# Liabilities for Extended Reporting Endorsement Guarantees under Claims-Made Policies

by
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**ABSTRACT**

This paper discusses the need to provide specific liabilities in certain situations where the writer of claims-made policies has guaranteed that an extended reporting endorsement will be available to the claims-made insured at some future date. The concept of economic equivalence between claims-made and occurrence-based insurance mechanisms is introduced and it is demonstrated that there is no difference in accrued liability between a continuous series of occurrence-based policies and an equivalent continuous series of claims-made policies followed by an extended reporting endorsement.

The need for specific accruals of extended reporting endorsement liabilities is discussed in the case of inadequately priced claims-made products and in the case where extended reporting endorsement issuance is guaranteed at no additional charge under specific circumstances.

## INTRODUCTION

The adoption of the claims-made policy form offers several advantages to both insurers and to insureds. Where reporting lags are significant, the claims-made form allows insurers to react more quickly to indicated changes in pure premiums than does the occurrence-based form. Because claims-made policies do not provide coverage for losses reported subsequent to the end of the policy period, there is a cost savings which can be passed on to the insured. These savings can be large for the first few years under the claims-made form.

In many instances, however, claims-made insurers are required to offer extended reporting endorsement coverage at some maximum rate, generally expressed as a multiple of the mature claims-made rate at the time the endorsement is issued. In other cases, claims made insurers offer guaranteed issuance of extended reporting endorsements under specific circumstances - most frequently death, disability or retirement.

Where there is a reasonable expectation that insureds will, at some future date, assert their rights under these extended reporting endorsement guarantees, the potential need for the specific accrual of liabilities for those guarantees needs to be addressed. This potential need is the subject of this paper.

## CLAIMS-MADE MODEL

In order to fully understand the implications of extended reporting endorsement guarantees under claims-made policies, the reader must be thoroughly grounded in the relationships which exist between claims-made and occurrence-based insurance coverages.

To facilitate the discussion of these relationships we will use a simple, but reasonable, model of loss reporting.

Suppose that $\mathcal{R}_t$, the proportion of claims which are reported through t years following occurrence, can be defined as follows:

$$\mathcal{R}_t = 1 - a^t \qquad [1]$$

where a is a constant which is less than 1. If we now define $\mathcal{AR}_t$ as the proportion of claims occurring within a twelve month period which have been reported through t years after the beginning of that period we see that:

$$\mathcal{AR}_t = \int_{t-1}^{t} \mathcal{R}_x \, dx = \int_{t-1}^{t} 1-a^x \, dx$$

$$= 1 - \frac{(a-1)a^{t-1}}{\ln a} \qquad t \geq 1 \qquad [2]$$

$$\mathcal{AR}_t = \int_{0}^{t} \mathcal{R}_x \, dx = \int_{0}^{t} 1-a^x \, dx$$

$$= t - \frac{a^t - 1}{\ln a} \qquad 0 \leq t < 1 \qquad [3]$$

Now $\mathcal{AR}_t$ is the cumulative distribution function of the accident year reported claims. These are the claims which will be covered under an occurrence-based insurance coverage. Figure 1 illustrates $\mathcal{AR}_t$ where a = 0.5.

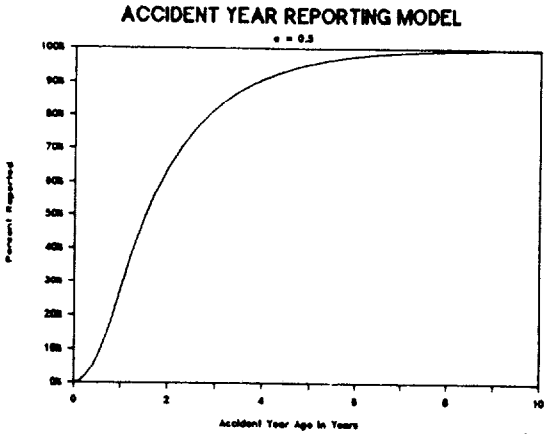


*Figure 1*

Taking the first derivative of $\mathcal{AR}_t$ we can generate the associated probability density function for our model:

$$\mathcal{AR}_t' = (1\text{-}a)\, a^{t-1} \qquad t \geq 1 \qquad [4]$$

$$\mathcal{AR}_t' = 1 - a^t \qquad 0 < t < 1 \qquad [5]$$

Figure 2 shows the probability density function where a = 0.5.

