A History of Federal Tax Depreciation Policy

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OTA Paper 64 May 1989

Office of Tax Analysis
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Washington, D.C. 20220

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I. Introduction

In computing taxable income under the U.S. income tax, deductions from gross income are allowed for "all the ordinary and necessary expenses paid or incurred during the taxable year in carrying on any trade or business."[1] In general, these expenses do not include capital expenditures, that is, amounts paid or incurred which "add to the value, or substantially prolong the useful life, of property owned by the taxpayer, such as plant and equipment, or ...[that] adapt property to a new or different use."[2] Amounts paid or incurred for incidental repairs and maintenance of property are not considered to be capital expenditures and, therefore, are deductible in the taxable period in which they are paid or incurred. In addition, the Internal Revenue Code allows, as a current expense, a depreciation deduction which represents a "reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence) -- (1) of property either used in a trade or business, or (2) of property held for the production of income."[3]

Depreciation deductions may be taken for both tangible and intangible assets. However, not all assets are depreciable. Deductions are not allowed with respect to inventories, unimproved land, or goodwill. In general, to be depreciable, an asset must possess a limited useful life which can be estimated with reasonable accuracy.

In 1985, gross corporate depreciable tangible assets were valued at $3,174 billion, while $145 billion represented gross corporate depreciable or amortizable intangible assets.[4] Depreciation and amortization tax allowances in 1985 totaled nearly $311 billion for purposes of computing corporate tax liability. The relative importance of these deductions can be appreciated by comparing them with other major corporate tax items: interest-paid deductions of $569 billion, taxes-paid deductions of $201 billion, advertising deductions of $92 billion, and net corporate income of $240 billion.[5] Depreciation allowances are also important for noncorporate business entities. Deductions for depreciation on partnership and sole proprietorship returns totaled $80 billion in 1985, compared to noncorporate business net income of nearly $70 billion.[6]

Depreciation controversies have most often centered on the suitability of the depreciable lives and methods used by taxpayers. The potential tax revenues resulting from a major change in these factors can be significant. For example, annual new investment in depreciable tangible property in 1988 was about $510 billion. Assuming an average 15-year life for this property, the increase in the present value of revenue arising from the use of the straight-line method as compared to the use of the 200 percent declining balance method would be about $13.5 billion.[7]

This paper reviews the history of depreciation under the U.S. federal income tax. This history was shaped, in part, by a gradual shift from a policy in which depreciation allowances were based on individual taxpayer circumstances to one in which uniform statutory rules are used to facilitate taxpayer compliance. Originally, taxpayers were given considerable discretion in the choice of depreciable lives, asset salvage values, and depreciation accounting methods. However, this policy ultimately placed a costly burden on the Bureau of Internal Revenue and taxpayers to verify the "reasonableness" of the deductions taken. Over time, administrative and statutory changes lessened this burden by creating more uniform depreciation rules. Today, most property is depreciated using a small number of recovery periods established by statute; salvage value is no longer a factor in the

determination of depreciation deductions for most property; and the method of allocating deductions over recovery periods is prescribed by statute. Consequently, taxpayer discretion with respect to tax depreciation has been virtually eliminated.

This history was also determined by a shift from a policy in which the depreciation allowances were intended to reflect the accrued loss in asset values to one in which the depreciation system is viewed as a mechanism for influencing the level and type of investment. This motive, combined with the desire for greater simplicity, produced a more tightly defined depreciation system which pays almost no attention to taxpayer-specific circumstances. It also produced tax benefits which, in turn, led to a more complex Internal Revenue Code as legislative efforts attempted to check the more excessive uses of such "tax preferences."

This paper traces the impact of these dual policy objectives. It does not, however, examine the economic and political background against which the shifts in policy took place, nor does it review the merits of the arguments used to justify the changes. Section II follows the development of depreciation accounting prior to the introduction of the modern U.S. income tax. Section III reviews the more significant statutory and regulatory changes that have occurred since that time.[8] An Appendix is attached which provides a summary of methods used by the Treasury's former Office of Industrial Economics (OIE) in its analyses of the useful lives of depreciable assets, and lists the results of the OIE studies that employed those methods.

