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Depreciation Accounting

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DEPRECIATION ACCOUNTING

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CHAPTER 1

INTRODUCTION

Material instruments of production are either used up in one productive process or deteriorate over a period of time with the necessity in both cases for replacement. In accounting, those used up in one productive process are a charge against current income and those that deteriorate over a period of time are a capital expenditure which should be recovered during the productive life. Depreciation charges are intended to spread the cost of the asset over the years of its usefulness in an equitable manner.

The most commonly accepted definition of depreciation is the one proposed by the Committee on Terminology of the American Institute of Certified Public Accountants, as follows:

> "Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurences during the year, it is not intended to be a measurement of the effect of all such occurrences."

This definition is a static concept based on cost convention and the realization rule. It does not suggest how the cost or other value should be distributed; it is sufficient that the allocation procedure be systematic and rational.

The American Accounting Association Committee on Concepts and Standards definition leads to the same conclusion as the AICPA definition

but it is based on a measure of asset valuation or service potential rather than merely on an allocation of cost. The 1957 AAA statement states that:

> "Any decline in the service potential of plant and other long-term assets should be recognized in the accounts in the periods in which such decline occurs . . . . The service potential of assets may decline because of . . . gradual or abrupt physical deterioration, consumption of service potential through use even though no physical change is apparent, or economic deterioration because of obsolescence or change in consumer demand."

Under this definition the inital cost of the asset is assumed to represent the value of a storehouse of services that can be released over the life of the asset. The definition also recognizes that the loss of service potential may be irregular and may be subject to many factors that cannot be foreseen when the asset is acquired.

The original valuations assigned to plant and equipment items are independent of the depreciation process. The basis of the original valuation determines the total amount to be depreciated, but the depreciation method selected does not generally affect the original valuation. Before a pattern or formula for allocating the original or restated valuation (less scrap value) to expense or production costs can be applied, the following estimates must be made:

1. The valuation (cost or other basic) of the asset when acquired or a restatement of this at a subsequent date.
2. The expected service life of the asset.
3. The scrap value or liquidation value at the end of the service life.

The term "Depreciation Accounting" is broadly descriptive of a special technique, applied in a variety of forms and with rather diverse results, for allocating fixed asset costs to accounting periods in a rational and systematic manner. Depreciation was recognized early in

accounting history with the railroad industry in the nineteenth century and income tax regulations in the twentieth century playing leading roles in the development of it as we know it today.

Many different methods seem to meet the usual accounting criteria which require that a depreciation method should be systematic and rational. Different depreciation methods yield differing annual depreciation costs. The primary objective in the choice of a depreciation method is the usefulness of the resulting costs for their intended purposes. The five major purposes of depreciation are:

1. Determining income subject to Federal income tax.
2. Management of a company's finances, particularly funds for replacements, modernization, and expansion.
3. Determining periodic net income and financial condition for reports to management and stockholders.
4. Determining product costs for internal management purposes.
5. Comparing costs of alternatives in selecting and replacing depreciable assets.

The type of depreciation method which would appear to be most useful is ascertained by deductive reasoning from the uses to be made of depreciation costs. No one method is appropriate for all plant assets, but there is one and only one proper method for each individual asset.

CHAPTER II

DEPRECIATION BEFORE 1800

Some accounting concepts can be traced back to the early Greek and Roman periods, while record keeping dates back to about 3600 B.C.. One of the earliest examples of depreciation is when a Roman architect of the early Christian era was found to have stated that the valuation of a wall should be determined not by cost alone but only after deducting from the cost one eightieth for each year the wall has been standing.[1]

The first published work describing the double-entry bookkeeping system is the Summa de Arithmetica, Geometria, Proportioni et Proportionalita published by Luca Pacioli in 1494 in Venice. Pacioli who devoted most of his life to being a teacher and scholar was a Franciscan friar. While he did not originate double-entry bookkeeping, his book did much to spread its use throughout all of Europe. Several books were published during the sixteenth century with descriptions of bookkeeping similar to that presented by Pacioli. This bookkeeping system became known as the Italian method.

One of the characteristics of the Italian method was the lack of a concept of the accounting period or a continuing nature of the business enterprise. Most business ventures were for specific trading objectives and therefore were of short duration and discontinued after the objective had been reached. Profit was calculated upon the completion of the venture. Accruals and deferrals were not needed where there was no concept of periodic profit or loss. There was no need for the

calculation of depreciation, as fixed assets played only a small part in the affairs of businessmen.[2]

A search for early reference to depreciation found that there were two ways of handling it. Depreciating property as if it were the unsold merchandise of a simple proprietorship was one method. The other method was to relate depreciation to the maintenance of long-lived corporate assets. Relating depreciation to maintenance is plainly seen in nineteenth century discussions of railroad problems and in many railroad corporations' reports of that period.

The proprietor's view of depreciation is explained in a few early bookkeeping texts and omitted entirely from most of them. One of the earliest bookkeeping texts in English was A Briefe Instruction . . . (1588) which was written by John Mellis. An explanation of an entry on the credit side of a ledger account entitled "Implements of householde" was quoted as follows:

> "Implements of householde here against is due to have xl. xs. and is for so much as I doe finde at this day to be consumed and worn, which said xl. xs. for the decay of the said householde stuffe is borne to profit and losse in Debitor."

