ALTERNATIVE APPROACHES TO CASUALTY LOSS RECOGNITION

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Recent work by the Financial Accounting Standards Board on the subject of "accounting for contingencies" has revived interest in the treatment of casualty losses. This topic is of particular significance to firms that carry risks of loss that would be insurable otherwise, known euphemistically as "self-insurance" but better described as "non-insurance."

Concern with the treatment of casualty losses bears on at least two areas of the financial manager's responsibility. First, the chief financial officer is responsible typically for the broad financial reporting function, including the determination of the firm's accounting policy. If the firm elects to self-insure against casualty losses, the financial manager must determine how this risk can best be reflected in financial statements.

Secondly, the financial manager probably is involved in the decision of whether to self-insure or purchase insurance coverage. In the interest of proper decision-making, the costs of either alternative should be properly recognized. If the cost of bearing the risk of casualty loss is not recognized in the determination of income, self-insurance may be unduly encouraged.

In the past, two major accounting alternatives were available: systematic recognition of cost in advance of the loss ("the insurance approach") and specific loss recognition when incurred ("the loss approach").

The Financial Accounting Standards Board [2], in considering the broad problem of contingencies in financial reporting, has specified that the following conditions must be met to justify the recognition of *potential* losses in financial statements before they actually occur: (1) Available information must indicate the probability that an asset has been impaired or a liability has been created. (2) Events that will confirm the fact and amount of the loss must be reasonably expected to occur. (3) It must be possible to reasonably estimate the amount of the loss. With these conditions, the insurance approach is unacceptable for recognizing casualty losses. This, however, need not rule out all methods of systematic, advance recognition of the cost of bearing the risk of casualty loss. A third approach, the "depreciation approach," avoids the deficiencies of the insurance approach, but still allows for some advance recognition of potential loss.

This paper reviews the insurance and loss approaches, examines their deficiencies in light of the FASB statement, and describes a probability-based depreciation approach as an alternative.

The Insurance Approach

If an "insurance approach" is used for casualty losses, two underlying situations are possible. A firm may enter into a contract with an independent insurer for protection from casualty losses. In this case, the accounting treatment is clear and uncontroversial; the cost of insuring against certain risks for a period of time is recognized as an expense of that period. Generally, one cannot (or does not) insure against *all* risks. Provisions of the insurance policy limit the amount of coverage and may provide other limitations as well. Some risks are not insurable or are excessively costly to insure. Thus, the problem of treating casualty losses may be reduced, but not entirely eliminated, for the firm possessing purchased insurance coverage.

Alternatively, a firm may choose to be a "self-insurer"—to bear all risks of loss itself. Under these circumstances, one accounting approach has been to recognize an implicit insurance expense and create a reserve for losses. This procedure has been attacked on several grounds. Cramer and Schrader [1] properly observe that in the case of self-insurance for casualty losses no exchange transaction has occurred, and no obligations for payment exist. Note that this condition applies only to losses that do not accrue, such as fire and casualty losses, and consideration here is limited to that type. Where a firm acts as a self-insurer for an accruing obligation, such as pensions, recognition as a periodic expense is appropriate.

In support of the insurance approach, it should be noted that not all costs are transaction-based. The recognition of bad debt expenses under an allowance system, for example, is a type of self-insurance expense. The costs of bearing risks of credit losses are recognized prior to their occurrence. In this case, the desire to match costs and revenues overrides the transaction criterion. Thus, it may be argued that in the case of a large self-insurer with many small, diverse risks, recognition of the cost of bearing the risk of casualty losses is as appropriate as that of credit losses is for any company. On the other hand, in the case of bad debts, it is difficult to observe a loss occurring. Existing accounts receivable may, in fact, be uncollectible, but this may not become evident until a later time. Thus, advance recognition is necessary to report losses that have probably occurred but are not yet obvious. Casualty losses such as destruction of property, however, are quite evident when they occur, so advance recognition on the basis of uncertainty cannot be justified.

Another objection to the insurance approach is that an amount greater than the cost of the asset may be charged against net income. The depreciation process eventually results in charging all of an asset's cost (net of expected salvage) to expense. The self-insurance process also makes a charge to expense, which amounts to a further write-off of the cost of the asset. Thus, the total charges to expense over the lifetime of an asset may be greater than the amount of cost incurred. *The presence of two allocation procedures for the same cost suggests that the insurance approach is questionable on grounds of double-counting.* It also suggests that the depreciation approach, to be discussed subsequently, may be particularly appropriate, since it combines all information into a single allocation procedure.

Finally, an advance provision for self-insurance costs clearly does not meet the first of the FASB criteria presented earlier (although the other two may be met to some degree). Since all conditions are not met, recognition of self-insurance costs prior to an actual loss is no longer considered an acceptable accounting practice.