II. Depreciation Accounting Prior to 1909

To the extent that depreciation accounting existed in the first third of the 19th century, it was limited to an appraisal method, in which depreciation (although the term was not used) represented the simple difference between appraised values obtained at two different points in time. The expense of conducting repeated appraisals, however, caused this practice to be replaced by more practical accounting methods.[9]

Depreciation accounting, as we recognize it today, began in the 1830's and 1840's with the advent and growth of industries employing expensive and long-lived assets. Railroads, in particular, were concerned with problems of accounting for the deterioration, repair, and replacement of plant and equipment. It was soon recognized that accounts should "avoid heaping an unusually large expenditure on particular periods for wear and tear going on gradually during a whole series of years."[10] By mid-century, a few state statutes required that railroads prepare annual reports with depreciation included as an item of expense.[11]

Nevertheless, depreciation accounting (i.e., allowing an annual expense for the estimated loss in asset value due to wear and tear) was neither immediately nor generally accepted by industry. Many nineteenth century railroads rejected depreciation accounting methods, and instead developed and used retirement, replacement, and betterment methods of accounting.[12] The underlying premise of these methods is that invested capital is a "sunk" value that can be maintained, perhaps indefinitely, through adequate expenditures on repair and replacement. In practice, however, it appears that these methods were primarily favored by the railroads and other proponents because of their levelling influence on reported net earnings. Most replacement investment took place during periods of strong cash flow, so that reported costs tended to vary directly with gross receipts. Depreciation accounting advocates opposed these methods for the very same reason. It was argued that reported costs should reflect the ongoing deterioration of the assets and not the replacement policy of the

firm. Despite these arguments, the use of the retirement-replacement-betterment methods was widespread in the nineteenth and early twentieth centuries. Their use under the Internal Revenue Code with respect to railroad roadway accounts continued until 1980.

Depreciation accounting methods violated a strict interpretation of the *realization principle*, which underlies much of accounting practice.[13] According to this interpretation, accrued gains or losses on assets must be validated by an actual sale or other transaction in order to be recognized as income or expense. Consequently, since losses in value due to wear and tear or to obsolescence are merely accrued while an asset remains in service, it was argued that depreciation costs should not be recognized until the asset is sold or retired. Depreciation accounting advocates have circumvented this problem either by asserting a less stringent view of the realization principle or by emphasizing the notion that depreciation deductions are merely allocations of an asset's original cost over the period of its useful life.

The latter half of the nineteenth century witnessed a battle for the legal acceptability of depreciation accounting. The Supreme Court initially took a dim view of the concept. In 1876 and 1878, it took the position that periodic allocations of original capital cost could not be viewed as legitimate costs.[14] Noting that depreciation represented amounts necessary to put an asset in proper repair, but that funds were not actually expended for that purpose, the Court stated, "We are clearly of the opinion that it is not a proper charge. Only such expenditures as are actually made can, with propriety, be claimed as a deduction from earnings."[15]

Opposition to the concept was not limited to the Supreme Court. A railroad comptroller, in 1880, referred to depreciation allowances as "new and strange forms and observances" and as "a monstrosity, a pulseless, inanimate, and boneless thing, imperfectly conceived, unduly developed, projected in the world before its time."[16] While the Civil War income tax laws failed to mention depreciation, the short-lived income tax enacted in 1894 expressly disallowed deductions for "all estimated depreciation of values."

Nevertheless, depreciation accounting techniques were further refined during this period and the practice gradually gained adherents, particularly among public utility firms.[17] By 1899, the Supreme Court could state, "...annual depreciation of the plant from natural causes ... ought to be taken into consideration."[18] By 1909, the Court had fully recognized not only the right, but the duty, of firms to make provision for the replacement of property through periodic depreciation deductions.[19] Government regulation of industry also encouraged the use of the practice. In 1907, the Interstate Commerce Commission prescribed a system of accounts for steam railroads which required depreciation accounting. These requirements were extended to other transportation and communication industries during the following decade. Nonetheless, depreciation accounting was not a widespread practice prior to the introduction of the modern income tax.

