An Alternative View of Depreciation and Recapitalization Costs

by Peter Lufkin

In this column I suggest that what is known (or just assumed) about the physical depreciation of facilities has little use in the estimation of recapitalization costs. I then argue that results from the study of economic depreciation provide a much better tool for this purpose.[1]

A key concept in facility management is the physical depreciation of fixed assets over time. Conventional wisdom is that facility condition declines with age as shown in Figure 1. Some variation of this graphic is found in many of the facility management textbooks and papers published in the last decade. It is also built into the forecast models used by many facility consultants. It is a plausible concept repeated so often I suspect many of us assume it is demonstrable fact.

However, I think this figure overstates our knowledge of the physical depreciation process and distracts us from other concepts more useful for determining recapitalizing costs.

To use Figure 1 as the basis for an actual funding plan—that is, how much need be spent on recapitalization as a facility ages—one would need the following things:

- ***A comprehensive measure of facility condition.*** Reducing the results of a condition assessment to a simple ratio, such as the facility condition index (required repair costs divided by total replacement

costs), is an oversimplification. For example, an airport with inoperable runway lights can have a "good" condition rating according to this index but be virtually unusable for evening flights. Other measures such as mission and safety must be included, though to date little or no work has been done for developing a multidimensional index of facility condition.
- ***An objective estimate of facility service life.*** What service life should we plan for a particular facility or group of facilities? Much of what we think we know is based on opinion and anecdote rather than documented fact. For example, U.S. federal agencies still depend heavily on asset lives defined by committee for the Bureau of Internal Revenue in 1918. Regulated industries such as utilities keep scrupulous records on facility retirements and estimated service life—the justification of the "plant depreciation" part of your light bill—but consider this information proprietary and will not share it with us. Commercial construction cost publishers—such as R.S Means or Marshall & Swift—may provide detailed service life estimates, but these are based on appraiser opinions and undocumented studies.
- ***An empirically derived depreciation curve.*** Even with proper maintenance, the condition of a facility reaches a zero point at some age, according to Figure 1. Yet, there is no study that we are aware of that demonstrates the actual decline of condition—however that is measured—with

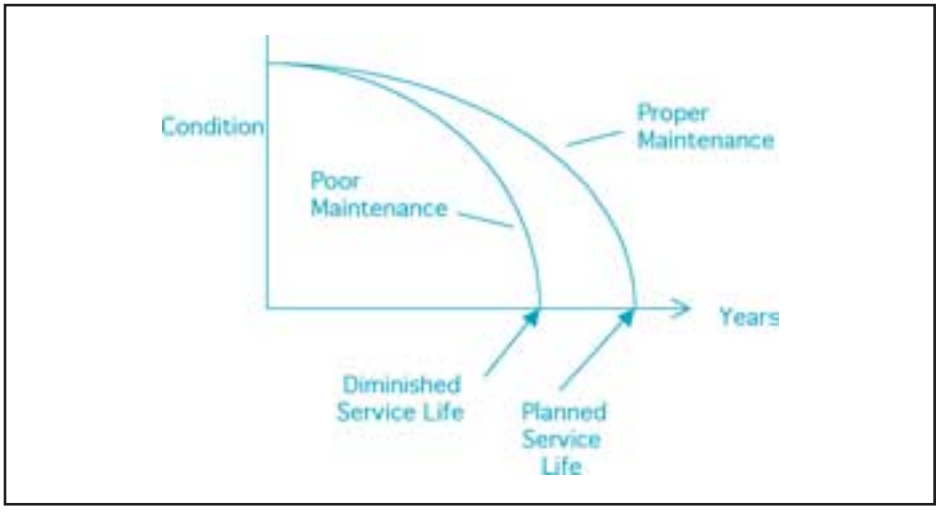

Figure 1. Physical Depreciation of Facilities (hypothetical)

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facility age. How do we know the depreciation curve is concave (accelerated toward the end of service life) rather than convex (accelerated at the beginning of service life), or some other shape? And if we don't know the shape of the depreciation trend, how can we know how much funding is necessary to reverse it?

Thus, I would argue we know very little about the relationship shown in Figure 1 and would recommend that in not be used as the basis for prudent recapitalization estimates. Any proposal to use this approach should be met with a simple reply: show me the data.

