Depreciation: Incurable Functional Obsolescence and Sequence of Deductions

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Many appraisers believe that the cost approach is unreliable and inappropriate for valuing real properties that have high levels of deterioration and obsolescence. Nevertheless, there are occasions when the appraiser is requested to provide a detailed cost approach as part of the market value estimate. It is useful to examine certain aspects of the cost approach, using depreciation determined by direct methods, in order to develop a logical analysis and enhance the accuracy of a conclusion based on that approach.

COMPUTATION OF INCURABLE FUNCTIONAL OBSOLESCENCE DUE TO EXCESS OPERATING COSTS

Functional obsolescence is the loss of value of the subject facility resulting from deficiencies, other than physical deterioration, that impair utility in the subject compared to a replacement facility. Functional obsolescence can be curable or incurable. When it is incurable it cannot be corrected by economically feasible means.

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(For purposes of this discussion, assume that incurable physical deterioration and economic obsolescence can be readily developed as percentages of replacement cost. Assume also that the dollar cost to correct curable physical deterioration and curable functional obsolescence can be developed.)

There are two types of incurable functional obsolescence. One type is measured by the cost of excess construction or cost that creates overadequacy of the subject. This type of incurable functional obsolescence is measured by the difference between reproduction cost and replacement cost. For example, if an industrial building constructed in 1945, containing 1,000,000 sq. ft., could be replaced in 1982 by a building with the same utility but containing only 800,000 sq. ft., the cost of the extra 200,000 sq. ft. would be excess construction cost for which a prudent buyer would pay nothing extra. Included also are other items involving excess construction cost, such as extra-thick walls, more costly materials, etc.

The second form of incurable functional obsolescence is due to excess operating expenses. Operating a facility in which the building design causes operating inefficiencies means that the occupant will pay excess operating expenses. The penalty for additional expenses, unlike excess construction cost, is not measured by the cost of construction but by the increase in operating expense of the subject over the replacement. These may include labor, materials, fixtures, equipment, insurance, utilities, taxes, etc. The additional operating expense must be capitalized by the appropriate rate in order to determine its impact on the market value of the facility being appraised.

EXAMPLE

If the 1,000,000-sq. ft. facility requires a greater expense for utilities than the 800,000-sq. ft. replacement facility, a prudent buyer would not only avoid paying for the extra 200,000 sq. ft. of construction but, in valuing the subject, would deduct from the replacement cost the capitalized excess utilities expense caused by the excess size and inefficient design. Excess expenses from other sources should be similarly treated.

INFLATION

Assuming, that the excess operating expense can be estimated and annualized, three important factors should be included in determining the penalty or deduction that must be taken from the replacement cost, in order to estimate market value. First, there should be recognition of, and allowance for, the fact that this expense, in most cases, can be expected to increase each year over the remaining life of the subject facility due to inflationary factors. For example, a prudent buyer would assume that the cost of labor, materials, fixtures, equipment, insurance, utilities, and taxes will increase annually. As a result, it is appropriate to factor in an estimate for inflation, i.e., increases in the annual extra operating expense.

ADJUSTMENT TO AFTER-TAX EXPENSE

The second important factor is the adjustment of the excess operating expense to reflect the after-tax cost. The significance of any such expense to a purchaser of the subject facility is the impact on net profits and cash flow. Because such expense is deductible for federal income tax purposes, the net cost to the operator of the facility should be diminished by the effective income tax rate applicable to the owner. For example, if the additional utilities expense of the property based on the additional 200,000 sq. ft. is estimated to be $40,000 for the first year, the actual after-tax cost to the owner, assuming an effective tax rate of 46%, would be only $21,600 (54% of $40,000).

DEPRECIATION BENEFIT

The third important factor is that a buyer of the hypothetical replacement facility would receive an income-tax benefit from taking depreciation on the difference between the cost of the replacement facility and the purchase price of the subject facility. The benefit from this additional depreciation must be computed in order to properly account for the after-tax cost of purchasing the subject facility as opposed to the replacement facility.

Assumptions:

46% effective tax rate.

Cost of replacement facility (after incurable physical deterioration and economic obsolescence): $1,000.

Remaining economic life of subject facility: 15 years.

Appropriate discount rate: Using 14% per annum, the effect of 15 years of annual expense discounted results in a discount rate multiplier of 6.14.

Annual excess operating expense before taxes is $50, and, for illustration purposes, no increase in such expense is expected in future years.

Assume also that straight line depreciation would be taken over 15 years for federal income tax purposes if the replacement facility were purchased.

Formula:

The cost of the replacement facility after deducting incurable physical deterioration and economic obsolescence,

less the present value of the excess operating expense penalty over the expected remaining life of the subject facility,

less the present value of the excess depreciation benefits derived from purchasing the replacement facility as opposed to the subject facility,

is equal to the value of the subject facility prior to deduction for curable physical deterioration and curable functional obsolescence.

Equation:

$$R - .54PVP - .46PVD = S$$

R = Cost of replacement facility after deducting incurable physical deterioration and economic obsolescence.

PVP = Present value of annual operating expense penalty, which in the example is computed by multiplying the excess operating cost ($50 in the example) by the discount rate multiplier (6.14 in the example).*

PVD = Present value of depreciation benefit, which in the example is computed by multiplying the difference between R and S by the discount rate multiplier (6.14 in the example) and dividing the product by the depreciation life of the replacement (N in the example).**

S = Market value of subject facility before deducting for curable physical deterioration and curable functional obsolescence.