III. Historical Survey of U.S. Tax Depreciation

A. The Early Years (1909-1933)

In 1909, the same year in which the Supreme Court recognized the legitimacy of depreciation accounting for regulated industries, the concept of depreciation was accepted for the first time in U.S. tax law. The corporate "excise" tax of that year authorized a deduction for depreciation. In the same year, Congress approved and submitted to the states the Sixteenth Amendment to the

Constitution, which authorized "taxes on incomes, from whatever sources derived, ..." Four years later, the Sixteenth Amendment was ratified, and Section II of the Tariff Act of 1913 established a tax on the net income of corporations and individuals. That Act allowed individuals "a reasonable allowance for the exhaustion, wear and tear of property arising out of its use or employment in the business, ..."[20]

1. The Depreciation Allowance as Loss of Value

Depreciation was originally defined by the Bureau of Internal Revenue as "the estimated amount of the loss, accrued during the year to which the [tax] return relates, in the value of the property ... that arises from exhaustion, wear and tear, or obsolescence out of the uses to which the property is put, and which loss has not been made good by payments for ordinary maintenance and repairs deducted under the heading of expenses of maintenance and operation."[21] The regulations stated further, "...amounts arbitrarily charged off will not be allowed as deductions except so far as they represent an actual shrinkage in values which may be determined to have taken place during the year for which the return is made."[22] Thus, in this earliest view, depreciation deductions were to be based as closely as possible on actual perceived losses in asset values (arising from wear and tear, or exhaustion). Allowances were not to be allowed to the extent that current repair and maintenance expenditures prevented declines in these values.

The early income tax regulations contained a "booking" requirement whereby depreciation deductions would be disallowed unless the accrued losses were also reflected in the taxpayer's annual balance sheets.[23] The regulations conceived of a depreciation reserve fund into which were placed annual contributions equal to the depreciation deductions. These funds could only be used to "make good" the prior losses, and no additional deduction was to be allowed for expenditures that restored asset values. Any diversion of these funds for other purposes, such as the payment of dividends, was to result in a concurrent recognition of income. Similarly, if a taxpayer were to realize that deductions in excess of the actual losses in value had occurred, then the excess was to be restored to income.[24]

The first income tax regulations denied depreciation allowances for goodwill.[25] Later editions extended the prohibited list to trademarks, trade brands, trade names, and secret formulae or processes, but explicitly allowed depreciation deductions for patents, copyrights, licenses, franchises, and other intangibles whose use was definitely limited in duration.[26]

2. The Depreciation Allowance as Allocated Cost

The regulations promulgated to implement the Revenue Act of 1918 represented a marked change in thinking on depreciation matters. The new rules more closely reflected an accounting view of the subject. Depreciation was no longer formally defined in terms of a loss in value. Instead, allowances were justified in terms of the limited useful life of certain property, but they were not to be thought of as necessarily reflecting a periodic loss of value. The deductions were simply allocations of the original capital cost (less salvage) over an estimated useful life. Market induced changes in values were to be considered only if they affected the estimate of the remaining useful life of the property.[27] Furthermore, "Property kept in repair may, nevertheless, be the subject of a depreciation allowance."[28]

The new regulations dropped all references to and restrictions on expenditures made from the depreciation reserve. They maintained the booking requirement, however.[29] This requirement continued in the regulations until the end of the following decade.

A deduction for losses due to obsolescence was also introduced with the Revenue Act of 1918. The Bureau defined obsolescence as "the gradual reduction in the value of property due to the normal progress of the art in which the property is used, or to the property becoming inadequate to the growing needs of the trade or business."[30] Obsolescence deductions were viewed, in part, as being distinct from those arising from depreciation. A reduction in value caused by economic or other factors, which could be anticipated with the same degree of accuracy as wear and tear or corrosion, was referred to as "normal obsolescence" and was to be reflected in the allowances for depreciation. However, obsolescence (without the "normal" qualifier) generally referred to a reduction in useful life brought about by some radical change in circumstances that was not anticipated when the asset was placed in service. Obsolescence was to be evidenced only by a demonstrable and certain shortening of an asset's anticipated useful life.[31]

3. Item Accounting

Under depreciation accounting principles, asset retirements may be accounted for by either item or group accounting rules. Under item accounting, a loss upon retirement is recognized and computed as the difference between the retired asset's adjusted basis and salvage receipts. In this case, the asset's original cost is credited to the asset account, and any accumulated depreciation that is attributable to the asset is debited from the accumulated depreciation account. Under group accounting rules, however, a loss on a retired asset is not generally recognized.[32] In this case, the undepreciated basis of the asset is recovered through future depreciation deductions, accomplished by crediting the accumulated depreciation account with the original basis of the retired asset, unadjusted for prior allowed depreciation.