The Loss Approach

Perhaps the most common manner of accounting for casualty losses of a self-insurer is to make no provision for self-insurance and report losses as they actually occur. This approach is implicitly followed for the several kinds of risk present in any company against which they are not (or cannot be) insured, e.g., obsolescence, loss on investments, etc. Use of this approach was also implicitly suggested by the FASB when it ruled out the insurance approach as an alternative. Normally, the major objection to this method is that it gives no recognition to the cost of bearing risks. Losses are reported when they occur; prior to that time, the fact that a company has decided to bear certain risks itself rather than pay insurance premiums goes unreported. Since the trade-off is likely to be small costs every period (insurance premiums) versus large costs in a few periods (occasional casualty losses), annual comparison of companies is made difficult. Such differences do, however, reflect actual differences in periodic costs incurred. In some cases, large casualty losses would be reported as extraordinary items and hence would not distort net operating income (the statistic frequently used for intercompany comparisons). APB Opinion 30, however, severely restricted the use of the extraordinary item classification for this purpose.

One minor question may also be raised concerning the loss approach. Losses have been defined by Hendriksen [3, p. 195] as "expriations of value not related to the normal operations of any period. That is, they result from extraneous and exogenous events that are not recurring or anticipated as necessary in the process of producing revenues." It may be asked whether this definition is appropriate for the casualty losses of a self-insurer. If it is not, then casualty losses should be presented in financial reports as "expenses," that is, normal occurrences in the conduct of the business, rather than "losses," which are unusual, abnormal occurrences. The typical self-insurer is characterized as possessing numerous small, diverse risks. Under these circumstances, it is reasonable to expect that losses will occur and recur over the life of the firm. Recurrence in this sense depends upon the time dimension considered. If the company's operating cycle is considered to be the proper time dimension, then casualty losses are probably not recurrent and can only be considered so if a long enough time period is used. Finally, while casualty losses may not be "anticipated as necessary," they must nevertheless be anticipated as likely.

The Depreciation Approach

A possible alternative to the two traditional approaches is to reflect the possibility of casualty loss in the determination of annual depreciation charges. This approach has been suggested by others [1] and will be further developed here.

The determination of annual depreciation charges is a complex task since various methods are available and asset life and salvage value must be estimated. In considering possible casualty losses, the focus is on the asset's expected life. The early occurrence of a casualty would cause the asset's useful life to be prematurely terminated. A useful technique for incorporating uncertainty concerning an asset's life into the depreciation process has been suggested in the literature [4, 5], and is particularly applicable to the incorporation of the possibility of a casualty loss into the annual depreciation charge.

Depreciation calculations are commonly based on a single-valued estimate of asset life (perhaps the average expected life). It may be argued that a better matching of costs and revenues occurs when the entire distribution of asset life is used in determining annual depreciation. This approach is known as probabilistic depreciation and operates as follows. Suppose an asset costing $60,000 is expected to have a life of 2 to 5 years. Suppose further that on some basis a probability is estimated for each possible life: a .10 probability of the life being 2 years, .10 probability of 3 years, .50 probability of 4 years, and .30 probability of 5 years. Annual depreciation is determined by first taking the depreciation charge that would result if each life were correct, multiplying by the probability of that life, and then summing the results. For the first year, this gives:

If life is	Annual depr.	×	Probability	=	Expected depr.
2	$30,000		.10		$ 3,000
3	20,000		.10		2,000
4	15,000		.50		7,500
5	12,000		.30		3,600
	Depreciation for first year				$16,000

Applying this technique for each year, the following depreciation schedule results:

Year	Depreciation
1	$16,000
2	16,000
3	13,000
4	11,100
5	3,600

Under conventional depreciation, using the average expected life of 4 years, depreciation would be $15,000 in years 1-4 and 0 in year 5. By comparison, probabilistic depreciation recognizes that the life may be shorter than 4 years, and thus there is higher depreciation in years 1 and 2, or it may be longer than 4 years, resulting in higher depreciation in year 5.

While probabilistic depreciation offers an improved approach in general, it is particularly useful for explicitly considering the effects of different factors on asset life. Many factors may enter into the eventual determination of an asset's actual life. Moreover, each factor may have a set of probabilities associated with it that can be estimated. The three most important factors are briefly considered.

First, physical factors cause the asset to lose its operational capabilities. For many asset types, studies have been conducted to estimate mortality curves, which offer useful data on which to base estimates of a probability distribution of physical termination of asset life (see [6]).

Second, economic factors cause the asset to become obsolete and noncompetitive. Obsolescence is briefly defined as the state that exists when a replacement for an existing asset is available and economic analysis indicates that replacement is desirable. The likelihood of obsolescence is an important consideration in the determination of annual depreciation charges. Lowe [7, p. 296], in discussing this problem, states:

"In a dynamic econom, improved techniques, processes, and methods of manufacture may be expected from time to time. The effect of these technological advances is to reduce the total annual cost of a new plant capable of providing the same services as the plant installed. . . .