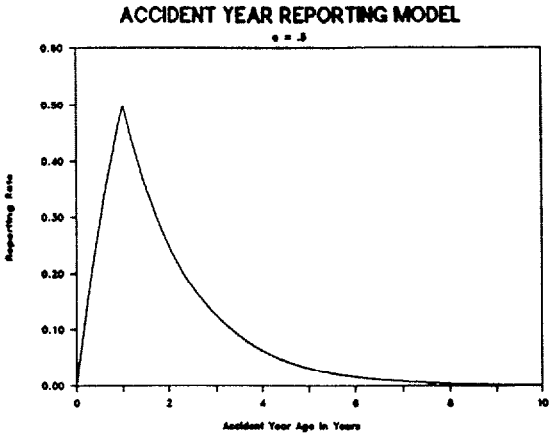


*Figure 2*

Let us now define $\mathcal{AF}_t$ as the proportion of accident year losses which are first reported between accident year ages t-1 and t:

$$\mathcal{AF}_t = \mathcal{AR}_t - \mathcal{AR}_{t-1}$$

$$= \frac{(1-a)^2 a^{t-2}}{-\ln a} \qquad t \geq 2 \qquad [6]$$

$$= 2-t + \frac{1-(2-a)a^{t-1}}{-\ln a} \qquad 1 \leq t < 2 \qquad [7]$$

*Claims-Made Model*

We are now ready to look at the implications of our simple occurrence-based claim reporting model when applied to a claims-made environment. Remembering that the claims-made policy form generally provides coverage for claims which occur subsequent to the *prior acts date* which are first reported during the term of the policy, we can define $\mathcal{RU}_p$ to be the claims first reported during a claims-made year with a prior acts date p years prior to the beginning of the year as follows:

$$\mathcal{RU}_p = \sum_{t=1}^{p+1} \mathcal{AF}_t$$

$$= \sum_{t=2}^{p+1} \mathcal{AF}_t \quad + \mathcal{AF}_1$$

$$= \sum_{t=2}^{p+1} \left[ \frac{(1-a)^2 a^{t-2}}{-\ln a} \right] + 1 - \frac{1-a}{-\ln a}$$

$$= 1 - \frac{a^p(1-a)}{-\ln a} \qquad p \geq 0 \qquad [8]$$

Note that:

$$\lim_{p \to \infty} \mathcal{RU}_p = 1 \qquad [9]$$

As illustrated in Figure 3, the claims-made reporting pattern can be thought of in terms of a series of accident years, beginning with the prior acts date. As the number of years of claims-made coverage increases, the number of accident years involved increases as well until the number of involved accident years equals the length of the accident year reporting pattern, at which point the number of involved accident years remains constant.

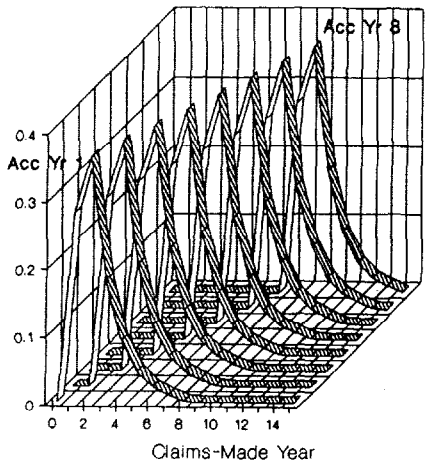


*Figure 3*

By stacking the individual accident year components of the claims made reporting model we can see that the summation of the proportions of the involved accident years contributing to the claims made year will approach 100%.

