

1965

# Depreciation and Enterprise Valuation

Walter J. Blum

Wilber Griffith Katz

Follow this and additional works at: [http://chicagounbound.uchicago.edu/journal\\_articles](http://chicagounbound.uchicago.edu/journal_articles)



Part of the [Law Commons](#)

---

## Recommended Citation

Walter J. Blum & Wilber Griffith Katz, "Depreciation and Enterprise Valuation," 32 University of Chicago Law Review 236 (1965).

This Article is brought to you for free and open access by the Faculty Scholarship at Chicago Unbound. It has been accepted for inclusion in Journal Articles by an authorized administrator of Chicago Unbound. For more information, please contact [unbound@law.uchicago.edu](mailto:unbound@law.uchicago.edu).

## DEPRECIATION AND ENTERPRISE VALUATION

WALTER J. BLUM\* AND WILBER G. KATZ†

**W**HAT function should prospective depreciation of assets serve in valuing an enterprise, especially for purposes of constructing a fair plan of corporate reorganization?

The answer which in the past gained wide acceptance in legal literature can be stated rather simply. Value of an enterprise is to be arrived at by estimating its earnings<sup>1</sup> in future years, on the basis of its assets and prospects as of the time of reorganization, and capitalizing the projected earnings at an appropriate rate. If the firm is viewed as having an earnings capability for an unlimited time, the estimate of annual earnings is to be capitalized in perpetuity. The projection of earnings then must reflect the need to replace major operating assets where it is foreseen that they will lose value through use and that at some predictable date their retention by the firm will become uneconomic in the sense that in operation their worth to the firm will be less than their resale or scrap value. Replacement in this common situation has to be presumed in order to validate the basic assumption that the estimated annual earnings will continue undiminished in perpetuity. The projection of an annual charge for depreciation adjusts estimated earnings to accommodate such replacement in valuing an enterprise.

Under the generally accepted approach to valuation, the total of depreciation charges over the forecasted life of an asset reduces estimated earnings by the expected diminution in the value of that asset resulting from its consumption. The total usually has no connection with the foreseeable cost of replacing the asset with a new or better model. The main reason for tying depreciation to existing asset values is that earnings estimates are usually geared to assets of the firm as of the time of reorganization. It would be incorrect to reduce such estimates by the anticipated cost of higher quality replacements inasmuch

\* Professor of Law, The University of Chicago.

† Professor of Law, The University of Wisconsin.

<sup>1</sup> In describing the generally accepted formula for valuing an enterprise, there is no need at the outset of this comment to be more specific about the meaning of "earnings." Refinement is added later when required by analysis of the depreciation problem.

as, all other things being equal, these improvements can be expected to enhance the earnings picture.<sup>2</sup>

In placing a value on a perpetual firm, the accepted approach usually entails calculating depreciation charges on the simple straight line annual basis—that is, dividing the total foreseeable charges for an asset by its estimated life. For some assets a case might be made for using an accelerated or retarded pattern of annual charges. But it is sufficient to observe that in reaching valuations there is a strong pull towards using a constant charge. In the typical situation the estimate of earnings, which is to be capitalized, takes the form of a constant figure that represents the most probable annual earnings for the foreseeable future. The quest for a constant annual estimate of earnings tends to be served by constant depreciation and to be thwarted by other patterns.

For purposes of valuing a perpetual enterprise, nothing turns on whether depreciation is thought of as reflecting anticipated declines in values or as reflecting costs which are to be amortized by charges against future operations. The two conceptions produce like results because in valuing an enterprise the total cost of depreciable assets to be amortized is, as previously stated, equal to the total anticipated deterioration in value.

Not all firms are viewed as perpetuities; in various situations it is anticipated that the enterprise will be liquidated at some foreseeable future date and it is not contemplated that major assets are to be replaced. In arriving at valuation in these cases, the prescription which has gained general acceptance is different. Estimated values obtainable on liquidation and estimated annual earnings for the finite period of predicted operation are to be discounted to present value without depreciation being taken into account in computing those earnings. Depreciation can be ignored because the prediction of earnings does not turn on replacing the existing assets of the enterprise. It is only necessary to take account of the estimated cost of maintaining and operating the existing assets until the date assumed for liquidation of the firm.

These principles for valuing perpetual and limited life enterprises were given official expression in corporate reorganization proceedings in the late thirties and early forties.<sup>3</sup> They appear still to receive gen-

<sup>2</sup> To be distinguished are situations in which it is assumed that certain assets will be replaced immediately after reorganization. If the estimate of earnings is predicated on such a development, the projection of depreciation for the asset to be acquired would be based on its anticipated cost—which presumably would be equal to its value at the time of acquisition.

<sup>3</sup> What is referred to as the generally accepted approach is well illustrated in *Matter of Atlas Pipeline Corp.*, 9 S.E.C. 416 (1941) (Corporate Reorganization Release No. 42).

eral acceptance in reorganization literature. However, a reconsideration of the treatment of depreciation seems to be in order. More recent trends in financial analysis suggest that the old standard way of handling depreciation in valuing enterprises viewed as perpetuities is too simple and often leads to incorrect results.