*PVP = DRM(A)

**PVD = $\frac{DRM(R-S)}{N}$

where

DRM = Discount Rate Multiplier (6.14 in our example)

A = Annual excess operating expense penalty (**$**50 in our example)

N = The number of years over which replacement facility will be depreciated for federal tax purposes (15 years in our example)

Calculation:

$$R - .54PVP - .46PVD = S$$
$$R - [.54 \times 6.14 \times 50] - [.46 \times 6.14 \times (R-S) \div 15] = S$$

Multiplying both sides of the equation by 15 results in:

$$15R - 2486.7 - 2.8244R + 2.8244S = 15S$$

Combining Rs and Ss results in:

$$12.1756R - 2486.7 = 12.1756S$$

Dividing both sides of the equation by 12.17566 results in:

$$R - 204.24 = S$$

Substituting 1,000 for R results in:

$$1{,}000 - 204.24 = S$$

Making the subtraction, the result is:

$$795.76 = S$$

In our example, the present value of the operating expense penalty itself is $165.78 [.54(6.14)50]. The present value of the excess depreciation benefit lost to the purchaser of the subject is $38.46 [.46(6.14) (1,000 - 795.76) ÷15]. Accordingly, in terms of this portion of the analysis, the total after-tax cost or penalty to purchase the subject as opposed to the replacement is $204.24 ($165.78 + $38.46), and the market value of the subject is $795.76 ($1,000 - $204.24) before deducting for any curable physical deterioration or curable functional obsolescence.

Including factors for increases in annual excess operating expense over the economic life of the subject facility and the use of accelerated depreciation will complicate the computation. In either or both cases, the equation set forth above will still apply.

PROPER SEQUENCE OF DEPRECIATION FACTORS

At the beginning of our discussion, we assumed that incurable physical deterioration and economic obsolescence percentages and curable physical deterioration and curable functional obsolescence dollar amounts can be developed for the subject facility. Using our formula, the effect on market value of incurable functional obsolescence due to excess operating expense can also be developed. It is imperative, however, that these items be applied to, and deducted from, replacement cost in the proper sequence. Unless this is done, the appraiser's conclusion of value will be mathematically incorrect even though each element of depreciation is supportable.

Accordingly, the logical and necessary sequence to determine each element of depreciation in the cost approach is as follows:

1) Replacement cost: The computation of reproduction cost is unnecessary to an estimate of market value using a cost approach. The difference between reproduction cost and replacement cost is excess construction cost.

2) Deduct economic obsolescence by applying it as percentage of replacement cost.

3) From the balance, deduct incurable physical deterioration by applying it as a percentage of the amount remaining after deducting economic obsolescence from replacement cost.

4) From the balance, deduct incurable functional obsolescence due to excess operating expense as a present value dollar amount.

5) From the balance, deduct curable physical deterioration and curable functional obsolescence as dollar amounts.

6) The result of this computation is the depreciated cost of the subject facility. When added to land value consistent with the use of those improvements, the result is market value as estimated by the cost approach.

It should be noted that as an alternative, items 2 and 3 above may be reversed and items 4 and 5 may be reversed without any effect on the result. The sequence of all other depreciation deductions, however, must be maintained in order to achieve mathematical accuracy.

IMPROPER CALCULATION

Assume a $1,000 replacement cost, incurable physical deterioration of 20%, economic obsolescence of 20%, and curable functional obsolescence of $500. If curable functional obsolescence is taken out of order, the appraiser may erroneously arrive at a value as follows:

$1,000	Replacement cost
- 500	Curable functional obsolescence
$ 500	
- 100	20% Economic obsolescence
$ 400	
- 80	20% Incurable physical deterioration
$ 320	Depreciated cost

Based on the foregoing, the appraiser would have erroneously concluded that a prudent purchaser would invest $820--$320 for the property and $500 for curable functional obsolescence. The effect would be that the purchaser would have paid $820 for a facility that would cost $1,000 to replace but which is in fact 20% incurably physically deteriorated and 20% economically obsolete. Based on either depreciation item alone, the total investment should not exceed $800.

PROPER CALCULATION

The proper calculation is as follows:

$1,000	Replacement cost
- 200	20% Economic obsolescence
$ 800	
- 160	20% Incurable physical deterioration
$ 640	
- 500	Curable functional obsolescence
$ 140	Depreciated cost

Based on the correct analysis, the purchaser will have invested $640 - $140 for the property plus $500 as curable functional obsolescence--for property that would cost $1,000 to replace and is 20% economically obsolete and 20% incurably physically deteriorated. The proof is that after the curable item has been cured, the value should be $640, the buyer's total investment in the property ($1,000 less 20% equals $800 less 20% equals $640).

The error in the first calculation arises from the fact that by taking the percentage deduction after the dollar deduction, that part of the percentage applying to the dollar deduction (curable functional obsolescence) is omitted. This is erroneous because, while the dollar amount of curable functional obsolescence is deducted from the hypothetical replacement cost, it is still spent by the buyer of the subject property as the obsolescence is cured and, therefore, is not diminished by the economic obsolescence and incurable physical deterioration losses represented by the percentages.

Similarly, if a present-value dollar amount of incurable functional obsolescence due to excess operating expense had been present in the example, that, too, would have been deducted after application of the percentages. Here again, the buyer expends this amount in full as he experiences and pays for the excess operating expense. There is no diminution of that expense due to economic obsolescence or incurable physical deterioration.

CONCLUSIONS

The theory of a proper deduction for depreciation in the cost approach is to account for the deficiencies in the subject facility as compared to a new, modern property with the same capabilities.

In developing a formula for depreciation using a direct method based on deductions from value due to obsolescence and deterioration, care must be taken to consider income tax requirements including depreciation benefits. Provision should also be made for the impact of inflation on excess operating expense.

In addition, it is important to sequence the calculations properly so that deductions for the actual dollar cost of curable items are accounted for in full. Proper estimates of obsolescence and deterioration and their correct application are necessary elements to a cost approach analysis.

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