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ORDINARY LIFE INSURANCE LIMITS

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WHAT is the significance of a company's limit of retention? When is it proper to reinsure amounts above this limit? What is the significance of a limit of issue?

Some answers to these questions are spread through our literature, but it takes considerable research to dig them out and the answers often have not been integrated one with another, so that it is difficult to piece together the basic philosophies from which they stem. This paper brings together in one place some of the underlying principles involved and discusses their application to certain situations. It is not our purpose here to indicate how big the limits of retention and issue should be. We are concerned only with the nature of the limits and their relation to reinsurance. For purposes of simplification the paper refers primarily to ordinary business only, and to first class standard risks except where otherwise specified, although many of the principles have a much broader application.

By limit of retention we mean the maximum amount that a company will issue without reinsuring. By limit of issue we mean the maximum amount that a company will issue including reinsurance. Most companies have a stated limit of retention; a number of companies do not have a stated limit of issue. Some companies do not reinsure, so that their limit of retention and their limit of issue are apparently one and the same.

Certain basic considerations link together these three things—limits of retention, reinsurance, and limits of issue:

1. Limits of retention are established primarily to avoid inconvenient fluctuations in the surplus that is generated from year to year.
2. Limits of issue assume that there is some amount beyond which it is unwise to issue insurance on a single life, regardless of reinsurance.
3. Reinsurance is not a hedge against underwriting losses; the ceding company ends up by paying for unprofitable business that is ceded to a reinsurance company. Reinsurance always involves some cost to the ceding company.
4. It may be good business to reinsure amounts in excess of a properly established limit of retention, but ordinarily we should never reinsure (or issue) amounts in excess of a properly established limit of issue.

These considerations lead to some interesting conclusions, but first let us seek to establish their validity.

LIMIT OF RETENTION

The chief reason for a limit of retention has been well expressed by L. J. Kalmbach: "Because it is desirable from the viewpoint of sound management to avoid wide fluctuations in surplus earnings from year to year, life insurance companies . . . limit the amount of insurance which they carry at their own risk on individual lives. Such fluctuations in surplus earnings would occur through the payment of a few death claims on policies involving disproportionately large amounts of insurance. For this reason, it is desirable for a company to establish retention limits which tend to keep the total death claims payable in any year within reasonable bounds, and to produce an over-all mortality cost which is fairly constant from year to year, except as the volume of insurance varies" (1942 *Proceedings* L.O.M.A., p. 145).

J. B. Maclean, in referring to a retention limit, states: "Generally speaking it should be fixed at such an amount that the company would not be embarrassed by the payment in a single year of somewhat more than the 'expected' number of claims of the maximum amount" (*Introduction to Life Insurance,* Vol. II, p. 167).

It is recognized that due to mere chance there will be annual fluctuations in mortality and that these will affect the annual gain from operations. The larger the limit of retention the greater these fluctuations will be. Therefore, retention limits are set at a point which should keep such fluctuations within a convenient range. By the application of statistical theory we can determine what the range of fluctuation is likely to be for a particular distribution of insurance in force, and what effect a change in a company's limit of retention might have on this likely range. Then business judgment is exercised to determine the largest range that might be considered "convenient." This depends on the size and stability of the company and the relative size of the company's surplus, among other considerations. It is generally accepted that some limit is necessary to avoid inconvenient fluctuations in the annual gain from operations. The thought is repeated throughout our literature.

This "theory of inconvenient fluctuation" goes a long way to explain the over-all limits of retention which exist in most companies. However, there are additional factors that have undoubtedly exerted some influence. For example, an element to be considered is the limits of other companies. One company might arrive independently at what it considered a proper limit of retention only to find that that limit is higher or lower than those of other similar companies. If it is higher, the company might fear that it would attract an undue proportion of large risks; if it is lower, the company might find its field force critically remarking the fact. Another element is the company's general attitude toward reinsurance. Where reinsurance is freely used, the upward pressures on the retention limit can easily be deflected into reinsurance channels; where the charms of reinsurance are resisted, the pressures are likely to force the limit of retention higher. As evidence, we can point to several companies which do not reinsure at all, and which have limits that are somewhat higher than those of other companies of about the same size.