The deibt side of the profit-and-loss accounts was explained:

> "More xl.xs. for so much lost by decay householde stuffe as in Creditor."[3]

In a book, Debtor and Creditor Made Easie, written by Stephen Monteage in 1683, examples of seventeenth century practices are shown. One example concerned certain transactions in livestock. At the end of an account, "valuation of the stock unsold," seven cows are valued at the same price at which they were originally charged, but one bull is valued at an amount less than charged at the beginning of the account, and one ram at an amount less than originally charged. In the third edition of this book (1690) this example does not appear but in a bookkeeping set

by the same author an account entitled "Horses" is equally appropriate for demonstrating depreciation. There is an entry on the credit side explained as "By Loss and Gain, lost by their use"; on the debit side of the loss-and-gain account the explanation is "To Horses impaired by a year's use . . ." In another place the account for cows shows a beginning price for a stated amount each, a later purchase is entered at charged price, but the balance remaining is not the total. The inventory price is slightly above the price at the opening but under an average price. It would seem that the closing price was probably made somewhat higher because of the recent purchase and yet low enough to represent a reduction in value for the animals owned throughout the year.[4]

John Mair's Bookkeeping Methodiz'd (5th ed. 1757) represents the eighteenth century method of treating long-lived assets as follows:

> "Accompts of ships, houses, or other possessions . . . contain, upon the Dr. side, what they cost at first, or are valued at, with all charges, such as repairs, or other expenses laid out upon them. The Cr. side contains, (if any thing be writ upon it), either what they are sold or exchanged for, or the profits arising from them; such as, freight, rent, etc. Here there are three cases. 1st, If nothing be written upon the Cr. side, it is closed, by being credited by Balance. 2dly, If the Dr. side be filled up, with the price of the ship, house, etc. sold, or otherwise disposed of, then the difference of the sides is the gain or loss made upon the sale; and the accompt is closed, by being debited or credited to or by Profit and Loss. 3dly, If the Cr. side contain only the freight or rent; in this case first charge the ship, house, etc. Dr. to Profit and Loss, for the freight or rent; and then close the accompt with Balance."

According to this plan the fixed assets were to be treated as mixed accounts. This would be like a merchandise account with the inventory portion carried forward and the remainder transferred to loss-and-gain. In a later test, Book-Keeping Modernized (2d ed. 1768), Mair used the term "value" in the sentence ". . . first give the account credit by Balance, for the value of the ship or house, and then close the account

with Profit and Loss." If "value" was used at that time with the same modern meaning, any shrinkage or depreciation would be transmitted to profit-and-loss by carrying forward a decreased amount as inventory or balance.[5]

During this early period in accounting, depreciation was viewed in two ways. Depreciating property was accounted for as unsold merchandise and income was measured as the increase in proprietorship, and also the value of the property was estimated and included in the inventory of assets in the calculation of the proprietors' equity. A second viewpoint was that depreciation was unnecessary as long as the property was maintained in proper working condition. Only the costs of maintenance were considered expenses of the current period. As is evident here, depreciation was not a clear concept in bookkeeping and accounting writings before 1800.

CHAPTER III

DEPRECIATION IN THE NINETEENTH CENTURY

In the nineteenth century the recognition of depreciation by the inventory method became unmistakable. This method used the fixed asset account as a merchandise account. The account was debited at cost and at the end of the period it was credited for the value of the property. This treatment was generally used by manufacturing firms throughout most of the nineteenth century.[6]

Depreciation as an annual deduction from cost was explained by W. Inglish in his book, Bookkeeping (1861), as follows: "In such accounts (buildings and machinery), a yearly deduction of 5 and 10 per cent requires to be made from original cost, to allow for deterioration, or wear and tear." However, this concept, more than likely, represented the best practice of the time rather than the common method.[7]

The development of railroads in Europe and the United States played a large part in the history of depreciation during the nineteenth century. The rapid growth of this industry created new problems in financing and accounting with a definite influence on accounting thought. Much larger investment and considerably longer lived equipment was required by railroads than most other industrial activity of that time. Both the larger investment and the longer-lived equipment led to an increasing importance of the distinction between capital and income. At the beginning of the development of the railroad industry, promoters often paid huge dividends out of capital during the early life of the firm.

Believing this to be the true income of the firm, investors paid high prices for the stock only to find afterwards that the large dividends could not be continued without jeopardizing the future operations of the firm. When this became common knowledge and the market price of the stock would fall, the windfall gains made by the promoters and short-term speculating investors was offset by losses to the long-term investors or permanent stockholders. As a result of the distinction between capital and income came the concern for the maintenance of capital through depreciation or current maintenance charges.[8]

In Great Britian where the railroad industry blossomed first, accounting treatment of the depreciation of fixed assets is frequently referred to in the Reports and Accounts of the various railway companies, as might be expected, but little was said about it in the Acts of Parliament governing railways. Companies Clauses Consolidation Act of 1845 probably contained the nearest reference to is in the following:

> "Before apportioning the Profits to be divided among the Shareholders, the Directors may, if they think fit, set aside thereout such Sum as they may think proper to meet contingencies, or for enlarging, repairing, or improving the Works connected with the Undertaking, or any part thereof, and may divide the balance among the Shareholders."