The nonrecognition of losses on asset retirements from a group account is required because the useful life of the account is based on an average useful life, which reflects both short-lived and long-lived assets. Recognition of losses due to early retirements implies that the costs of short-lived assets are recovered over their actual lives, while the costs of long-lived assets are recovered over the assets' average useful life. Thus, if item accounting rules were applied to a group account, a good proportion of the assets in the account would be fully depreciated well before their actual retirement date.

The Bureau of Internal Revenue in 1920 was clearly thinking in terms of accounting for assets on an item basis or in group accounts where the assets had identical or similar characteristics:

> The allowances should be computed and charged off with express reference to specific items, units or groups of property, each item or unit being considered separately or specifically included in a group with others *to which the same factors apply*. The taxpayer should keep such records as to each item or unit of depreciable property as will permit the ready verification of the factors used in computing the allowance for each year for each item, unit or group.[33]

The prescribed treatment of asset retirements was consistent with the item accounting view; losses could be recognized upon the retirement of assets in an account.[34] Nevertheless, composite accounts, in which assets with quite different useful lives are grouped together, were not explicitly disallowed. It does not appear that the Bureau at this time was concerned that assets of the same type, used by a given firm, could experience a significant dispersion in their actual useful lives.

4. Allowed Versus Allowable Depreciation

In the early years of the income tax, an asset's basis was to be adjusted for "any depreciation sustained," irrespective of whether the depreciation had been reflected in depreciation deductions or whether those deductions resulted in lower taxes.[35] These rules were intended to prevent taxpayers from reducing their claimed depreciation in loss years, with the hope that a larger depreciable basis would be available in later, more profitable years. While the Revenue Act of 1924 referred to adjustments for "allowed" deductions, the Revenue Act of 1926 specified that adjustments were to be made for "allowable" amounts.[36] The Revenue Act of 1932 further modified the basis adjustment rules by stipulating that an asset's basis was to be adjusted "for exhaustion, wear and tear, obsolescence, amortization, and depletion to the extent allowed (but not less than the amount allowable) under this Act or prior income tax laws."[37] In this context, "allowed" deductions are those taken by the taxpayer and which have not been challenged. "Allowable" deductions refer to those allowances that should have been deducted under proper application of the regulations. In explaining this change from prior law, the Senate Finance Committee stated,

> The Treasury has frequently encountered cases where a taxpayer who has taken and been allowed depreciation deductions at a certain rate consistently over a period of years, later finds it to his advantage to claim that the allowances so made to him were excessive and that the amounts which were in fact 'allowable' were much less. By this time the Government may be barred from collecting the additional taxes which would be due for the prior years upon the strength of the taxpayer's present contentions.[38]

The new rules were attacked as being unfair, since they could lead to situations in which the full cost of the asset was not recoverable. For instance, the 1935 edition of the income tax regulations introduced the following example. For an asset costing $10,000 with a ten year useful life, the total "allowed" deductions over the first five years were shown as $5,000. The deductions were unevenly distributed, however, ranging from zero in some years to $2,000 in other years, so that the sum of the greater of the allowed and allowable deductions was $6,666.67. This meant that the unrecovered cost to be deducted over the following five years was limited to only $3,333.33. Thus, total allowed deductions could not exceed $8,333.33, or 83.3 percent of the asset's original cost.[39] The rules were relaxed slightly in 1952; since that time, any excess of "allowed" over "allowable" deductions reduces an asset's basis only to the extent that the excess deductions actually result in lower taxes paid.[40]

5. Determination of Depreciable Lives

The Bureau's policy towards the determination of depreciable lives under the 1918 Revenue Act were described in *Bulletin F: Depreciation and Obsolescence*, issued in 1920.[41] This publication did not list specific useful lives for taxpayers, but encouraged taxpayers to choose depreciation rates based on their own experience. The Bureau justified the absence of a tabulation of useful lives in the following statement:

> It is considered impracticable to prescribe fixed, definite rates of depreciation which would be allowable for all property of a given class or character. The rate at which property depreciates necessarily depends upon its character, locality, purpose for which used, and the conditions under which it is used. Manufacturing plants in the same locality, doing identically the same kind of business, depreciate at widely different rates, to a large extent dependent upon the management and the fidelity with which repairs are made and the property maintained; but so many other elements enter into

> the question that even the relative importance of the different factors can be determined only with difficulty and as approximations. The taxpayer should in all cases determine as accurately as possible according to his judgment and experience the rate at which his property depreciates. The rate used will, however, be subject to the approval of the Commissioner.
>
> In recognition of these facts, if understatements of taxable net income in returns are due to charging off depreciation in excess of an amount deemed reasonable by the Commissioner, negligence or intent to defraud will not be imputed to the taxpayer unless the position taken is so unreasonable as to indicate gross carelessness or bad faith.[42]

The regulations further specified the standard by which deductions would be judged.