The clue to the source of oversimplification is found in the accepted treatment of an enterprise of limited life. Assume for purposes of analysis that an enterprise is composed of a single asset, a commercial building, which was completed today at a total cost of \$1,000,000; assume further that it is estimated to have a 40 year useful life and no scrap value thereafter, and that it is expected to produce an annual net cash inflow of \$105,000 before depreciation; and finally assume that no working capital is required in running the enterprise, that there is no income tax, and that all agree that 8% is the appropriate rate for converting the projected net cash inflow into a statement of present value. If the venture is treated as a perpetuity—meaning that it is assumed that every 40 years the structure will be replaced by an identical building costing \$1,000,000—the standard approach would operate as follows: Straight line depreciation of \$1,000,000 spread over 40 years would call for an annual charge of \$25,000; this would bring net cash inflow down to \$80,000 a year; and capitalizing that amount in perpetuity at 8% would result in a valuation of \$1,000,000. Suppose, however, it is assumed that the enterprise has a life limited to 40 years and that the building will not be replaced. Under the accepted approach, depreciation would not be taken into account, the \$105,000 of estimated net cash inflow would be valued as a 40 year annuity on an 8% basis, and the result would be a present value of not \$1,000,000 but \$1,252,084.

Why, against all the dictates of common sense, is the same profitable enterprise found to be worth more as one of limited duration than as a perpetuity? A moment's reflection will point to the treatment of depreciation in the perpetuity calculation as the root of trouble. The straight line assumption produces an improper timing of earnings and therefore an understatement of value. Depreciation covered by earnings can be thought of as capital which has been disinvested from the depreciated asset and which is now available for other purposes: it can be left at risk generally in the operation of the enterprise; it can be accumulated in a savings account type of sinking fund for replacing the building; or it can be used to reduce outstanding indebtedness of the firm. Under any of these programs the value of the \$25,000 a year taken as depreciation would at the end of 40 years exceed \$1,000,000. If the savings account rate of interest were 4% per annum, the sinking fund would accumulate to \$2,375,638 in 40 years; and if the business were

to succeed in earning its rated 8% per annum, the added value attributable to the earnings retained by depreciation for general use in the business during that same period would be \$6,476,413.<sup>4</sup> Obviously in either case the allowance for depreciation is far too generous. What is needed is not \$1,000,000 in total charges over 40 years, but charges which, compounded at the proper earnings rate assigned to the disinvested amounts, will grow to a total of \$1,000,000 in that time. Depreciation is thus like an annual annuity. At a 4% earnings rate on disinvested sums, the yearly depreciation annuity for the building would be \$10,523; the net cash inflow after depreciation would then be \$94,477, and the capitalized value of the enterprise, at 8% in perpetuity, would be \$1,180,962. At 8% on disinvested sums the depreciation annuity would be \$3,860, the net cash inflow after depreciation would be \$101,140, and the capitalized value of the enterprise, at 8% in perpetuity, would be \$1,264,250. It is to be noted that the value of the enterprise treated as an 8% perpetuity exceeds its value of \$1,252,084 as an 8% venture with 40 years of life. This is an obviously correct relationship in view of the assumption that annual net cash inflow after depreciation is positive and not negative. The excess of \$12,166 is the present value of a deferred perpetual annuity of \$101,140 starting 40 years from now.

It might now be asked whether the straight line approach to depreciation on the basis of existing values always results in an incorrect

<sup>4</sup> If the disinvested capital is used to retire indebtedness, the appropriate computation might seem to be somewhat different. Assume, by way of illustration, that the firm had outstanding \$1,000,000 principal sum of 4% debentures which could be called at any time at par plus accrued interest; assume further that the debentures always sell in the market at their call price. If the same amount of debentures is to be retired each year, and if the final retirement is to occur at the maturity date, the constant annual retirement would have to be \$25,000 ( $\$1,000,000 \div 40$ ). In this situation, if debt retirement is thought of as being financed out of disinvestment by way of earned depreciation, the required amount of depreciation would appear to be \$25,000 a year, or \$1,000,000 in total—thus seeming to contradict the position taken in the text.