There is still a feeling in some quarters that certain classes of business should be thought of as separate statistical groups, and that where relatively few policies are issued in such a class the limit of retention should be drastically reduced so that the chance mortality fluctuations within that group will be minimized. Policies for large amounts are sometimes thought of as constituting such a class, as are policies issued at the extreme ages at issue, and in the various substandard brackets. There may be very good reasons for having special limits of issue in each of these various classes, but the concept that mortality fluctuations *within each class* must be specially limited is fallacious. For the purpose of keeping chance mortality fluctuations within convenient limits we should consider all the classes of insurance that are in the same line of business as being lumped together to form a single average. It might even be argued that we should not distinguish between lines of business.

This thought is by no means new; it was recognized nearly one hundred years ago by Dr. Thomas Young. In 1856 he wrote: "There is a common prejudice that it is disadvantageous for an office to take a single risk of any particular description; and it is sometimes said that if the adventure should happen to be unsuccessful, there would be no possible compensation from others of the same kind. There is, however, just the same chance that it would be compensated by others of a different kind" (*JIA* VI, 287). Ten years later the great British actuary, T. B. Sprague, said, "I can find no sufficient reason for thinking that it is necessary for an insurance company to have a sufficient number of each class of risks to form a separate average" (*JIA* XIII, 28). The principle has been reiterated from time to time by other eminent authorities.

LIMIT OF ISSUE

A limit of issue is dictated by a desire to restrict possible mortality losses. It assumes that there is a limit beyond which it is unwise to issue insurance—not, in this case, that we wish to limit inconvenient losses due to chance fluctuations in any one year, but rather that we wish to prevent losses due to bad mortality over all years. The limit of issue is basically the limit of the confidence we are willing to place in underwriting techniques. Limits of issue are derived from underwriting considerations; limits of retention are derived from "inconvenient fluctuation" considerations.

It is impossible to select any single underwriting element as being the one that determines the limit of issue. The limit results from the impact of a variety of forces. No doubt the forces are given differing degrees of importance in different companies. Some of them are almost matters of taste rather than scientific evaluation. "Burnt child fire dredth" (*Proverbes*, John Heywood, 1546). When a company has had a particularly traumatic experience for some reason, on a very large case, it is likely to give exaggerated importance to that reason in considering its limits of issue.

One important element bearing on the limit of issue is the concept that mortality may worsen as amount increases. J. B. Maclean has stated: "As we have already seen, overinsurance constitutes, in itself, an extra hazard which may result in an unfavorable mortality experience. The fact that an applicant applies for a very large amount of insurance does not, of course, necessarily indicate overinsurance but, in such cases, there is usually a somewhat greater possibility than in the case of smaller amounts that the applicant is exercising 'selection against the company'—either consciously or unconsciously. There is, thus, the likelihood that the death rate will be greater on the very large policies than on the medium-sized and smaller policies" (*Introduction to Life Insurance*, Vol. II, p. 168). Certainly the experience of 1929–1933 demonstrated that mortality could worsen by amount in a period of economic collapse. Whether our knowledge of underwriting and the country's knowledge of economics have improved sufficiently to prevent a recurrence of this phenomenon, time alone will tell. A recurrence cannot be ruled out as a possibility.

All of this contributes a certain element of uncertainty to the classification of the risk. Frequently we are none too sure of the underwriting classification in which we should place a large case. It has been pointed out, for example, that we must be wary of minor impairments on large applications. However, we do not know the exact effect of various minor impairments at various amount levels. Nor do we know just how much, if any, mortality increases by amount in normal times, or how bad it will be in the next depression. Moreover, the more uncertain we are of our underwriting, the greater is the risk of antiselection.