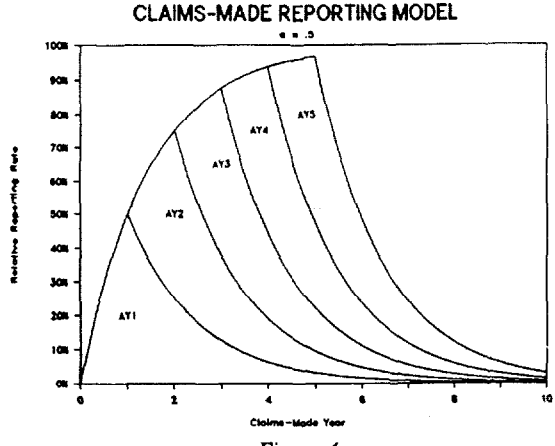


*Figure 4*

*Extended Reporting Exposure*

Since we do not eliminate claims by moving from occurrence-based to claims-made coverage, the accumulation of claims which have occurred subsequent to the prior acts date but have not been reported under the series of claims-made policies represents an uninsured liability. It is this exposure which will be picked up under the extended reporting endorsement. Returning to our model, let us define $\mathcal{ER}_n$ as the cumulative extended reporting exposure after n years of continuous claims-made coverage with a constant prior acts date at the beginning of the claims-made coverage period:

$$\mathcal{ER}_n = n - \sum_{p=0}^{n-1} \mathcal{RU}_p$$

$$= n - \sum_{p=0}^{n-1} \left[ 1 + \frac{a^p(1-a)}{-\ln a} \right]$$

$$= \frac{1 - a^n}{-\ln a} \qquad [10]$$

We are also interested in the maximum value of $\mathcal{ER}_n$ and we note that:

$$\lim_{n \to \infty} \mathcal{ER}_n = \frac{1}{-\ln a} \qquad [11]$$

In the case where a = .5, this limit becomes 1.4427. Stated differently, the maximum extended reporting exposure consistent with an a value of .5 represents approximately

144% of the mature claims-made annual exposure. Figure 5 shows the buildup of this exposure graphically.

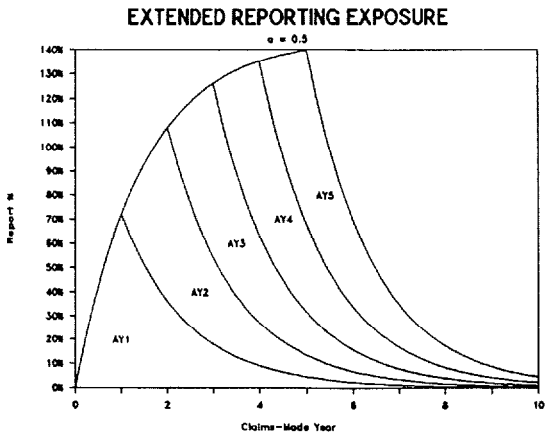


*Figure 5*

We have developed this highly-simplified model in order to facilitate the understanding of the relationships between exposures under the claims-made and occurrence-based coverages. While it is valuable in this context, the reader must understand that the model contains no provision for claim severity, exposure growth or the effect of changes in policy limits.

## THE CONCEPT OF ECONOMIC EQUIVALENCE

Assume that we are seeking to insure against loss from all claims arising out of occurrences over the next n years. Assume further that we have perfect knowledge of the following:

$O_j$ the occurrence-based pure premium for year j

$C_j$ the claims-made pure premium for year j with prior acts date j-1 years prior to coverage

$\mathcal{E}_n$ the pure premium for extended reporting after n years

We now wish to investigate coverage of the subject claims under either a claims-made or an occurrence-based form. Since the losses to be covered under the two forms will be identical, the economic values at annual interest rate i must be equivalent:

$$\sum_{j=1}^{n} (1+i)^{1-j} O_j = \sum_{j-1}^{n} (1+i)^{1-j} C_j + (1+i)^{-n} \mathcal{E}_n \qquad [12]$$

Now, consider the situation at the beginning of year two:

$$\sum_{j=2}^{n} (1+i)^{2-j} O_j = \sum_{j=2}^{n} (1+i)^{2-j} C_j + (1+i)^{-n+1} \mathcal{E}_{n-1} \qquad [13]$$