> While the burden of proof must rest upon the taxpayer to sustain the deduction taken by him, such deductions must not be disallowed unless shown by clear and convincing evidence to be unreasonable.[43]

The Bureau of Internal Revenue expressly authorized only the straight-line method and, in certain cases, the unit-of-production method for calculating depreciation allowances. Other methods were allowable, but only if they were "reasonable."[44] While business depreciation methods at the time were almost universally straight-line, lives much shorter than actual average useful lives were in general use. This practice not only reflected conservative accounting practices, but also the fact that few, if any, companies in unregulated industries had developed the data and experience needed to conduct detailed asset retirement studies.[45] In effect, businesses were using an accelerated method -- equal deductions over a period shorter than the actual average useful life, and no further deductions thereafter. This practice might have more adequately reflected the economic depreciation of values than a strict adherence to straight-line principles. Nevertheless, the practice fostered the impression that businesses were taking overly liberal depreciation deductions.

In 1931, the Bureau of Internal Revenue released a revised *Bulletin "F,"* entitled *Income Tax Depreciation and Obsolescence*, and also published a document called *Depreciation Studies*.[46] The former explained depreciation rules as they applied with respect to the Revenue Act of 1928, while the latter provided a schedule of "probable" useful lives and annual depreciation rates for nearly 2,700 types of depreciable assets used in 44 different industries.[47] These lives were reportedly based on studies of the useful lives claimed by taxpayers, which were conducted by the Bureau during the 1920's. They were not, therefore, based on asset retirement studies, but instead reflected tax accounting practices. The lives were to be used "solely as a guide or starting point from which correct rates may be determined in the light of the experience of the property under consideration and all other pertinent evidence."[48] The report acknowledged that, as taxpayer experience became further known, the recommended lives would be modified accordingly.

The listed lives were for new property only, whereas suitable adjustments were anticipated to be made by the taxpayer for used assets. The lives were predicated on a "reasonable expense policy as to the cost of repairs and maintenance ... Therefore, in the determination of the depreciation allowance in each case, due consideration should be given the maintenance and replacement policy of the taxpayer and the accounting practice regarding the same."[49] The lives were also intended to reflect the existence of normal obsolescence.[50]

By 1931, the Bureau had recognized the existence of composite accounts, but still had not fully accepted their widespread use. The revised *Bulletin F* expressed the hope that taxpayers would only group assets with similar lives, and it continued to allow the use of item accounting rules for such accounts. No composite lives were provided in *Depreciation Studies*, and the Bureau stated that a single composite rate of depreciation applicable to all of a taxpayer's assets would not ordinarily be permitted. Nevertheless, it did not completely disallow the use of composite accounts. Instead, *Bulletin F* stated that when a composite rate of depreciation was used, no loss could be claimed on the retirement of an asset unless the composite depreciation rate was decreased to reflect the increased average life of the assets remaining in the account.[51]

6. Tax Administration Before 1934

Revenue agents, in this period, were not likely to question a firm's depreciation rates as long as they were similar to those used by other companies in the same industry.[52] The examiners' chief concern appears to have been to ensure that the total allowances taken over the life of an asset did not exceed its depreciable basis, less estimated salvage. The use of short useful lives, combined with item accounting rules meant that many assets appeared on the books after being fully depreciated for tax purposes. However, this apparently caused no particular concern to the revenue agents.[53] The use of group accounts, however, presented problems to the examiners, since there was no quick means of determining when depreciation in excess of 100 percent recovery of cost was occurring, without examining detailed depreciation schedules.[54] While the tax regulations required that such schedules be maintained, in many instances the information was not available from taxpayers or had to be prepared by the examining agent.