However, this gave no detailed guidance to railway directors and accountants and in actual practice a variety of methods of accounting for depreciation were adopted. The variety of methods followed not only from the lack of experience in matters such as the life of assets but also from the absence of any clear definition of what was meant by depreciation. Some accountants and directors meant a fall in the market value of the assets when they spoke of depreciation; therefore, when the price of a locomotive rose some companies assumed that their assets had improved. Others meant no more than current repairs and maintenance, and others were concerned only with replacement.[9]

In general the early accounting practices and changes in the bases of profit calculations were not designed principally to produce statements prepared in accordance with preconceived definitions or concepts of profits, income or asset values. Possibly at first lack of experience may have been partly responsible for changes in the accounting treatment of depreciation. However, later changes in accounting policy cannot be explained in these terms. In actual practice the calculations of profits was often influenced significantly by changing financial circumstances and the dictates of management policy. Therefore in the mid-1840's some companies stopped providing for depreciation in their revenue accounts supposedly in order to pay high dividends. It is not possible to detect dominant aims or attitudes of railway directors in this period since these were influenced by the changing economic sense as well as by the circumstances of particular companies. There is some evidence to suggest that many railway directors as well as shareholders wished to have regular rather than fluctuating dividends, and the entries in the fixed accounts may very well have been influenced by the desire for a record of stable earnings and dividends. The fact that many items of depreciation appearing or not appearing in the revenue accounts involved personal judgments, and that there was not yet a generally accepted body of accounting doctrine, made it easy for the preparation of the final accounts of even the most conscientiously conducted company to be influenced by considerations of management policy.[10]

About 1850, various phrases in accounting literature suggest a reserve for depreciation, but the accounting techniques of reserves is not described and probably it was not yet developed. In the last quarter of the nineteenth century the consideration given depreciation was broadened somewhat. The thought of railroad renewals continued, but it was soon

associated with the matter of uniform accounts and commission regulations. A beginning was made at the same time, in a few books, and student lectures, in relating depreciation to factory production.[11]

The third national convention of railroad commissioners meeting in June, 1879, adopted a committe report on uniform accounts which included the following rules:

> "1. All liabilities are to be entered in the month incurred without reference to the date of payment.
>
> "2. Expenses are to be charged each month as used, without reference to the time purchased or paid for.
>
> "3. No expenditure is chargeable to the property accounts except for an actual increase thereof unless it is made on old work in such a way as to clearly increase the value of the property over and above the cost of renewing the original structures."

The committee report included an analysis of expenses which mentioned repairs to various structures and renewals of rails and ties, but gave no place to depreciation as such.[12]

In 1888 the Interstate Commerce Commission's second annual report contained a form of company report to be outlined which placed repairs or renewals of ties, rails, roadway, locomotives, and cars under the classification "operating expenses," but it did not mention depreciation. This preferred treatment centered attention at the time when the expenditures were made upon preserving the distinction between capital and revenue charges. Apparently the nature of depreciation was not yet sufficiently understood to produce the idea that all expenditures for long-lived assets be charged to asset accounts and that this cost be gradually amortized into operating expenses either by direct credits or by the use of a valuation reserve.

The idea of depreciation in the 1880's began to expand beyond railroad circles and to be thought of in factories as well. In 1883,

Edwin Guthrie lecturing to the Manchester Students Society said, "Because the profit of manufacturing is the difference in value of that which is consumed and the value of that which is produced, it is important to ascertain accurately the value or cost of that which is consumed." He indicated that the values consumable within the period are raw materials, stores, direct labor, and outside services, and those values consumable over a number of years are machinery and building. As would be expected as soon as attention was directed to the accounting side of factory production, here was a better recognition of the cost-of-production aspect of depreciation that was evident in the railroads' treatment.[13]

Ewing Matheson wrote a book in 1884 entitled The Depreciation of Factories. This was the first book on the subject and he recognized the possibilities in railroad work that depreciation would be made good at regular renewal of separate units, but in theory maintenance may be considered to balance depreciation. He also recognized that it is often difficult to separate maintenance expenditures from capital expenditures even when the transaction occurs, and yet it is very important.