The contradiction, however, is only superficial. The effect of retiring the debt is to hold in the firm the amounts which otherwise would have been paid out in interest on the debt. The "savings" in the second year would be \$1,000 (4% of \$25,000); in the last year it would be \$39,000 (4% of \$975,000). The total savings is the sum to which the savings in the particular years (\$1,000 in year two, and \$1,000 plus \$1,000 for each year after year two) will grow in 40 years when compounded at the appropriate rate. If the appropriate rate is 4%, the situation can be viewed as though the firm at the end of each year bought \$25,000 of its own debt as an investment yielding 4% a year. The interest on the investment would cumulate to \$1,375,638 in 40 years at 4%. (The similarity to putting \$25,000 annually into a savings account sinking fund should be apparent.) If investment in the firm is rated at 8%, that rate, rather than the 4% interest rate on the debentures, is the proper one for compounding the investment attributable to the "savings" in interest payments.

valuation of the firm. Further reflection on the commercial building example is helpful. The reason why the straight line approach is inappropriate is that it fails to take account of the time schedules for disinvestment and reinvestment. In the illustration, the \$1,000,000 of anticipated disinvestment spread over 40 years through earned depreciation of course has a higher present value than anticipated reinvestment of \$1,000,000 in a lump sum 40 years from date. A disparity of sufficient proportions between time of disinvestment and of reinvestment always causes straight line depreciation on existing values to produce distorted results; and this is equally true where reinvestment is expected to take place earlier than disinvestment through earned depreciation. Only where such disinvestment and reinvestment are expected to occur on substantially the same schedules—so that the two are in equilibrium—will straight line depreciation based on existing values produce a proper result in valuing the enterprise.

These reflections suggest that an enterprise can be valued without taking *annual* depreciation into account. It should be noted that the old generally accepted approach to depreciation imports a degree of circularity into the valuation process: value of the enterprise turns on earnings after depreciation, while the total amount of depreciation depends on the present value of certain existing assets of the firm. This circularity is especially troublesome where the present value of particular assets turns on their estimated earning power rather than on independent market data. Thus in the commercial building example, how can one estimate earnings after depreciation without knowing the current value of the building on which to base depreciation charges? And once that value has been determined, is not the whole problem of valuing the firm thereby solved? If these questions are answered in the affirmative, as they must be, it would seem advisable to find a route by which depreciation can be dispensed with entirely in the valuation of enterprises.

So long as elementary straight line depreciation continues to be applied in inappropriate situations—where the anticipated schedule of annual reinvestment does not match the anticipated schedule of annual disinvestment through earned depreciation—the omission of annual depreciation from the valuation computation would make a difference in the result reached. But such a difference reflects only the improper handling of depreciation. Were depreciation to be figured correctly, in accordance with the analysis presented earlier, an alternative approach would produce the same valuation of an enterprise without working through an accounting for annual depreciation. The alternative would treat the cost of anticipated asset replacements merely as cash outflows

and would offset their negative present values against the valuation otherwise obtained by capitalizing anticipated positive annual net cash inflows. The commercial building case can be used as an illustration once again. The estimated annual net cash inflow of \$105,000 (ignoring depreciation) would be capitalized in perpetuity at 8%, giving a present value of \$1,312,500; the negative present value of \$1,000,000 to be spent every 40 years to keep the enterprise operating in perpetuity is \$48,250; combining the two components results in a valuation of \$1,264,250—the same figure reached when depreciation is taken into account on a proper annuity basis in valuing the firm as a perpetuity.

It should be clear that the skip-depreciation approach to enterprise valuation consists of finding the present positive value of all anticipated net cash inflows and the present negative value of all anticipated investments to produce and maintain those inflows. Hence in essence it values a perpetuity on the same principle as that which underlies the generally accepted method for valuing an enterprise of limited duration.

One can now easily see why use of this approach to a perpetuity produces the same valuation as does application of a proper depreciation pattern. The present value of anticipated investment to replace assets is equal to the total present value of all depreciation charges that would be projected under annuity depreciation.<sup>5</sup> A final look at the commercial building example will show why this relationship exists. Depreciation on an 8% annuity basis to accommodate the first replacement at the end of 40 years would, as noted, call for annual depreciation of \$3,860, which on an 8% assumption has a present value of \$46,030. The present value of a reinvestment of \$1,000,000 in 40 years, discounted at 8%, is likewise \$46,030. This equivalence of present values will hold 40 years from now in regard to the contemplated second building replacement at the end of 80 years; it will also hold then in regard to the third replacement at the end of 120 years; and so on through infinity. The present values today of the disinvestment side and the reinvestment side of each replacement in the series will also be exactly equal. It must follow that this equivalence will hold whether the enterprise is viewed as a finite series of limited duration ventures or as a perpetuity. Annual depreciation therefore can safely be ignored in valuing the firm.

It need only be added that the skip-depreciation approach—that of arriving at present values for all anticipated cash inflows and outflows

<sup>5</sup> The present value of anticipated investment to replace assets would be equal to the total present value of all projected depreciation charges called for by elementary straight line depreciation in the case of a firm expected to be in disinvestment-reinvestment equilibrium.

of the firm—is equally applicable where net cash inflows or investments are expected to follow an irregular pattern. It can be employed where earnings estimates at the time of valuing the firm are predicated upon ownership of assets which are to be acquired in the future. And it also can accommodate situations in which the risks associated with various classes or strata of anticipated earnings or of investments are different.<sup>6</sup>

<sup>6</sup> See Gardner, *The S.E.C. and Valuation under Chapter X*, 91 U. PA. L. REV. 440 (1943).