Other subsidiary considerations may also influence our thinking. For example, the risk of financial antiselection and the probability of litigation vary somewhat in proportion to the size of the policy.

There are very few references to limits of issue, as such, in actuarial literature. J. M. Laird uses the phrase in his article on reinsurance (*TASA* XXXII, 438) and Irving Rosenthal in his article on limits of retention (*RAIA* XXXVI, 6) uses the phrase "limits of acceptance or issue." There may be other references, but they are few. In contrast there are innumerable references to limits of retention. Actually, however, much that has been said about limits of retention applies instead to limits of issue! If we accept the principle that we should never reinsure (or issue) amounts in excess of a properly established limit of issue, failure to distinguish carefully between the two types of limits can greatly becloud our understanding of their significance, particularly where we have special limits, as at the high ages, at the low ages, in various substandard classifications, for various plans of insurance or for women versus men. We fail to develop a consistent reinsurance philosophy.

COST OF REINSURANCE

We have stated that reinsurance is not a hedge against underwriting losses; the ceding company ends up by paying for unprofitable business that it has reinsured. Reinsurance always involves some cost (or reduction in profit) in any event. These statements are not without some authority. "It is a truism that the basic purpose of a schedule of limits of retention is not to get rid of unprofitable business, for one cannot reasonably assume that the volume of business reinsured in consequense of those limits will, in the long run, prove unprofitable to the reinsuring company" (Rosenthal: *RAIA* XXXVI, 6). "Reinsurance is a genuine cost to the company" (Porter: *RAIA* XIV, 280). "When a company issues more than it retains and passes along the excess to a reinsurance company, it does not mean that the original company expects this reinsurance to be unprofitable. It is expected that the entire amount issued will prove profitable, but the original company cedes a portion to the reinsuring company in order to stabilize its mortality experience by limiting the maximum loss on any one life" (Laird: *RAIA* XIV, 272). "The actual cost of reinsurance will depend on the terms of the reinsurance agreement and on the particular type of reinsurance employed. . . . In any event, however, reinsurance must involve some *expense*" (J. B. Maclean, *Introduction to Life Insurance*, II, p. 170). "For reasons which need not be discussed here, the reinsurer must make provision for mortality in excess of that for direct agency business. It is obvious, then, that the ceding company must pay to the reinsurer an amount sufficient to provide for both the higher anticipated mortality on reinsured policies and the reinsurer's operating expenses" (Ormsby: *TSA* IV, 449)." With participating reinsurance, a poor risk passed on to a reinsuring company merely cuts the dividend which the originating company would otherwise receive" (McAulay: *TSA* IV, 466). Mr. Ormsby's recent paper, "The Cost to Reinsure Individual Life Insurance," and the discussions of Messrs. McAulay and Guest, together with Ormsby's comments thereon (*TSA* IV, 448–484), are pertinent to this whole question.

WHEN TO REINSURE

To summarize, for the average company there is some limit of retention for standard ordinary business. This limit is established primarily to avoid inconvenient fluctuations in surplus. We recognize that amounts of insurance greater than this limit can be issued profitably, but we wish to avoid the inconvenient surplus fluctuations that might result. It is a help to our field force if we can issue such larger policies, so we arrange to reinsure the excess. We realize that this will deprive us of at least some of the profits on the excess amounts, but we think it is good business to forgo such profits.

If we were not concerned about these inconvenient fluctuations in surplus from year to year we would not reinsure at all, generally speaking. We would retain the insurance up to our limit of issue, and decline it beyond that point. This would be so even though we might be uncertain of the exact classification of the risk. Uncertainty of classification is hardly a valid reason for reinsuring. If the classification turns out to be proper, then why forgo part of the profits by reinsuring part of the case? If the classification turns out to be improper, we do not avoid the ultimate cost of the extra mortality by reinsuring, since, as we have already attempted to establish, the ceding company ends up by paying the cost anyway. It would be a case of heads they win, tails we lose.