Matheson turned from railroads to a variety of methods for systematically recognizing depreciation in factories. In his opinion the most effectual method for recording alterations in value would be to revalue everything at stated intervals. Because of the time and trouble involved and the faulty valuations due to the absence in the early years of unmistakable signs of deterioration, this method is hardly feasible. The next best plan is to establish a rate which can easily be written off every year and then to check the result with part valuations at longer intervals. A method which applies a fixed proportion of profits to make good the depreciation is unsound, Matheson thinks, because deterioration goes on even if no profits are being earned. The best

methods, according to him, is to use a percentage of the capital value besides charging expenditures for maintenance to revenue. His essential thought was to preserve the distinction between capital and revenue charges and that current revenue as the the basis of dividends and withdrawals should be correctly stated. Included in his theory is the recognition of the relation of depreciation to the calculation of divisible net profits and of the persistence of depreciation in spite of a lack of profits. Even with his excellent comprehension of much of the problem, Matheson does not fully associate depreciation with factory cost of production. This does not detract from the importance of his book as the factory system had not then developed to a point where overhead costs were either much in mind or systematically transferred into production cost.[14]

After a brief study of the development of depreciation accounting, one feels that the essential problem of depreciation was not recognized until quite late. Depreciation, if mentioned at all prior to the middle of the nineteenth century, appeared simply as a variation in an inventoriable item similar to the treatment of merchandise inventory. However, its slowness to develop seems only natural because there seemed no need for a long time to raise the question of depreciation. Business units were small, relatively little use was made of long-lived assets, and there was no deep interest on the part of proprietors in refining the calculation of net profit. The growth of the corporation changed many of these conditions. The simultaneous appearance of active, long-lived assets and a special need for the careful calculation of net profit seems to be essential for the recognition of the importance of depreciation. Before these two are joined depreciation is incidental to the profit calculation;

afterward it becomes indispensable. It seems that some third element was also needed which was present in the case of the railroads but not earlier.

Largely attributable to a greatly improved knowledge of bookkeeping by the middle of the nineteenth century was a clearer perception of the necessity for careful distinction between capital and revenue in relation to correct net profits. With all its imperfections seen from the twentieth-century point of view, depreciation in the nineteenth century made more progress than all the centuries before had known.

CHAPTER IV

DEPRECIATION IN THE TWENTIETH CENTURY

Depreciation was widely accepted as a valuation concept by the beginning of the twentieth century although the concept was not completely understood. Many companies had established a systematic write-off procedure but depreciation was still thought of as a valuation procedure and a process of providing funds for replacement or funds for return to investors.

William Morse Cole wrote in 1908: "Allowing for depreciation is usually called, in technical terms, 'writing off.' The expression means simply that the valuation formerly on the books is displaced by a new and smaller valuation."[15] The valuation concept was present in Cole's three policies with respect to depreciation:

> ". . .first, allowing the property to wear out or go to decay without replacement, on the theory that no use will ever again be had for its like; second, keeping the property up to the original standard by frequent repairs and replacements but without special provision for future replacements; third, allowing depreciation to continue to a certain point and accumulating, in the meantime, special funds to be available for replacement at whatever time it shall become necessary."[16]

Prior to World War I depreciation had not been widely accepted by industry as a systematic charge although several systematic depreciation methods had been used, particularly in the public utility field. From World War I until the early 1930's, many industrial, and commercial corporations were still using a haphazard charge for depreciation. Corporations were still apt to consider depreciation as an act of choice

rather than of necessity and allowance was frequently less in poor years than in prosperous years. During the 1920's a few corporations were making charges for depreciation even if the charge may result in a net deficit.[17]

The rapid growth of railroads during the nineteenth century had a definite effect in helping to clarify the concepts of capital and income and was influential in the development of the concept of depreciation. Railroads, however, were late in accepting accrual depreciation. In 1907, the Interstate Commerce Commission prescribed that monthly charges to operating expenses for depreciation on various classes of equipment be made. But these regulations contained optional provisions that allowed individual carriers to take into consideration such things as their financial condition when making a decision about the desirability or necessity for such accruals. The Bureau of Accounts of the Interstate Commerce Commission proposed in 1923 the mandatory setting up of depreciation accounts and reserves. Railroads immediately met this proposal with opposition. Evidently the opposition was sufficient to delay the mandatory use of accrual depreciation as it was not until 1932 that the Interstate Commerce Commission ordered that depreciation be applied on a straight-line basis. This order was suspended due to the depression and railroads were allowed to omit depreciation and exclude retirements and repairs from the operating expenses in the computation of net income. A modified order was finally put into effect in 1943, but the practice of charging to expense the cost of new replacements of items retired as a substitutue for depreciation is still used for rails, ties, and ballast.[18]

If depreciation development was generally slow for accounting and management purposes prior to the present century, it was even more

so for tax purposes. In the Civil War income tax law, depreciation was not mentioned. In the act of 1894, it was expressly disallowed. In the corporate income tax of 1909, the propriety of capital consumption charges was recognized and permitted a reasonable allowance for the depreciation of property. The availability of the depreciation deduction for income tax purposes beginning with this 1909 act and continuing thereafter had a large effect in rationalizing the accounting practices of industry in this field. The repeated question of how much depreciation was allowable for tax purposes directed attention to the issues and principles involved and accelerated an evolution of accounting practice that would of course have come anyway, but it would have come much more slowly.[19]