B. Treasury Decision 4422 and its Aftermath (1934-1953)

By 1933, Congress was concerned with a need for more revenue and looked at depreciation allowances as a ready source. In that year, the House Ways and Means Committee suggested that all depreciation allowances be cut by 25 percent for the years 1934 through 1936, an amount intended to raise business tax liabilities by about 11 percent.[55] However, in a January 1934 letter to the Committee, Treasury Secretary Henry Morgenthau, Jr. suggested that a similar increase in revenues could be effected through changes in administrative procedure which would ensure that depreciation deductions were taken over the entire useful lives of assets. The Secretary referred to a Bureau study which had shown that, under current practices, "the amount representing the basis of the assets will be completely recovered through depreciation deductions before the actual useful life of the assets has terminated."[56]

1. Treasury Decision 4422

The proposed administrative changes took the form of regulatory amendments and were promulgated in February 1934 as a Treasury Decision, T.D. 4422.[57] The new regulations required taxpayers to file detailed depreciation schedules, stipulated that deductions must be limited to amounts considered necessary to recover the unrecovered basis of any asset during its remaining useful life, and placed the entire burden of justifying deductions claimed on the taxpayer, i.e., the Bureau would no longer have to show by "clear and convincing evidence" that taxpayers' deductions were unreasonable. The Ways and Means Committee accepted this plan in lieu of legislative action.

The Bureau of Internal Revenue issued Mimeograph 4170 to its revenue agents in April 1934 to explain the new requirements resulting from Treasury Decision 4422.[58] This memorandum served as a signal for a vigorous implementation of the new procedures. The document emphasized that the burden of proof as to the correctness of deductions was to be placed squarely on the taxpayer. In this regard, a finding that fully depreciated property was still in use, or that the depreciation reserve was "higher than is justified by the actual physical condition of the property," was to be taken as a presumption that depreciation rates had been excessive.[59] Mimeograph 4170 described the information required of taxpayers, and stressed that "all schedules and other data deemed necessary shall be prepared by the taxpayer and not by the examining officer."[60] It further remarked that depreciation reserves were to be credited with previously allowed depreciation (for closed taxable years), if larger than that allowable.[61]

Besides clarifying the new regulations, Mimeograph 4170 also imposed group accounting rules on taxpayers. It stated that loss deductions could not be claimed on the normal retirement of assets until all assets in an account had been retired. Exceptions existed for sales, casualties, and other similar abnormal retirements, provided it was "clearly evident that such disposition was not contemplated in the rate of depreciation."[62] Item accounting rules could be used only where an account's useful life equaled the expected life of the longest-lived asset in the account. These requirements were contained in the next revision of *Bulletin "F"* in 1942. However, they were not explicitly incorporated in the depreciation regulations themselves until 1956. This fact probably contributed to the result that many taxpayers remained unaware of this change in Bureau policy for several years thereafter.[63]

The Bureau provided a public explanation of the application of T.D. 4422 in Office Decision, I.T. 2838, initially issued in October 1934.[64] This document identified the principal change brought about by T.D. 4422 as the "requirement that full and complete information with respect to the past history of depreciable property accounts must now be furnished by those taxpayers whose income tax returns indicate that deductions from gross income on account of depreciation have been in excess of reasonable amounts."[65] Accordingly, the statement made clear that taxpayers were not required to submit detailed depreciation records unless specifically requested to do so by a Bureau agent. It mentioned nothing of the new standard for justifying allowances or the new requirements for using group accounting rules with respect to asset retirements.

T.D. 4422 required a substantial reduction in depreciation rates, for two reasons. First, for many firms, it was clear that the depreciable lives being used were significantly shorter than those contemplated by the Bureau's tax examiners. Second, in order to recover an asset's adjusted basis (reduced by the previously allowed depreciation) over its remaining useful life, an initial depreciation rate less than that implied by the correct useful life was needed. Nevertheless, revenue agents apparently did not require the full and immediate adjustment to the depreciation rates demanded by a strict interpretation of T.D. 4422. They tended to follow a policy of reducing depreciation rates in several steps extending over a number of years; taxpayers whose depreciation rates were audited during the years following the publication of T.D. 4422 experienced a number of reductions in those rates.[66]

Grant and Norton (1955) offered the following observations concerning the policy changes introduced in 1934:

> Treasury Decision 4422 initiated changes in Treasury policies and practices which have been responsible for progressive reductions in allowable depreciation rates in income tax returns since 1934. Although Treasury Decision 4422 initiated these changes, it was not really the cause of them. Their real basis lay in the statistical approach to

physical property mortality combined with a belief on the part of the Bureau officials that depreciation rates should be based on the best available evidence of average service lives. Associated with this was their belief that the straight-line method of apportionment was fundamentally sound. Although many taxpayers complained bitterly that the Bureau examiners were making unreasonable reductions in depreciation rates, very few taxpayers made any effort to examine or criticize the fundamental concepts underlying the change.[67]