Multiplying both sides of [13] by $(1+i)^{-1}$ and subtracting the result from [12] we see that:

$$O_1 = C_1 + (1+i)^{-n}(\mathcal{E}_n - \mathcal{E}_{n-1})$$

Or, in general:

$$O_j = C_j + (1+i)^{-n+j-1}(\mathcal{E}_{n-j+1} - \mathcal{E}_{n-j}) \qquad [14]$$

Note, therefore, that the difference between the occurrence-based pure premium and the claims-made pure premium for any year can be expressed in terms of the required accrual

for the extended reporting exposure. When viewed in this manner it becomes clear that the pure premium savings associated with the claims-made coverage form is equivalent to the economic value of the increment to the extended reporting exposure. There is no economic savings inherent in the claims-made coverage relative to the occurrence-based coverage other than that resulting from the failure to provide coverage for the extended reporting exposure.

## EXTENDED REPORTING ENDORSEMENT GUARANTEES AT INDEXED RATES

Frequently, regulatory requirements dictate that claims-made insurers provide for the issuance of an extended reporting endorsement at the end of any continuous period of claims-made coverage at a maximum price equal to some stated multiple of the mature claims-made rate at the time of issuance of the endorsement. Under certain circumstances this guarantee can give rise to the need for the accrual of a liability during the period of claims-made coverage.

### *Inadequacy of Indexed Rate*

The most obvious instance giving rise to the need for an extended reporting liability accrual is where the guaranteed maximum multiple of mature claims-made rate is deficient. In his remarks before the 1987 Coopers & Lybrand Insurance Update, Daniel J. McNamara, President of ISO, stated that "... according to our analysis, medical malpractice loss and loss adjustment reserves were still deficient by over 50% ... at the end of 1986." For purposes of illustration, let us assume that an insurer used loss projections for ten accident years of medical malpractice experience to price a claims-made product and that

those projections were based upon estimates of unreported claims which were 50% deficient.

| Accident Year | Estimated Ultimate Claims | Reported Claims 12/31/86 | Estimated Unreported Claims | Actual Unreported Claims | Actual Ultimate Claims |
|---|---|---|---|---|---|
| 1986 | 840 | 159 | 681 | 841 | 1,000 |
| 1985 | 752 | 411 | 341 | 589 | 1,000 |
| 1984 | 758 | 588 | 170 | 412 | 1,000 |
| 1983 | 797 | 712 | 85 | 288 | 1,000 |
| 1982 | 841 | 798 | 43 | 202 | 1,000 |
| 1981 | 881 | 859 | 22 | 141 | 1,000 |
| 1980 | 911 | 901 | 10 | 99 | 1,000 |
| 1979 | 937 | 931 | 6 | 69 | 1,000 |
| 1978 | 955 | 952 | 3 | 48 | 1,000 |
| 1977 | 967 | 966 | 1 | 34 | 1,000 |
| Total | 8,639 | 7,277 | 1,362 | 2,723 | 10,000 |

The "actual" data in the above chart are based upon our model of claim reporting with a = 0.7. But if our hypothetical, and misguided, insurer used the above estimates, the resulting indicated step rate factors would be as follows:

| Claims Made Year | Step Rate Factor | Extended Reporting Accrual |
|---|---|---|
| 1 | .189 | .811 |
| 2 | .547 | .453 |
| 3 | .776 | .224 |
| 4 | .893 | .107 |
| 5 | .949 | .051 |
| 6 | .975 | .025 |
| 7 | .989 | .011 |
| 8 | .993 | .007 |
| 9 | .996 | .004 |
| 10 | .999 | .001 |
| Total | 8.306 | 1.694 |

The insurer, based upon the indicated extended reporting accrual multiple of 1.694, might provide a guaranteed maximum multiple of 2.0. We know, however, from [11] that the true value is 2.804. The guaranteed maximum price is therefore insufficient to cover the extended reporting exposure.