As a result of the 1909 legislation and of a Supreme Court decision in the same year recognizing depreciation as a legitimate charge in the determination of public utility rates, the matter became one of more than academic interest. It was a common practice by the late 1920's to provide depreciation at a rate which allowed recovery more rapidly than was justified by the durable life even though there was little tax advantage in accelerating depreciation because of the low tax rates. In 1934, taxpayers were required to review their depreciable assets and to write off the undepreciated balances over the estimated remaining life. There was not insistence on the straight-line method; other methods were permissible.[20]

Taxpayers admitted that the straight-line method resulted in underdepreciation during the early years of asset lives, but after 1934 they were not aggresive in proposing alternatives to this method. In the period following World War II, the straight-line method has been subjected to severe attack. One of the solutions to underdepreciation is the substitution for that method of the dimishing balance method at double

the rate. Undoubtedly in a period or rising prices, the underdepreciation resulting from the straight-line method became aggravated and this alone can account for the change in attitudes.[21]

By the middle of the twentieth century there was no serious dissent from the principle of depreciation accounting, whether for tax or for managerial purposes. That part has been settled. Present discussion and controversy focuses on questions of application. The controversies over depreciation between taxpayers and the Treasury were largely concerned with the question of establishing the probably useful life. If taxpayers cannot establish the probably useful life, the Bureau has issued Bulletin F which reflects average experience and rates allowed others. There have been several special announcements and revisions of this Bulletin since the original issue.

The twentieth century has been one of rapid change for most business entities, necessitating replacement of worn out equipment, modernization to take advantage of technological progress, and acquisition of new facilities to accomodate expanded business volume. All of these conditions have focused attention upon depreciation. Methods employed for determining the amount of depreciation expense deducted must conform to tax laws and administrative regulations. Changes in tax laws and their administration will continue to occur and will continue to have a large role in the future history of depreciation.

CHAPTER V

VARIABLE-CHARGE METHOD

The cost or other value of an asset should be allocated over the service life of that asset in a systematic and rational pattern to satisfy the various objective of depreciation. One of several established depreciation methods is selected if the general pattern appears reasonable or if income tax effects are suitable. Even though there is some merit in using standarized methods, it is possible to combine the expectations of the several determining factors and derive a mathematical equation for each asset or group of assets. More useful information would be provided by such equations derived from past experience and from specific expectations than would be provided by the common practice of fitting a standard model to each situation. While in many cases one or a few of the factors will dominate and the minor effects of the other may be ignored, the selection of a depreciation pattern should be based on all of the following factors:

"1. The relationship between decline in market value and use.

"2. The effect of obsolescence.

"3. The expected pattern of repairs and maintenance.

"4. The anticipated decline in operating efficiency.

"5. Expected changes in revenues.

"6. The long life of assets and the necessity for waiting or the interest factor.

"7. The degree of the uncertainty regarding the later periods of the asset's life.[22]

One method of depreciation cost allocation can be categorized as a variable-charge method. Also known as activity or use methods of depreciation, this method is based on the assumption that depreciation is a variable rather than a fixed cost. It is assumed, in this case, that the value of the asset declines as a function of use rather than as a result of the passing of time. For example, a vehicle may be expected to operate for a given amount of miles during its lifetime, or a machine may be expected to operate a given number of hours or turn out a given number of units of the product.

If the physical wear and tear are more important than economic obsolescence or if the expected services can normally be expected to be obtained before obsolescence sets in, the assumption of a variable depreciation is reasonable for many types of assets. In this manner, if an asset's services are not used in one year, no depreciation should be figured because there is no reduction in service value. If the obsolescence can be anticipated and if an estimate can be made of the usage to be obtained from the asset, the activity method of depreciation may be appropriate even though obsolescence may be a significant factor in determining the expected life of an asset. The cost of the asset can be assumed to represent the purchase of a given number of service units. The measurement of the decline in service value may be of secondary importance as the main objective of depreciation applied in this case is the allocation of input value of each service unit.

Even though the production method of depreciation appears to be ideal for situations where the service value of the asset declines with use, there are serious disadvantages to the method, as listed:

"1. While a variable charge to each year is accepted, the production method is similar to the straight-line method

CHAPTER VI

STRAIGHT-LINE METHOD

Another method of depreciation cost allocation is the straight-line method. This method of allocation is based on the assumption that depreciation is a function of time rather than of use. While physical wear and tear caused by use is the basis for the variable-charge method, obsolescence and deterioration over time are considered to be determining factors in the decline in service potential using the straight-line method of allocation. The total cost of the services used in any period is assumed to be the same regardless of the extent of use as the service potential of the asset is assumed to decline by an equal amount each period.

The straight-line method is very simple to use and will fit the usual situation; however, the results are correct only if the following assumptions are true or reasonably accurate:

> "1. The interest factor can be ignored or the cost of capital can be assumed to be zero.
>
> "2. Repairs and maintenance expenses are constant over the life of the asset.
>
> "3. The operating efficiency of the asset is just as good in the last year as in the first year.
>
> "4. The revenues (or net cash flows) made possible by the use of the asset are constant for all years of the asset life.
>
> "5. All necessary estimates including the anticipated useful life, can be predicted with a reasonable degree of accuracy."[24]

Because of the indeterminate factors involved with most of the above assumptions, it is hard to find a depreciation method that is likely to take all of the various assumptions into consideration. For these reasons, the straight-line method is probably as accurate as any other method. As the above assumptions tend to be offsetting, it is frequently claimed that the straight-line method may be the most appropriate. As an example of offsetting, it may be possible that declining operating efficiencies and increasing maintenance and repair expenses are exactly offset by increasing revenues and decreasing insurance and property tax expense. Another advantage of this method is the ease of operation and understanding.

