A PRACTICAL METHOD FOR DETERMINING RETENTION LIMITS FOR INDIVIDUAL DISABILITY INCOME INSURANCE

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For a direct writing company reinsurance can be a burdensome expense, and every company should make efforts to understand what its reinsurance needs are in order to keep this expense at a minimum. In understanding its needs an insurer must be aware of the nature of the insurance which requires risk transference so that the right type of reinsurance agreement can be entered into. In comparison to life insurance, for disability income insurance the task of identifying the proper reinsurance arrangement is more difficult.

In the recent past, many insurers had been constantly adopting ever increasing issue and participation limits for individual disability income insurance which by earlier standards were viewed as extremely high.[1] More recently, because of the adverse claim levels experienced during the 1974-75 recession, many insurers have been more cautious in increasing their issue and participation limits, with some insurers even retrenching from the levels of their prior limits. Despite this reaction to the 1974-75 experience, increasing limits will necessarily have to be adopted by insurers in the future. Therefore, more so now than ever before, insurers must ascertain what amount of monthly indemnity they should retain and what form their retention should take.

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[1] The issue limit is the amount of insurance - the monthly indemnity - which an insurer will underwrite on an applicant. The participation limit is that aggregate amount which cannot be exceeded when an amount applied for is in addition to existing amounts of insurance. The adoption of the seemingly high limits can be attributed to a number of factors. Important among these are (1) the continuously increasing insurable incomes being earned in a highly inflationary economy and (2) the ever increasing competition among insurers in the more "sophisticated" markets.

Sophisticated approaches to setting retention limits exist, including methods dependent on simulation techniques and ruin theory. Drawbacks exist, however, to using such methods. Application of these approaches is necessarily based on factors highly subjective in themselves. If nothing else, interpretation of the significance of the results obtained from these approaches can also be highly subjective. This subjectivity exists since mathematical "answers" are not sufficient by themselves for defining a retention limit, especially when the events insured against are not independent, and without additional considerations mathematical "answers" would lead to adoption of retention limits exceeding those which most managers would feel confortable with. Consideration beyond the purely mathematical which would have to be entertained include but are not limited to: (1) how should changing social attitudes be recognized? (2) how should the expanded social insurance programs be recognized? and (3) how should inflation's impact on taxable income be recognized? Furthermore, many insurers lack either the technical knowledge or the inclination for using sophisticated methods and therefore must adopt practical approaches to the determination of retention limits.

This essay sets forth for a life insurance company some of the considerations necessary to a practical determination of retention limits appropriate for disability income insurance. That the value of a disability income insurance claim, unlike a life insurance claim, is not determined solely by its incidence but also by its severity is considered. Nevertheless, an insurer's life insurance retention limit is adopted as the basis for determining the retention limit for disability income insurance.

The essay includes sections (1) which set forth a conceptual framework for developing retention limits for disability income insurance based on a company's life insurance retention limit, (2) which set forth hypothetical issue limits in the absence of any reinsurance arrangement, and (3) which establish a basis for selecting a reinsurance arrangement. For completeness two appendices have been added. Appendix A gives a concise review of reinsurance considerations in general, and Appendix B sets out possible types of reinsurance arrangements to be found in the marketplace.

LIFE INSURANCE COMPARISON

A company's disability income insurance retention limits may be established by considering its life insurance retention limit.[2] To make the establishment it is necessary that the respective amounts at risk be comparable. The probability of loss gives a measure of the expected number of claims. And, of course, the amount at risk is simply the economic value of the loss.

Disabilities may be classified as either severe or less severe. Less severe disabilities are empirically taken as those disabilities which terminate within one year of their onset. Severe disabilities then are disabilities persisting for at least one year.

The rate of incidence of severe disabilities by age at disablement, that is the probability of loss, is compared in Table I to the rate of mortality. The comparison indicates that the severe disability incident rate is not significantly different than the related mortality rate, with the incident rate generally about 70% of the mortality rate for the tables used in the comparison.

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[2] It is beyond the scope of this essay to judge the appropriateness of a company's life insurance retention limit. However, it is held that the amount which is retained for the one type of insurance should not differ significantly from the amount retained for the other.