*Adverse Selection*

Although the insurer is obligated to offer the extended reporting endorsement, the insured is under no obligation to purchase the coverage. It is likely that insureds who are unaware of any potential claims under an extended reporting endorsement might opt to self-insure the extended reporting exposure. Those insureds who suspect that there are unreported claims will be likely purchasers of the endorsement. To the extent that this adverse selection produces an inadequacy in the maximum extended reporting multiple, an accrual of the additional unfunded liability would be appropriate.

*Estimation of Liability*

The liability for extended reporting endorsement coverage can be estimated using [12]. Under current statutory accounting practices this liability will be stated on an undiscounted basis. This requires the use of an interest rate of zero in [12]. The undiscounted reserve is therefore equal to the summation across all active claims-made insureds of the cumulative difference between the occurrence-based pure premiums and the claims-made pure premiums - including the current extended reporting pure premium to the extent it is less than the maximum allowable - for the entire period of claims-made coverage.

The above calculation is, of course, impractical to determine. It is suggested that, as a reasonable surrogate, the complements of the indicated step rate factors be summed from year one through the mature rate year to yield gross extended reporting factors for each claims made year. From these factors we subtract the maximum allowable multiple and limit the difference to zero as a minimum. The resulting net extended reporting factors can then be applied to the in-force premiums by claims-made year to yield the appropriate liability. This method, illustrating the calculation at the end of the fifth year of providing claims-made coverage and assuming a maximum extended reporting multiple of 2.0, is illustrated in the following table:

| Claims-Made Year | Indicated Step Rate Factor | Gross Extended Reporting Factor | Net Extended Reporting Factor | In-Force Premium | Net Extended Reporting Liability |
|---|---|---|---|---|---|
| 1 | .159 | .841 | .000 | $366,000 | $0 |
| 2 | .411 | 1.430 | .000 | 598,950 | 0 |
| 3 | .588 | 1.842 | .000 | 786,500 | 0 |
| 4 | .712 | 2.130 | .130 | 935,000 | 121,550 |
| 5 | .798 | 2.332 | .332 | 1,000,000 | 332,000 |
| Total | | | | $3,686,450 | $453,550 |

Note that this method is efficacious only where the in-force premiums closely reflect the indicated pure premiums. Inadequate rates will give rise to inadequate accruals. Where rates are significantly inadequate or redundant, the in-force premiums should be adjusted accordingly.

## DEATH, DISABILITY OR RETIREMENT GUARANTEES

Over the past few years, several insurers have introduced claims-made programs for professional liability which offer extended reporting endorsements after a specified number of continuous claims-made years in the event of death, disability or retirement of the insured professional. It is generally stated in the policy that this coverage will be provided at no additional cost. Presumably the claims-made pure premiums have been loaded to cover this exposure.

There are several contingencies which may eliminate the exposure for the extended reporting guarantee. The insurer may become insolvent, or the insured may choose to change insurers. Nevertheless, if there is a reasonable expectation that a professional insured under this type of program will remain insured until death, disability or retirement, then the full value of the additional exposure must be reserved.

In point of fact, an insured professional under this type of program has occurrence coverage. As is demonstrated in [14], the annual accrual required to adequately fund the extended reporting exposure is the difference between the occurrence-based and claims-made pure premiums. Where the insurer of such a program is charging less than the indicated occurrence rates, that insurer is sustaining an economic loss; and it would seem proper that the loss sustained be recognized in the period giving rise to the exposure.

*Impact of Economic Value Pricing*

Where economic value pricing, based upon the present values of future cash flows, is used in establishing claims-made rates, special attention must be paid to the impact on the liabilities for extended reporting endorsement exposure. Remembering from [14] that the annual accrual of extended reporting exposure liability is the difference between the occurrence-based pure premium and the claims-made pure premium, where the pure premiums are economic values themselves, the annual accrual must be supplemented by the imputed interest on the unamortized portion of the prior year liability.