An Alternative View

In the 1970s and early 1980s, economists Hulten and Wykoff published a number of papers describing the economic depreciation they found in a large sample survey of non-residential facilities.[2] The definition of economic depreciation is (my paraphrase) "…the decline in value that arises from wear and tear, obsolescence, change in use, or accidental damage not restored by ordinary maintenance and repair."

Hulten and Wykoff's basic finding was that the economic (that is, productive) value of structures depreciates according to a geometric trend as shown in Figure 2. They derived economic depreciation rates for 14 classes of structures. Others have adapted these results for a broader class of fixed assets.[3]

In comparison with the view of physical depreciation shown in figure 1, the example of economic depreciation calculated for office buildings (shown in Figure 2) is considerably different.

First, it shows that depreciation is slightly concave rather convex, suggesting in practical terms that the productive value of facilities declines much more quickly in the first part of service life than indicated by the hypothetical trend.

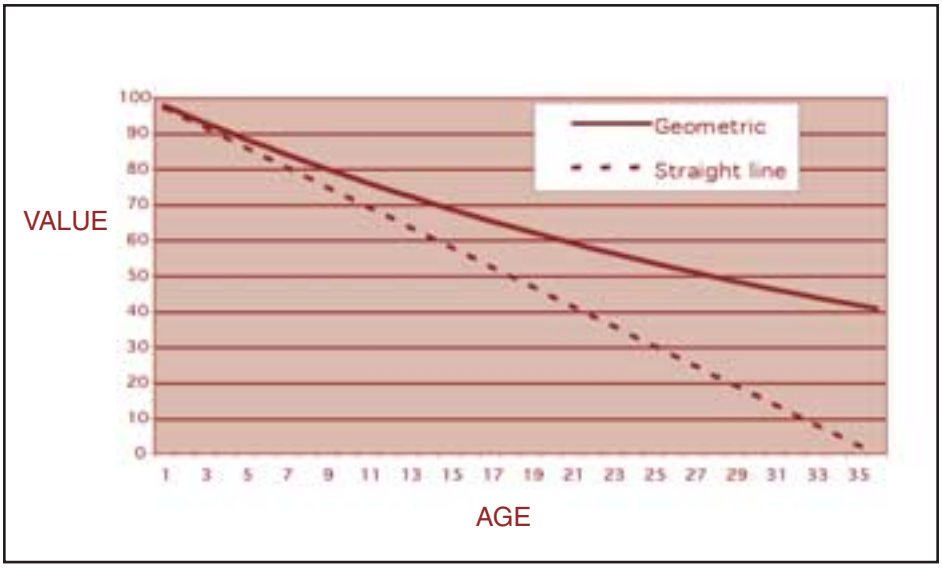

Figure 2. Economic Depreciation of Office Buildings

Second, at the end of typically cited service lives, say 35 to 40 years, an office building without the benefit of recapitalization still retains 30 to 40 percent of its productive value. This is different than the straight-line calculation often used for tax purposes, and is also different than the hypothetical trend showing facility condition coming to an abrupt end at some foreseen point. However, it is consistent with surveys showing that much of the national facility inventory aged well beyond its depreciated tax life.

And third, the depreciation trend shown in Figure 2 is based on actual data, rather than the hypothetical relationship shown in Figure 1.

These differences demonstrate an alternative view of depreciation and recapitalization worthy of consideration by asset managers. In contrast to the empirical weakness of the hypothetical model, the economic depreciation approach offers an objective and validated model—for example, the U.S. Bureau of Economic Analysis uses depreciation rates derived from the Hulten & Wykoff work.

Also in contrast to the hypothetical model, recapitalization estimates derived from economic depreciation curves address the restoration of the productive value of a facility, rather than facility condition. While the two objectives may be closely related, it would seem the former should be the primary responsibility of the asset manager.

Notes

1. Recapitalization is the funding necessary to restore an asset to its full productive state. It is the opposite of depreciation, which is the erosion over time—through obsolescence, accidents, change in use, neglect—of a facilities productive capacity.
2. See Hulten and Wykoff, "Economic Depriation and the Taxation of Structures," in *The Measurement of Capital, Studies in Income and Wealth,* Vol. 45, Ed. Dan Usher; Chicago: University of Chicago Press. 1980.
3. See Fraumeni, "The Measurement of Depreciation in the U.S. National Income and Product Accounts," *Survey of Currents Business,* July 1997.