TABLE I

Comparison of Number of Deaths and Number of Disabilities of at Least One Year's Duration for Selected Ages at Disablement per 1,000 Active Lives Exposed One Year*

Age	Deaths	Disabilities	(Disabilities) / (Deaths)
27	1.04	.74	.71
37	1.63	1.19	.73
47	4.42	2.83	.64
57	12.42	8.42	.68
67	31.40	28.65	.91

*Deaths are based on 1965-70 Graduated Basic Male Ultimate Mortality Table, Transactions, Society of Actuaries, 1973 Reports Number. Disabilities are based on Commissioners 1964 Disability Table. A comparison based on select rates would give ratios of disabilities to deaths which would be greater and more uneven.

What is the amount at risk for disability income insurance which can be likened to the amount at risk for life insurance? In the context of this essay, it is the economic loss -- the monthly indemnity claim value -- expected from a severe disability. This claim value is not constant but depends on the monthly indemnity, the duration of disability, and the indemnity period remaining after any duration of disability. The claim value is defined as the sum of (a) the total monthly indemnity paid during the specified duration of disability on the basis of a zero deductible period and (b) the present value of the remaining expected monthly indemnity payments on the basis of 1964 CDT 3% at the end of the specified duration of disability.[3]

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[3] Although this simplified method of defining the disability indemnity claim value incorrectly states such value, it is reasonable for use in obtaining such value for the purpose of the essay.

Table II sets forth claim values for $100 of monthly indemnity for various combinations of maximum indemnity periods and durations of disability. Since claim values are reasonably invariant by age at each duration of disability only values for age 37 are given.

TABLE II

Disability Indemnity Claim Values at Specified Duration of Disability for Age 37 at Disablement for Selected Maximum Indemnity Periods Based on $100 of Monthly Indemnity

Maximum Indemnity Period (in years)	Duration of Disability (in years)	Claim Value	Maximum Indemnity Period (in years)	Duration of Disability (in years)	Claim Value
1	1/2	$ 1,070	65 - 37	1/2	$ 7,030
	1	1,200		1	9,690
				2	11,990
2	1/2	1,820		5	17,250
	1	1,760		10	22,700
	2	2,400		14	26,260
5	1/2	3,340	100 - 37	1/2	7,470
	1	4,090		1	10,330
	2	4,760		2	12,810
	5	6,000		5	18,600
				10	24,900
10	1/2	4,860		14	29,380
	1	6,420			
	2	7,770			
	5	10,320			
	10	12,000			

HYPOTHETICAL ISSUE LIMITS

Table III sets forth monthly indemnity issue limits which may be considered reasonable in the absence of a reinsurance arrangement, which are roughly consistent with a life insurance retention limit of $75,000. These issue limits have been based on the level of disability indemnity claim values at duration 2 and 5 given in Table II, although other durations could have been used.[4]

TABLE III

Monthly Indemnity Issue Limits, Without Reinsurance, Consistent with a Life Insurance Retention Limit of $75,000 for Age 37 at Disablement by Indemnity Period

Indemnity Period (in years)	Monthly Indemnity Issue Limit
1	$6,250
2	3,250
5	1,500
10	750
65 - 37	350
100 - 37	300

Some may find the issue limits given in Table III somewhat surprising. For example, a retention limit of the first $600 of monthly indemnity under an excess share reinsurance arrangement (for definitions see Appendices A & B) for the "65-37" and the "100-37" periods would impute to an insurer an amount at risk of about $200,000, an amount significantly in excess of what might be considered reasonable if its life insurance retention would be $75,000. On the other hand, monthly indemnity amounts at the shorter indemnity periods would be reinsured when no need for such reinsurance would exist.

[4] Obviously the imputed retention limit increases when the duration used is increased.