The only case where it might be held that uncertainty of classification justifies reinsurance is where the ceding company feels that it knows so little about the proper classification of a case that it has no confidence whatever in its own appraisal of the risk. This I would label not uncertainty of classification, but ignorance of classification. The ceding company frankly confesses that it cannot classify the case (perhaps the case falls in an extreme substandard area where the company does not ordinarily do business at all), and so it relies completely on the underwriting judgment of the reinsuring company. It cannot, as a rule, obtain the opinion of the reinsuring company without reinsuring at least part of the risk, so it does just that. Under such circumstances the ceding company must never lose sight of the fact that it will, over the years, pay for the mortality that results from such cases. It has not gotten off the risk, in the long run; it has merely substituted the underwriting ability of the reinsurance company for its own. And it is paying a price for so doing. (Actually a stipulated fee for obtaining the underwriting opinion of the reinsurance company might be a better method of compensation than the cost of reinsuring. Maybe someone should establish an underwriting service, antitrust laws permitting, to which any company could apply, for a fee, in order to get a sophisticated appraisal of a given risk. This might be a boon to the smaller companies. Having obtained the opinion the originating company could then carry the risk itself up to its limit of retention.)

Ordinarily we never deliberately issue any business which we expect to be unprofitable. The limit of issue is established to help us avoid doing this; we feel that insurance cannot profitably be issued beyond that limit. Thus we will in some cases reinsure up to the full difference between the limit of retention and the limit of issue, but beyond the latter we will not go.

This line of reasoning accurately summarizes the situation, I think, in regard to the average company's over-all limits for first-class, standard risks issued in the central age ranges. However, there is an important question that requires further inquiry. The reasoning set forth above assumes that the limit of issue (based on underwriting considerations) is always larger than the limit of retention (based on our theory of inconvenient fluctuations). Here, then, is the question: Are there areas of insurance where the limit of issue is less than the theoretical limit of retention? It is important to answer this question since, because of the nature of the limit of issue, it is not proper to reinsure or issue amounts offered in excess of that limit.

I believe that the answer to the question is *yes*. Whenever we establish special lower limits for certain classes of insurance we are doing so primarily because we think that business cannot profitably be issued above those amounts. The limits are determined mostly by underwriting considerations. They are essentially limits of issue, not limits of retention.

These remarks will bear considerable analysis. There is always the danger of oversimplification.

HIGH AGES AT ISSUE

Let us examine, as an example, why it is that we have lower limits at the higher ages at issue and what are the implications of these limits. Perhaps first we should state certain considerations which are of dubious application. The lower limits which exist at the high ages are not the result of a fear that the paucity of exposure will cause abnormal annual mortality fluctuations. If we accepted that as a reason, we would be assuming that each age or group of ages had to form a separate average and that we did not want the mortality results within that age, or age group, to fluctuate too widely from the average. Actually we should consider all ages at issue as working together to form a single average, as previously pointed out. Then we are not unduly influenced by the fact that one class has less exposure than another.

Again, it has been held that a reason for lower limits at the high ages is that the greater probabilities of death at such ages will produce wider fluctuations in the death rate. While it is true that the standard deviation of the mortality rate increases with an increase in the probability of death (as long as q_x is less than $\frac{1}{2}$), it is at least debatable whether this is a valid reason for lower limits at the high ages. There may also be an increase in the gains from mortality, and the increased gains might support wider fluctuations without having the fluctuations become inconvenient. Rosenthal pointed out that "relative chance variation decreases as exposure and expected mortality increase" (*RAIA* XXXVI, 13).