"If such advances are expected, the capital charge on the plant installed must decrease year by year so as to make its total annual cost no greater than the decreasing total annual cost of any new plant constructed in the future."

The likelihood of obsolescence may be difficult to estimate. Experience or informed judgment about the future may serve to underlie a probability distribution of life termination.

Finally, casualty losses may occur, causing assets to be destroyed in whole or part. As mentioned above, it has been suggested that this should also be reflected in the determination of depreciation charges. For insurable losses actuarial data may be available to assist in estimating the life distribution; for non-insurable losses, subjective estimates may be needed. In some cases, a firm's historical records of experience may be a satisfactory basis for estimating the life distribution.

Each of the 3 determined conditional distributions of asset life provides the probability that an asset's life will terminate in a particular year due to the factor (physical, economic, or casualty) underlying the distribution. To calculate a set of depreciation charges, a joint distribution must be formulated.

To illustrate the calculation of a joint probability distribution, assume that 3 sets of probabilities are estimated for an asset. Let $p_E(n)$ = probability that the asset's life will terminate in year n due to economic factors; $p_p(n)$ = probability that the asset's life will terminate in year n due to physical factors; and $p_C(n)$ = probability that the asset's life will terminate in year n due to casualty loss.

Suppose that the probabilities are estimated as shown in Exhibit 1. Note that in the case of casualty loss the probabilities total less than one, since there is no certainty that the asset will suffer destruction by casualty within the first ten years.

Next these 3 individual probability distributions must be combined into a joint probability distribution (denoted $p^*(n)$). To accomplish this, a cumulative distribution must be determined for each factor. Let $P_E'(n)$ = probability that the asset's life will be greater than or equal to n years, considering only economic factors, with $P_p'(n)$ and $P_c'(n)$ defined similarly for physical and casualty loss factors, respectively. These distributions are easily constructed from the data in Exhibit 1. Under the economic-factors distribution, for example, Exhibit 1 indicates no probability of termination before the third year. Thus, as shown in Exhibit 2, $P_E'(n)$ is 1.00 for years 1, 2, and 3. With a .10 probability of termination in year 3, the probability of a life of 4 or more years ($P_E'(4)$) is .90, and so on. Exhibit 2 indicates the values of the cumulative distribution function for each factor.

A combined cumulative distribution function, $P'(n)$, is now calculated by multiplying together the 3 individual functions. Thus, $P'(n) = P_E'(n) \times P_p'(n) \times P_c'(n)$. Finally, the joint probability function is determined as the difference between successive values of $P'(n)$: $p^*(n) = P'(n) - P'(n+1)$. Values for $P'(n)$ and $p^*(n)$ are shown in Exhibit 2. $p^*(n)$ represents the probability that the asset's life will terminate in year n due to the combination of economic, physical, and casualty loss factors. Note in Exhibit 2 that once any one of the cumulative distribution functions becomes zero, all subsequent joint probabilities are zero. Thus, in the example given, 8 years is the maximum possible life due to the economic factor.

The joint probability distribution is used to calculate a set of depreciation charges. Depreciation for year j is given by the formula

$$D_j = \sum_{n=j}^{N} (C/n)\, p^*(n) \qquad \text{for } j \leqslant N,$$

Exhibit 1. Probabilities of Termination of Asset Life

n	$p_E(n)$	$p_p(n)$	$p_C(n)$
1	.00	.00	.05
2	.00	.00	.05
3	.10	.00	.05
4	.20	.00	.05
5	.20	.05	.05
6	.30	.10	.05
7	.10	.15	.05
8	.10	.20	.05
9	.00	.25	.05
10	.00	.25	.05
Total	1.00	1.00	.50

Exhibit 2. Calculation of Joint Probability

n	Probability that asset life is at least n years: Economic $P'_E(n)$	Physical $P'_p(n)$	Casualty $P'_c(n)$	Combined $P'(n)$	Joint probability $p^*(n)$
1	1.00	1.00	1.00	1.00	.05
2	1.00	1.00	.95	.95	.05
3	1.00	1.00	.90	.90	.135
4	.90	1.00	.85	.765	.205
5	.70	1.00	.80	.56	.204
6	.50	.95	.75	.356	.237
7	.20	.85	.70	.119	.074
8	.10	.70	.65	.045	.045
9	.00	.50	.60	.00	.00
10	.00	.25	.55	.00	.00
Total					1.00

where C is the cost of the asset, and N is the maximum possible life (in our example N = 8). This formula calculates the sum of annual depreciation charges for each possible life times the probability that life will occur, as illustrated previously. Assuming an asset cost of $100,000, the following depreciation schedule (with figures to the nearest $5) is produced:

D_1 = $26,775 D_5 = 9,650
D_2 = 21,775 D_6 = 5,570
D_3 = 19,275 D_7 = 1,620
D_4 = 14,775 D_8 = 560

This schedule recognizes the effects of economic, physical, and casualty loss factors on the asset's life by incorporating each estimated probability of termination of the asset's life.