For an insurer interested in a partial form of proportional self-insurance, rather than establishing its retention limits on the basis of an examination of severe disability claim values, it could instead establish them on the basis of the maximum change in such claim values in any given calendar year of disability. This approach which many hold to leads directly to establishment of significantly higher retention limits. This can be seen in Table IV wherein is set forth the largest average change expected in the disability indemnity claim values defined in Table II, on a calendar year basis, and the year in which the change occurs. However, for an insurer holding to this approach, to have a consistent retention philosophy for both disability income and life insurance, it would have to have for life insurance a nonproportional stop- or spread-loss reinsurance agreement, an agreement which many insurers could not accept.

TABLE IV

Largest Average Change in Disability Indemnity Claim Value for $100 of Monthly Indemnity, Occurring in Any Calendar Year, and Year of Disability at the End of Such Year for Selected Maximum Indemnity Periods for Age 37 at Disablement

Maximum Indemnity Period (in years)	Year of Disability Maximum Change Occurs	Largest Average Change in Disability Indemnity Claim Value
1	1st	$ 1,200
2	1st	2,040
5	2nd	3,940
10	2nd	6,250
65 - 37	2nd	9,490
100 - 37	2nd	10,120

SELECTING A REINSURANCE ARRANGEMENT

If an insurer has the technical ability to underwrite "large" amounts of insurance on a single life, and if its portfolio is sufficiently "large" to generally avoid significant statistical fluctuations in claim experience when such experience is related to expected experience, a stop- or spread-loss arrangement in combination with a high limit excess share or preferably an extended wait arrangement is superior to other reinsurance alternatives in terms of that insurer's long term financial interest. Many companies, however, do not meet at least the second condition and many of these companies also fail to meet the first condition. These companies therefore may feel compelled to adopt one of the proportional reinsurance arrangements. Accordingly, their reinsurance interests may be defined simply as having (1) accessibility to the ancillary services of a reinsurer and (2) the lowest possible costing proportional reinsurance arrangement which is consistent with their retention objectives. For these companies what proportional reinsurance arrangement would be appropriate?

If an excess share reinsurance arrangement were to be adopted, the excess amounts to be reinsured can be determined from Table II. For example, if $75,000 would be the amount at risk which a company desires to bear, any amount of monthly indemnity in excess of those set out in Table V below would be reinsured.

TABLE V

Monthly Indemnity Retention Limit Consistent with $75,000 at Risk Under an Excess Share Reinsurance Arrangement

Indemnity Period		Monthly Indemnity Retained	
Sickness	Accident	Sickness	Accident
1 year	1 year	$6,250	$6,250
1 year	life	6,250	300
2 years	2 years	3,250	3,250
2 years	life	3,250	300
5 years	5 years	1,500	1,500
5 years	life	1,500	300
10-year	mortgage	750	750
15-year	mortgage	500	500
to 65	to 65	350	350
to 65	life	350	300
X	life	X	300

The Table V illustration differentiates between accident and sickness caused disabilities. This differentiation recognizes that different indemnity periods by cause of disability are often provided under the same policy. Since the financial impact of a disability is the primary determinant to setting retention limits, and not the cause of the disability, the retention limit on a policy should vary by cause when the indemnity period varies by cause. Adoption of such a variation is underpinned by the tacit assumption that the termination rates for accident disabilities do not differ significantly from those for sickness disabilities.

Many reinsurers favor an excess share reinsurance arrangement (or, since it is the same in substance, a quota share arrangement) over extended wait reinsurance. Excess or quota share gives the reinsurer an interest in the shorter periods of disablement and gives the ceding company a greater interest in the longer periods than it would have under extended wait. Because of a general misunderstanding of the amount at risk underlying disability income insurance, which in turn may lead to establishment of retention limits which for indemnity periods of five years or less are below realistic levels, reinsurers are frequently ceded business which a direct writing company generally has no reason to reinsure. The expected indemnity claim values ascribed to the longer periods of disablement are more catastrophic in nature than those ascribed to the shorter periods, and thus excess or quota share reinsurance imputes to the ceding company a larger element of high risk insurance, exactly the type that should be reinsured (especially in these deteriorating political-economic times), than does extended wait. Furthermore, the financial impact of the period of disablement in excess of five years is less certain and less predictable than that impact for the first five years, that is actuarially less is known about periods of disablement in excess of five years than is known about the first five years of disablement.