Another reason sometimes advanced for lower limits at the high ages is that there is less mortality margin at the high ages. It is well known that the American Experience table contains considerably more relative mortality margin at the low ages than it does at the high ages, and the same is true, though to a lesser degree, in the CSO table. But does this fact constitute a valid reason for reducing our limits at the higher ages? In this connection J. B. Maclean has written, "If the premiums charged are adequate at all ages—as they are—the company could use the same maximum at all ages if no other factors were involved" (*Introduction to Life Insurance*, Vol. II, p. 172). The converse is, of course, also true, as P. H. Evans graphically pointed out: "It seems to me that if the dice are loaded against you, you are bound to lose, however small the stakes may be" (*RAIA* XVII, 100).

The true reason seems to be that there is a general feeling that it is uncertain whether the risk has been properly classified. The possibility of selection against the company is increased; medical examinations may be less revealing; older people have more impairments; the effects of minor impairments seem to be exaggerated; there are more borderline and doubtful cases; if the insurable value of a man decreases with advancing age there may be less insurable interest and more speculative hazard. To a certain extent these can be controlled by careful underwriting, but a lower limit is also felt to be necessary.

We say, then, that we need a lower limit because we are uncertain of the classification. Is this, though, a limit of retention, beyond which we might reinsure, or a limit of issue, beyond which we should not go with or without reinsurance?

It seems obvious that the greater the uncertainty of classification, the greater will be the relative chance fluctuation. Instead of measuring the fluctuation plus or minus on each side of a point, we are measuring it plus or minus from each side of a band of uncertain width. The width of the band is added to the range of fluctuation. Thus, to keep the fluctuations within boundaries that have previously been determined to be convenient, we would in theory need to reduce somewhat our limits of retention on such cases. If no other forces were at work, these new limits would be limits of retention.

Unfortunately, this neat theory does not explain many of the limits which we encounter in actual practice. The limits of most companies at the very high ages are much lower, it seems to me, than this theory alone would warrant. We can only conclude that the limits are based on underwriting considerations, not "inconvenient fluctuation" considerations. They must be the result of a desire to prevent possible mortality losses.

It appears then, that we are dealing with limits of issue, not limits of retention. The limit of issue in this case has sunk below the limit of retention! Now if we accept the premise that business in excess of a properly established limit of issue is unprofitable, and that reinsurance affords us no escape from its unprofitableness, we are forced to conclude that we should neither reinsure nor accept amounts offered in excess of our limits at the high ages.

OTHER LIMITS

What about the other special limits that companies have? Are these, also, basically limits of issue rather than limits of retention? I have no wish to extend this paper by attempting a detailed analysis of each, but I cannot help thinking that most of these limits, like the limits at the high ages at issue, are established primarily to avoid or minimize possible mortality losses. They are generally lower than the theory of inconvenient fluctuations would dictate—they are limits of issue, not limits of retention.

Perhaps for the very large companies all limits are, in fact, limits of issue. I should think that it would take an enormous policy, indeed, to create for them an inconvenient fluctuation in any one year.

It should be noted that the two types of limits are not related except where, by chance, they happen to coincide. For any particular class of business the underwriter should ask himself: (1) What is the maximum amount for one case beyond which this class of business is not likely to be profitable? That amount is the limit of issue. (2) For this class of business, what is the maximum amount for one case that can be issued without so influencing our mortality results, *as a whole,* that inconvenient annual fluctuations might result? That amount is the limit of retention; it is independent of the limit of issue. Where the limit of issue exceeds the limit of retention we may reinsure the difference. Where the limit of issue is less than the limit of retention, the limit of issue takes over, and reinsurance should not be considered.

We do not wish to imply by word or deed that either of the limits can be easily arrived at or precisely defined. The many considerations affecting each one must be carefully weighed, and the best possible judgment brought to bear. (If all companies had underwriters of equal skill, would all companies arrive at the same limits of issue?) In any event, once having arrived at figures for our limits we should stand by them. As a big league umpire once remarked, when asked how he knew whether it was a ball or a strike, "They ain't nuthin' till I calls 'em!"

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