustments can offset the effect of adverse deviations.

.24 The insurer promises to declare policyholder dividends in accordance with experience, but does not promise a specified amount of dividends. An insurer's participating insurance policy liabilities include the present value of expected future policyholder dividends. If the insurer experiences adverse deviations and reduces dividends as a result, then the amount included in policy liabilities corresponding to the reduction in dividends becomes available for other promised benefits and therefore is not needed in the provision. If the amount included for dividends is large, and if the insurer's management of its dividend practices is responsive to change in conditions, then a minimal or, in the extreme case, zero provision for adverse deviations is appropriate.

.25 Similarly, in the event of adverse deviations, contributions may be adjusted, decreases in benefits or even winding-up of the plan may be possible, and the plan may have surplus which can substitute for contributions.

.26 Those adjustments are rarely fully credible. For example, an insurer's legal right to adjust policyholder dividends may be constrained by inertia or marketplace forces; a participating employer who can afford to pay higher contributions today may be unable to do so later; substitution of surplus for contributions may be restricted, and assessment of insurer's or participating employer's ability to make the adjustment may be difficult or impractical.

Provision of zero

.27 A provision of zero is appropriate in two situations, as follows:

work that requires an unbiased calculation, in which situation, the provision of zero is always appropriate, and

where the actuary considers a provision but concludes that a provision does not promote expectations for financial security or that there are other means which reduce or eliminate the need for the provision.

Examples

.28 Two important examples of provision for adverse deviations are in the valuation of

the policy liabilities of an insurer for its financial statements if they are prepared in accordance with generally accepted accounting principles, and

the liabilities of a benefits plan if the actuary is giving advice on its funding.

.29 In valuing those liabilities, the actuary would strike a balance between security of benefits promised to policyholders or plan members and equity among conflicting interests.

Security of benefits promised

.30 A provision in liabilities reduces the likelihood that their amount will later prove to be inadequate. As well, if those liabilities (including the provision) are funded (i.e., fully supported by investments) and the provision accelerates the funding of those liabilities, then the provision promotes security of those benefits.

.31 On the other hand, if those liabilities are unfunded, then the provision has no explicit effect on the security of those benefits, (unless some action that improves benefit security occurs or is taken) since the actual ultimate value of the benefits has not changed and neither has the likelihood of them being paid.

Generations of policyholders, shareholders or plan members

.32 The amount of a provision increases the liabilities of an insurer or a benefits plan, and decreases its equity or surplus, or increases its unfunded liabilities, by the same amount. If the later experience is according to the best estimate assumptions, then the provision will revert to equity or surplus and be available to finance policyholder dividends or benefit increases or contribution decreases. That is an inequitable result if one generation of policyholders, shareholders or plan members bears the cost of making the provision, but a later generation makes a windfall from its reversion to equity or surplus. In striking a balance, the actuary may have to give financial security greater importance than equity unless the terms of the engagement suggest otherwise.

.33 In the case of policyholders, the provision and its later reversion may affect dividends on participating policies and premiums and benefits on adjustable non-participating policies. It is appropriate for the insurer to manage its dividends and adjustments so that an unneeded provision reverts to the policyholders who made it.

.34 In the case of shareholders of a client or employer, a provision and its later reversion could transfer share value from the current to a future group of shareholders.

.35 In the case of benefits plan members, the provision and its later reversion may affect benefits or the members' share of contributions. In those cases, it may be difficult to strike a balance between financial security and the various generations of plan members. The importance of inter-generational interests varies, however, among plans. It tends, for example, to be a more important consideration in

contributory plans when the members pay a percentage share of the contributions, and

multi-employer plans with negotiated contributions.

Policyholders versus shareholders, and plan members versus the participating employer

.36 A provision tends to favour policyholders and benefits plan members at the expense of the participating employer and the insurer's shareholders. A participating employer, by establishing a benefits plan, and an insurer, by selling policies, create reasonable expectations among benefits plan members and policyholders for payment of the promised benefits. The actuary would therefore strike a balance that promotes security of promised benefits but that is not excessive. An excessive provision would militate against the willingness of participating employers to improve plan benefits and the ability of insurers to raise needed capital.