Extended wait reinsurance, or some variation thereof, can generally meet a company's proportional reinsurance objectives better on a risk bearing basis than can excess or quota share. Under an extended wait arrangement, to achieve on each individual risk a company's retention objective and to minimize the element of risk imputable to the longer periods of disablement, monthly indemnity retention limits should vary by indemnity period. Consistent with these two objectives, a monthly indemnity retention limit comparable to $75,000 at risk is illustrated in Table VI. In this table at least $100 of monthly indemnity have been retained for periods of disability in excess of five years (the common extended wait period offered by reinsurers) since most reinsurers underwriting extended wait will require the ceding company to retain some amount after the extended wait period. Because of such a requirement, these arrangements offered by reinsurers are in effect hybrids of excess share and extended wait.

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TABLE VI

Monthly Indemnity Retention Limits Consistent with $75,000 at Risk Under Extended Wait Reinsurance

Maximum Indemnity Period	Monthly Indemnity Issued	Monthly Indemnity Retained by Period of Disability: First Five Years	Monthly Indemnity Retained by Period of Disability: There-After
1 year	to $6,250	$6,250	$ X
	over 6,250	6,250	X
2 years	to 3,250	3,250	X
	over 3,250	3,250	X
5 years	to 1,500	1,500	X
	over 1,500	1,500	X
10-year mortgage*	to 750	750	750
	over 750	750	750
15-year mortgage*	to 400	400	400
	over 400	400	400
20-year mortgage*	to 350	350	350
	over 350	350	350
25- & 30-year mortgage*	to 300	300	300
	over 300	300	300
to 65	to 350	350	350
	350 to 650	650	225
	650 to 850	850	175
	850 to 1,000	1,000	125
	over 1,000	1,100	100
lifetime	to 300	300	300
	300 to 650	650	200
	650 to 850	850	150
	850 to 950	950	125
	over 950	1,000	100

*Mortgage disability income insurance is decreasing term insurance which complicates the selection of an appropriate form of reinsurance. Testing might indicate that the limits set out for the lifetime maximum indemnity period would be more appropriate rather than the excess share limits shown.

APPENDIX A

Reinsurance Considerations in General

The principal purpose of reinsurance simply stated is providing the ceding company financial protection (that is, risk transference on individual or collective risks insured). Reinsurance fulfills at least in part the real or imagined need of a direct writing company to avoid the inconvenient effects which adverse fluctuations in claim costs can have on surplus and which may be objectionable to management. Under some arrangements other benefits may accrue to the ceding company on risks reinsured, such as limitation of loss from early lapse, transference of surplus drain resulting from issuance of new business, transference of part of the investment risk, and limitation of loss from loss of federal income tax loss carry forward deductions. It must be recognized, however, that there exists a real cost to risk transference.

In addition to the various acceptance of risk transference, certain auxiliary services may be provided the direct writing company by the reinsurer. Important among these are assistance in underwriting and advice on administrative, operational, marketing and actuarial matters.

Reinsurance methods may be considered as either proportional or nonproportional. Proportional or excess loss reinsurance arrangements are concerned with each insurance risk, and the amount of any claim on this risk in which the reinsurer has an interest is shared with the ceding company in a proportion determined in advance. Proportional reinsurance methods customarily encountered in health insurance which will be examined in Appendix B are quota share, excess share, and extended wait arrangements, although extended wait is viewed by some writers as nonproportional reinsurance.

Nonproportional reinsurance methods are concerned only with a collection of insurance risks and the aggregate amount of claims thereon. The arrangements encountered may be classified as limited proportional reinsurance (catastrophe reinsurance) and complete or fully collective nonproportional reinsurance (stop-loss reinsurance).