For example, consider the following situation:

| | |
|---|---|
| Undiscounted Occurrence Pure Premium | $1,000.00 |
| 7.5% Discounted Occurrence Pure Premium | 758.53 |
| First Year Undiscounted Claims-Made Pure Premium | 279.00 |
| First Year 7.5% Discounted Claims-Made Pure Premium | 233.59 |
| Second Year Undiscounted Claims-Made Pure Premium | 639.00 |
| Second Year 7.5% Discounted Claims-Made Pure Premium | 534.99 |

Now the required accrual for extended reporting exposure as of the first year is:

| | |
|---|---|
| Undiscounted | $1,000.00 - 279.00 = $721.00 |
| Discounted | $758.53 - 233.59 = $524.94 |

In order to properly calculate the discounted accrual for the second year we must consider that the occurrence-based discounted pure premium assumes that the unused portion of the occurrence pure premium will generate a 7.5% annual return. The above example is based upon our reporting model with a = 0.5 and an assumption that losses pay out over the five years following reporting by increments of 10%, 20%, 40%, 20%, and 10%. We would therefore expect to pay $27.86 ($1,000 x .2786 x 10%) during the first year. On

average we therefore have $744.60 ($758.53 - $13.93) of unused pure premium invested at 7.5%. The imputed interest is therefore $55.84. The second year required accrual for extended reporting exposure is therefore:

| | | | | |
|---|---|---|---|---|
| Undiscounted | $1,000 | - | 639.00 | = $361.00 |
| Discounted | $758.53 + 55.84 | - | 534.99 | = $279.38 |

And the required reserve for extended reporting becomes:

| | | | | |
|---|---|---|---|---|
| Undiscounted | $721.00 | + | 361.00 | = $1,082.00 |
| Discounted | $524.94 | + | 279.38 | = $804.32 |

*Effect of Limits Drift*

The extended reporting endorsement guarantee problem is exacerbated where the extended reporting endorsement is issued at policy limits equivalent to those in effect at the time it is issued. Where policy limits increase over the claims-made period, the conversion to an occurrence basis will produce loss exposure in excess of that which would have been provided under continuous occurrence-based coverage.

It would not be unreasonable to assume that insured professionals under this type of program will exhibit a tendency to increase claims-made limits in the years immediately preceding planned retirement. Where the reporting period is long, the additional coverage provided in the extended reporting endorsement will be well in excess of the additional charges under the claims-made coverage.

*Reinsurance Considerations*

An often-ignored aspect of the guaranteed extended reporting endorsement in case of death, disability or retirement is that of reinsurance. While the direct insurer is promising to provide a specified coverage at some point in the future, in general there can be no assurance that reinsurance will be available at the time the promised coverage is provided. Insurers under this type of program may find themselves with retentions in excess of those anticipated, or with reinsurance costs not contemplated in the pricing.

*Relationship to Policy Reserves under Life Policies*

Viewed on its own, the guarantee of extended reporting endorsement coverage in the event of death, disability or retirement is basically a life and health insurance coverage with a benefit equal to the pure premium for losses arising out of occurrences subsequent to the first continuous claims-made year which remain unreported at the time of death, disability or retirement. Life contingencies reserving techniques may provide the best method for the establishment of the proper reserves for this exposure, especially if insurance regulators would be receptive to specific discounting of these reserves.

## SUMMARY

We have examined the basic structure of the relationship between the claims-made and occurrence coverage bases and we have developed a simple model of claim reporting to help understand that relationship. We have discussed the concept of the economic equivalence between the two coverage bases where extended reporting endorsements are

provided at the end of the claims-made period - effectively converting the entire claims-made period to an occurrence basis - and the resulting need to accrue the attendant liability.

We have examined some of the situations under which a guaranteed maximum rate for extended reporting endorsement coverage may be or become inadequate. We have looked at the need for the accrual of liabilities for guaranteed extended reporting endorsement coverage in the case of death, disability or retirement.

It is hoped that this paper will serve to focus attention on what has the potential to become a major issue. Claims-made policies are fairly new, and the unaccrued liabilities are manageable. As claims-made coverage is adopted in new lines of business, as additional guarantees of future coverage are provided, and as the unaccrued liabilities under existing coverages grow over time, continued failure to properly establish these liabilities may have a severe impact on the solvency of some insurers, and possibly on the entire industry.