Thus, probability distributions concerning various factors relating to asset life may be incorporated into the depreciation calculations without great difficulty. Such a procedure permits the firm to recognize the possible effects of bearing the risk of casualty loss without having to consider the deficiencies of the insurance approach. Rather than recognizing this risk by providing an imputed insurance expense, the depreciation approach recognizes it in the form of a potentially shorter asset life with no compensation if this shorter life occurs. Since depreciation calculations should reflect the various factors associated with an asset's expected life, this method appears to be in accordance with generally accepted accounting principles.

The above illustration dealt with a single asset. A typical self-insurer may have numerous similar assets and thus may adopt group depreciation. Procedures similar to those described for a single asset would be followed in calculating a joint probability distribution and annual depreciation charges for a group of assets. Further development of the application of probability concepts to group depreciation are found in the literature [4, 5]. For purposes of this paper, the individual asset case serves to illustrate the general principles involved.

Comparison of Effects

Of particular concern to the financial manager is the effect of the various alternatives on reported income. Such a comparison serves to clarify the impact of the depreciation method in situations where an uninsured (self-insured) casualty loss occurs. To illustrate, the example of the preceding section is continued.

An asset having a cost of $100,000 was assumed. As shown in Exhibit 1, the life due to economic factors is expected to be between 3 and 8 years (with a mean of 5.4) and the life due to physical factors is expected to be between 5 and 10 years (with a mean of 8.25). Assume that the firm chooses its depreciable life primarily on the basis of the physical characteristics of the asset and selects a life of 8 years. Assume further that the asset is completely destroyed by casualty at the end of year 5.

The charges against income under each of the 3 approaches are shown in Exhibit 3. Under the insurance approach, a depreciation charge of $12,500 (determined by the straight line method ($100,000/8 years)) and a self-insurance charge of $2,000 (assumed to be equivalent to the premium that would be paid if this (high risk) asset were insured) are recorded each year. When the casualty occurs at the end of year 5, $62,500 has been depreciated, leaving a loss of $37,500. Of this loss $10,000 is charged against the accumulated reserve for self-insurance, leaving $27,500 to be charged against income.

Under the loss approach, the depreciation charge of $12,500 is made each year, and the remaining $37,500 is written off when the loss occurs. Under the depreciation approach, the use of probabilistic depreciation yields annual charges that reflect in each year the possibility of life termination due to economic, physical, or casualty factors. The annual charges presented in Exhibit 3 were developed in the preceding section. With recognition of all these factors, depreciation charges in the early years are higher than under the other approaches. Thus, when the loss occurs in year 5, only $7,750 remains to be written off.

Combining the last two lines of Exhibit 3, the size of the charge against income in year 5 (the year of the casualty loss) is noted:

Insurance approach	$42,000
Loss approach	50,000
Depreciation approach	17,400

The insurance and loss approaches result in a large loss in the year of casualty. The depreciation approach, by recognizing the possibility of casualty loss in each year, reports a much smaller loss. From another point of view, the depreciation approach has given annual recognition to the cost of the firm's decision to self-insure. The insurance approach attempts to do this in an imperfect (and now nonacceptable) manner, and the loss approach does not achieve this at all.

Conclusion

The FASB statement on accounting for contingencies requires that the financial manager reexamine the reporting options available to his firm, if the choice is made to self-insure certain risks. Since reported net income is likely to be a topic of major concern, knowledge of the available methods of reporting and their effect on reported income is needed.

It has been shown that advance recognition of loss via the insurance approach has certain inherent deficiencies and does not meet the criteria of the FASB statement. The loss approach meets these criteria, but prevents any recognition of the cost of risk-bearing prior to the occurrence of a loss. This deficiency may be remedied by incorporating the possibility of casualty loss into the depreciation process as one of several determinants of asset life. Probabilistic depreciation has been suggested as a particularly appropriate way to do this. In short, the depreciation approach to accounting for casualty loss has been shown to be both theoretically reasonable and computationally feasible. By adopting this approach, the financial manager's decision to self-insure will be reflected in the periodic determination of income.

Exhibit 3. Comparison of Effects on Income

Year	Insurance approach	Loss approach	Depreciation approach
1	$14,500	$12,500	$26,775
2	14,500	12,500	21,775
3	14,500	12,500	19,275
4	14,500	12,500	14,775
5 (normal)	14,500	12,500	9,650
5 (write-off)	27,500	37,500	7,750

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