Opponents of proportional or conventional reinsurance point out that from the viewpoint of the direct writing company a commonly cited objective for reinsuring - avoidance of undesirable claim cost fluctuation - is accomplished only in part by the conventional arrangements. Little or no protection against an inordinate number or average size of claims is provided. They further contend that the ceding company must always pay, that is, the ceding company cannot "win" under these arrangements. On the other side of the coin it is argued that conventional reinsurance has adequately served the needs of direct writing companies in the past, that the auxiliary reinsurance services furnished have played an important part in the development of many ceding companies, that over the last decade or two the drastic reduction in reinsurance rates and refinement of techniques have kept pace with those of direct writing companies, that the guaranteed nature of the reinsurance agreements is in conformity with the long term obligations of the ceding company, and that reinsurance in any form is a business for profit and not a charity.

Proponents of nonproportional reinsurance point out that under stop-loss reinsurance nearly complete protection against the impact of adverse claim cost whatever its cause may be is provided, that retention limits of direct writing companies may be substantially increased thereby effecting retention of profitable business otherwise reinsured, and that paper work and thus administrative expenses are reduced. Opponents counter that stop-loss reinsurance arrangements are usually not guaranteed and therefore do not coincide with the long term obligations of the ceding company, that in practice warranties, restrictions and limitations are incorporated in the reinsurance agreement which by their very nature hinder the effectiveness of the method, that the seemingly low premiums are far in excess of those resulting from pure risk theory, that the presumed lower administrative expenses may be more imaginary than real, and that without additional loading of the stop-loss reinsurance premium the auxiliary services normally made available and so important to a vast majority of ceding companies under conventional reinsurance arrangements are not available.

In giving this review, the author acknowledges without identifying them the writings of many others on whom he relied.

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APPENDIX B

Types of Reinsurance Arrangements

In setting the level and form of retention limits it is necessary to have some idea of the types of reinsurance arrangements available in the marketplace. Therefore, a brief description of these reinsurance arrangements for individual disability income insurance is given below. This description has for the most part been taken directly from E.L. Bartleson's Health Insurance Provided Through Individual Policies, Second Edition, The Society of Actuaries.

Quota Share Reinsurance

Under the quota share or fixed share method of reinsurance, a specified portion of each risk issued is reinsured. The reinsurance may apply to all policies, to all policies of a designated type or to certain specified benefits. For example, the reinsurance might apply to all benefits of a particular type of policy or might be limited to accidental death and dismemberment benefits.

Excess Share Reinsurance

Under the excess share or surplus line method, the reinsurer's share of each risk is the excess over a predetermined retention limit of the direct insurer. Again, the reinsurance may apply to all policies, to all policies of a specified type or to certain specified benefits. Sometimes excess share and quota share reinsurances are combined, such as in an agreement for the reinsurer's risk to be a portion, such as 75%, of the excess over a predetermined retention limit rather than the full excess.

Extended Wait Reinsurance

Reinsurance of the loss on each insured, only after an insurer has made benefit payments up to a specified amount or for an extended period, is intended to limit the direct insurer's loss arising from any one policyholder only with respect to large claim liabilities. For example, in reinsuring a disability income policy, it might be agreed that the reinsurer would have no liability during the first two years of disability, but would pay a fixed proportion, such as 75%, of the disability benefits payable for any portion of a continuous disability in excess of two years.

Catastrophe Reinsurance

The primary purpose of this form of reinsurance is to protect the direct insurer against the hazard that a number of individual policyholders will be killed or injured in the same accident. To this end, these reinsurance arrangements frequently contain a definition of the mimimum number of losses, such as four, which must occur in order for the event to be deemed a catastrophe. In addition, the reinsurer's liability is usually limited to a specific dollar amount, such as $1,000,000 or $5,000,000.

Stop-Loss Reinsurance

Reinsurance of a loss in excess of a predetermined amount on all insureds collectively during a specified period such as a calendar year is intended to limit the direct insurer's loss arising from all policyholders. The predetermined limit, the so-called stop-loss limit, is taken as a certain percentage, such as 120%, of the expected loss. The expected loss is determined from an actuarial evaluation of the business reinsured and the percentage is normally inverse to the amount of expected loss. When a reinsurance loss can be carried forward indefinitely as a charge against future net reinsurance consideration until it is completely "amortized," or nearly so, the arrangement is referred to as spread-loss "reinsurance" and is a type of nonproportional self-insurance.

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