The straight-line method of depreciation, while of appealing simplicity and still acceptable, results in overstatement of period net income because it substantially understates the amount of exhaustion of economic usefulness in the early years of an asset's useful life. It tends to discourage sale or other disposal prior to the end of an asset's useful life because the amount of underdepreciation, having overstated prior net income, would on sale or other disposal result in a corresponding loss that is otherwise ignored under the going concern concept until realized in a transaction that can be accorded accounting recognition.[25]

The straight-line method does have another major disadvantage which is that it does not take into consideration the discount factor. The reported net income gives the appearance of a rising rate of return on total invested capital even if the other assumptions are correct.

CHAPTER VII

INCREASING-CHARGE METHOD

Increasing-charge or interest method of allocation of depreciation is a title that can be given to several methods. A particular increasing-charge method designed to avoid a built-in tendency for net earnings to rise over the life of an asset may be called the offsetting-interest method. No unrealized interest is to be credited or charged off under this method, and only original cost is to be amortized. However, original cost is amortized in such a way that the charge for depreciation increases each year if depreciated funds had been invested when recovered. With depreciation calculated in this way, reported net earnings will have no tendency to change over the life of the asset if depreciated funds in fact are invested as contemplated, since rising gross earnings will be offset by an equally rising charge for depreciation.[26]

The financing method of treating long-term leases in the reports of the lessor reclasses as a receivable the cost of a product purchased and leased under a long-term contract. Income is calculated by multiplying the internal rate of return by the book value at the start of the financial period. The total cash received each period minus this reported income is assumed to represent a return of the amount invested in the asset or equal to the cost of the product. If an equal cash rental is received each year, the return on investment reported would be an increasing amount. This return on investment is not usually referred to as depreciation, but the effect is the same and an allocation procedure is

required. In this method the use of the cash flow as a basis for amortizing the investment seems justified as the maintenance and operating costs are paid by the lessee. However, it may be criticized on the basis of its assumption of a constant rate of return and on the basis of its failure to distinguish between a true interest income and the income from the operations of obtaining and servicing the lease contracts.[27]

Included in the increasing-charge category of allocating depreciation would be the annuity and sinking fund methods which also result in increasing amortization amounts. Public utility firms occasionally use the sinking fund method which charges depreciation with the annuity portion only and charges interest expense with the increasing interest computed on the increasing accumulated depreciation which is the same as a hypothetical sinking fund. When the utility's rates are computed by using an undepreciated cost as the rate base, this method is especially relevant. An argument for the sinking fund method is that is allows a public utility to earn a constant rate of return on its total investment when its revenue is held constant through regulations.[28]

Where insurance and property tax expenses decline over the asset's life while revenues, repairs and maintenance, and general operating efficiencies remain relatively constant, the increasing-charge methods are also relevant. Some public utility properties meet these conditions, while expectations of increasing revenues may support the use of increasing charge depreciation methods in other cases. Revenues may be expected to increase as demand increases over the asset's life as in the case of toll roads and toll bridges which are built to handle top traffic loads expected sometime in the future.[29]

The main arguments against the increasing-charge or interest methods of allocating depreciation are:

"1. Very few assets can be expected to provide services with a constant or increasing value.

"2. Repair and maintenance costs usually increase.

"3. Operating efficiency usually declines over the asset's life."[30]

Additional objections to the interest method are that it is too complicated, that plant life is too uncertain to warrant refined methods of amortization, that is is not conservative, and that increasing depreciation when combined with increasing costs of maintenance would unduly reduce reported earnings in later years.[31] Just because interest methods take into consideration the additional factor of rate of return, they are not necessarily more dynamic or better than the straight-line method. Interest methods disregard more factors than they include.

CHAPTER VIII

DECREASING-CHARGE METHOD

The last category of depreciation allocation to be discussed is the decreasing-charge method also known as accelerated depreciation. The two most common methods are the sum-of-the-years'-digits method and the constant percentage of declining-book-value method. The sum-of-the-years'-digits method is difficult to state as a brief formula. It can be figured by adding the numbers representing the periods of life. Use this sum as a denominator and use as numerators the same numbers taken in inverse order. Multiply this fraction times the total depreciation to obtain the depreciation expense for that particular period.[32] The constant percentage of declining-book-value method is a precise formula which can be used to determine the constant rate of decline when the scrap value is positive. An approximation of this rate, which is acceptable for tax purposes, is obtained by taking twice the straight-line percentage. This is generally known as the double-declining-balance method.

The main reasons for the increased interest in the decreasing-charge methods recently has come from the liberalization in the choice of depreciation methods permitted by the 1954 Internal Revenue Code. The theoretical justification for decreasing-charge methods is based on the following nontax considerations:

> "1. Declining annual service contributions without consideration for interest or the cost of capital.