Reporting the provision

.37 The actuary would usually make the calculation including the provision. It is not necessary to report the amount of the provision itself, and in some situations, may be misleading to do so without also reporting a discussion of the related uncertainty and risk. The actuary would calculate the amount of the provision as the difference between the results of two calculations; namely, a calculation including the provision, and one not including the provision. That is practical only when the actuary selects the best estimate assumptions explicitly.

.38 Reporting the amount of the provision would be accompanied by a discussion of the related uncertainty and risk.

Assumptions: margin for adverse deviations

.39 The standards in this subsection apply to the selection of a margin for adverse deviations in an assumption if the actuary uses that margin in order to make provision for adverse deviations. The standards do not apply when the margin in an assumption makes provision for another purpose, such as to make future benefit improvements.

.40 A margin for adverse deviations may be expressed as one of the following:

the difference between the assumption used for the valuation and the best estimate assumption. For example, if the actuary expects the interest rate to be 10% and assumes 8%, then the margin for adverse deviations is 2%. The provision for adverse deviations is the dollar amount of increase which results from a margin for adverse deviations. For example, if that 2% margin for adverse deviations in the interest rate assumption increases liabilities from $100 million to $120 million, then the provision for adverse deviations is $20 million.

a multiplier to the liabilities without provision for adverse deviations. For example, if the actuary sets claim liabilities equal to 1.1 x expected claim liabilities, then the margin for adverse deviations factor is 10% and the provision for adverse deviation is 0.1 x expected claim liabilities.

an addition to the liabilities without provision for adverse deviations, determined through scenario testing.

.41 Actual future experience will be equal to the combined effect of

expected experience (i.e., in accordance with the best estimate assumption), and

deviation, favourable or adverse, from expected experience.

.42 Deviation of actual from expected experience may result from one or more of the following:

error of estimation, which may be favourable or adverse. Except in the simplest cases, it is not possible to determine expected experience with complete confidence. Past experience data may be insufficient or unreliable. Future conditions may differ from the conditions which generated the past experience.

deterioration or improvement of the expected experience as a result of influences which the actuary does not anticipate.

statistical fluctuation, which also may be favourable or adverse.

.43 A larger margin for adverse deviations (compared to the best estimate assumption) is appropriate if

the actuary has less confidence in the best estimate assumption,

an approximation with less precision is being used,

the event assumed is farther in the future,

the potential consequence of the event assumed is more severe, or

the occurrence of the event assumed is more subject to statistical fluctuation.

.44 A smaller margin for adverse deviations is appropriate if the opposite is true.

.45 In principle, it is better to reflect an assumption's uncertainty by a margin for adverse deviations in the assumption itself rather than by adjustment to another assumption. For example, except in case of approximation, it is not accepted actuarial practice to make provision for adverse deviations in claim liabilities by assuming that the investment return rate is zero; i.e., by valuing the liabilities undiscounted.

.46 Selection of a relatively large margin for adverse deviations for the assumption whose uncertainty most affects the calculation and a zero margin for the others may be an appropriate approximation. 1510

.47 The choice of the sign (+ or –) of the margin for adverse deviations (i.e., whether the assumption for the valuation is larger or smaller than the best estimate assumption) is sometimes complex, and testing may be necessary to ensure that the margin affects the calculation in the desired direction; i.e., to ensure that the margin is not a margin for favourable deviations. For example:

in the valuation of insurer policy liabilities, the margin for the withdrawal rate assumption may be positive at some policy durations and negative at other policy durations, and

in the valuation of the liabilities of a pension plan, a positive margin for the early retirement rate assumption usually, but not always, increases the liabilities, so testing is needed to determine the sign of the margin.

.48 A margin with the seemingly wrong sign in one assumption, is however, appropriate if it ensures consistency with a related assumption having a greater effect on the calculation. For example, in the valuation of liabilities, the margin in the interest rate assumption is usually negative and the margin in the inflation rate assumption is usually positive. If, however, the actuary assumes that the inflation rate is the nominal interest rate minus the real interest rate, then both margins would have the same sign to ensure consistency; i.e., negative if investment income has the greater effect, positive if expenses or inflation-indexing of benefits has the greater effect.