"2. Declining operating efficiency or operating performance, resulting in increases in other operating costs.

"3. Asset values (represented by the discounted value of remaining service values) declining more in early years and less during the later years of asset life.

"4. The expiration of the cost of equal service contributions discounted back to the date of acquisition--thus, more is paid for the service values becoming available in the early years than the service values of the later years even though all the service values are equal when used.

"5. Increasing repair and maintenance costs.

"6. Declining cash proceeds or revenues.

"7. The uncertainty of revenues of later years because of possible obsolescence.[33]

With respect to the depreciation that should be charged to operations in each period, declining revenue contributions and declining operating efficiency are interrelated and have the same consequences. Declining revenue contributions may be caused by loss of use in later years because more time is needed for repairs or because of the possibility of breakdown with heavy use. Decreased efficiency can cause less output and therefore less net revenue contribution. It may also result in large fuel costs, higher labor costs, or greater waste in the use of materials. As a result of these the net contribution of the asset is less than when it was new. If interest costs are ignored, this decline in the net service contribution of the asset provides a justification for a decreasing-charge method. If interest is taken into consideration, a decreasing-charge method may also be justified if the amount of decline in the annual net revenue contribution is greater than the rate of interest multiplied by the net decline in total remaining service value.[34]

George Terborgh states that on a priori grounds a declining pattern of annual net revenue contribution seems logical. One would

expect a decrease in operating efficiency over the life of most classes of equipment and buildings. One would also expect increasing repair and maintenance costs and possibly declining net revenues because of increasing obsolescence and competition.[35] Terborgh continues that on empirical grounds, the decline in total service value for equipment is about one half during the first third of the asset's life and about two thirds for the first half of the asset's life.[36]

The assumption that the original cost represents the discounted value of the expected annual contributions to be obtained by using the asset is another proposed justification for the declining-charge depreciation methods. The cost of the earlier annual contributions is greater than the cost of future values. Therefore, the depreciation charge based on cost would be greater in the early years and smaller in later years even if the annual net revenue contributions can be expected to be equal in all years of service life.[37]

If it is assumed that depreciation represents the cost of each year's services and not the decline in the value of the remaining services, using the interest methods the depreciation charge each year is the net revenue contribution less the interest on the asset's book value at the beginning of the year. The difference between the total value of all services and the cost is assumed to accrue each year. If the computation of depreciation is based on the discounted cash of annual services assuming equal annual contributions as in the decreasing-charge methods, it is assumed that the difference between the total value of the services and their cost is realized only in the year of use. Therefore, the main differences between this approach and the interest methods are in the concept of depreciation and in the method of reporting the increase in asset value through holding the asset.[38]

The above explanation of the decreasing charge methods seems quite weak. Hendriksen state that:

> "First, it represents a very rigid application of the cost rule--each unit of service value is charged to expense in the amount of its original discounted cost. The longer the waiting period, the lower this cost will be. Second, it applies a very rigid form of the realization rule. The difference between the original cost and the value of the services is assumed to be realized only when the asset is used or when its product is sold. Third, depreciation is assumed to represent the expiration of the original cost of each year's contribution, rather than the net revenue contribution less the earnings associated with a declining investment."[39]

Using this method, the result would be a rapidly increasing rate of return based on the reported net income. Greater amounts of interest would be realized in later years and the income from reinvested capital would tend to increase the net incomes of the later years. This method, like the interest or increasing-charge method, disregards more of the factors than it includes.

Decreasing-charge depreciation methods have other types of support. For instance, the argument that a declining depreciation charge should be used to offset increasing repairs and maintenance expenses has some merit. Repair and maintenance expenses are related to the depreciation process and should be included in the total cost of the services or in the computation of the net revenue contribution. However, only normal repair and maintenance expenses should be included in the process of equalizing the total of repair expenses and depreciation. For managerial control purposes and for proper reporting of income, expenses resulting from inefficiences should appear in the year in which they occur.[40]

Another argument in support of decreasing-charge depreciation methods for all assets used in operations is decreasing expected cash proceeds or revenues. If it is expected that revenues will decline

over the life of an asset, it may be assumed that a larger part of the original cost of the asset was incurred to obtain the income of the early years. The revenues will provide a good indication of the net contribution of the asset each year. Standard depreciation methods cannot be expected to automatically take care of the decreasing revenue factor. Appropriate depreciation schedules could be devised after estimates are made for specific assets. If the decline in prices of products can be attributed to anticipated increases in competition or decreases in demand, the declines in the prices of products should be taken into consideration in the computation of the depreciation allocation. Unanticipated changes in product prices would be considered in the income of each period affected.[41]

Declining-balance depreciation does not stand for taking depreciation more rapidly than it apparently should be. Declining-balance depreciation does stand for taking depreciation on a more realistic basis than is possible under the straight-line method.[42]

The most difficult factor to treat in the allocation of depreciation charges is uncertain values, such as, expected life, anticipated net revenue contributions, and future repair and maintenance charges. These uncertain values can usually be converted into single-valued certainty equivalents by using the expected values adjusted for risk preference. For this reason, uncertainty in the life of the asset is not proper justification for the use of decreasing-charge methods of depreciation. Because uncertainty regarding repair and maintenance expenses is primarily a result of inadequate experience and data rather than a result of uncertainty regarding unpredictable events there is little justification for using a declining depreciation charge. Some support for declining-charge depreciation methods can be found for

uncertainty regarding future revenue contribution. The support is that since early revenues are more certain than future revenues, future revenues are discounted more heavily in the initial investment decision and a larger part of the cost of the asset should be allocated to the earlier years. The main defect of this argument is that any specific depreciation schedule should not be justified on the basis of uncertainty alone.[43]

Even if the formalized depreciation methods do not fit precisely the actual life history of particular assets, the specific depreciation method to be used should be selected on the basis of as many relevant factors as possible. Hendriksen has suggested that one or more of the following conditions may provide support for the general allocation pattern chosen:

> "Variable Charge Methods
>
> The value of the asset declines as a function of use rather than because of the passing of time.
>
> Obsolescence is not an important factor in determining the life of the asset.
>
> Repairs, maintenance expenses, and revenues are proportional to use.
>
> "Straight-Line Method
>
> Discounted value of future benefits declines as a function of time rather than use.
>
> The interest factor can be ignored or assumed to be offset by other factors.
>
> Repairs, maintenance expenses, operating efficiency, and revenues are relatively constant over the life of the asset.
>
> "Increasing Charge Methods
>
> The cash flow or net revenue contribution of each year is constant, but the asset value each year represents the discounted value of remaining contributions.

Repair and maintenance expenses are constant or decreasing over the life of the asset.

Revenues and operating efficiency are constant or increasing over the life of the asset.

"Decreasing Charge Methods

Increasing repair and maintenance charges.

Decreasing operating efficiency and revenues.

Interest factor recognized only when "realized" through use of the asset.

Uncertainty of revenues of the later years."[44]

FOOTNOTES

[1]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 23.

[2]Ibid., p. 26.

[3]A. C. Littleton, Accounting Evolution to 1900 (New York: American Institute Publishing Co., Inc., 1933), p. 223.

[4]Ibid., p. 224.

[5]Ibid., p. 225.

[6]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 37.

[7]A. C. Littleton, Accounting Evolution to 1900 (New York: American Institute Publishing Co., Inc., 1933), p. 226.

[8]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 39.

[9]A. C. Littleton and B. S. Yamey, Studies in the History of Accounting (Homewood, Illinois: Richard D. Irwin, Inc., 1956) p. 343.

[10]Ibid., p. 353.

[11]A. C. Littleton, Accounting Evolution to 1900 (New York: American Institute Publishing Co., Inc., 1933), p. 233.

[12]Ibid., p. 236.

[13]Ibid., p. 236.

[14]Ibid., p. 239.

[15]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 37.

[16]Ibid., p. 38.

[17]Ibid., p. 39.

[18]Ibid., p. 41.

[19]George Terborgh, Realistic Depreciation Policy (Washington, D.C.: Machinery and Allied Products Institute, 1954), pp. 2-3.

[20]John Ryan, Current Depreciation Allowances: An Evaluation and Criticism (New York: Fordham University Press), pp. 39-40.

[21]Ibid., pp. 41-42.

[22]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 405.

[23]Ibid., p. 406.

[24]Ibid., p. 406.

[25]J. C. Winter, "Accelerated Depreciation--A Victim of Its Own Success," New York Certified Public Accountant, XXXVII (October, 1967), p. 777.

[26]Stephen H. Sosnick, "Depreciation: The Offsetting-Interest Method," Accounting Review, XXXVII (January, 1962), p. 62.

[27]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 409.

[28]Ibid., p. 409.

[29]Ibid., p. 410.

[30]Ibid., p. 410.

[31]Stephen H. Sosnick, "Depreciation: The Offsetting-Interest Method.," Accounting Review, XXXVII (January, 1962), p. 64.

[32]H. A. Finney and Herbert E. Miller, Principles of Accounting: Intermediate (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1965), p. 316.

[33]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 410.

[34]Ibid., p. 411.

[35]George Terborgh, Realistic Depreciation Policy (Washington, D.C.: Machinery and Allied Products Institute, 1954), pp. 37-38.

[36]Ibid., pp. 44-45.

[37]Robert L. Dixon, "Decreasing Charge Depreciation--A Search for Logic," Accounting Review, XXXV (October, 1960), p. 590.

[38]Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 413.

[39]Ibid., p. 414.

[40]Ibid., p. 414.

[41] Ibid., p. 414.

[42] J. C. Winter, "Accelerated Depreciation--A Victim of Its Own Success," New York Certified Public Accountant, XXXVII (October, 1967), p. 781.

[43] Eldon S. Hendriksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 415.

[44] Ibid., pp. 415-16.

Saliers, Earl A. Principles and Applications of Depreciation. New York: Ronald Press Co., 1922.

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