2. Treatment of Capital Gains and Losses on Depreciable Property

From 1922 to 1933, capital gains of individuals were subject to a maximum tax rate of 12.5 percent. Since 1925 a dollar of capital loss could not lower taxes by more than 12.5 cents. The Revenue Act of 1934 introduced a sliding scale for including noncorporate capital gains and losses in income.[68] This scale ranged from 100% for assets held one year or less to 30% for assets held for more than 10 years. The Act also limited the annual deductions for included net capital losses to $2,000. This limit also applied to corporations. At the time, depreciable assets were considered capital assets, and thus were subject to this loss limitation. The Revenue Act of 1938, however, excluded depreciable property from the definition of capital assets in order to allow the full recovery of losses incurred in the sale or exchange of depreciable property and to remove noncorporate business depreciable property from favorable capital gains treatment.[69]

General inflation and the demands of World War II drove up the market values of depreciable assets, so that what had been partially intended as a relief measure in 1938 (denying capital asset status to depreciable assets in order to allow full loss recovery) had become a source of additional tax burden. The Revenue Act of 1942 imposed a 25 percent maximum capital gains tax for both corporate and noncorporate taxpayers.[70] Gains on the sale of depreciable assets, however, would have been ineligible for this benefit (a situation exacerbated by the prospect of property being converted to wartime use at inflated values). This prospect prompted Congress to enact a special provision that allows net gains from the disposition of depreciable assets to be taxed as long-term capital gains, yet allows net losses on depreciable property to be fully deductible.[71]

These new rules had implications for the determination of useful lives. Even without inflation or short-term excess demand, an excessively short useful life produces an adjusted basis below an asset's resale value. This allows taxpayers to take generous depreciation deductions against ordinary income but have the gains obtained on the sale or wartime conversion of assets to be taxed at the lower capital gains rate under the new provision. Thus, the capital gains treatment of depreciable property gave an added impetus to Bureau policies to enforce the use of actual useful lives and salvage values.

3. The 1942 *Bulletin "F"*

In 1934, the Bureau may have anticipated that taxpayers would conduct the necessary asset retirement studies needed to substantiate their estimates of useful lives and salvage values. This did not happen on a large scale, and the Bureau was forced to rely on industry-wide estimates of useful lives for purposes of audit. These estimates were reflected in a revised edition of *Bulletin "F,"* issued in 1942, which provided a new listing of useful lives to replace those in the 1931 *Depreciation Studies.*[72] The new lives primarily reflected observations and estimates made by Bureau engineers over a number of years. It is generally believed that the 1942 useful lives were

frequently used by Bureau revenue agents in deciding whether taxpayer deductions for depreciation were reasonable. They soon became the *de facto* standard, which could be refuted only by substantial evidence produced by the taxpayer.

The 1942 lives were generally longer than those in *Depreciation Studies*. This lengthening may have been prompted, in part, by the new capital gain provisions in the Revenue Act of 1942. The new *Bulletin "F"* provided "average useful life" estimates for over 5,000 types of assets used in 57 different industry activity categories. One study found that, of the 2,700 equipment lives listed in 1931, 1,038 lives had been increased, 54 lives were decreased, and the rest left unchanged.[73] By one estimate, the weighted average 1942 *Bulletin "F"* life for industrial equipment was 19 years.[74]

The 1942 revision of *Bulletin "F"* contained the same general asset groupings and similar industry-activity groupings as in the 1931 *Depreciation Studies*. It also provided, for the first time, composite lives for several industry and general asset groupings. For example, a ten year composite depreciation rate was provided for use to cover all equipment assets used in the Buildings Construction trade.[75] Whereas the earlier *Bulletin "F"* had discouraged the use of composite accounts, the new *Bulletin* advocated such accounts and, consistent with Mimeograph 4170, required the use of group accounting principles with respect to the treatment of retired assets.

4. New Administrative Procedures

The new *Bulletin "F"* lives, combined with a general deferral of asset retirements during World War II, added to taxpayer complaints that the Bureau's estimates of useful lives were too long. In an effort to reduce the administrative burden associated with depreciation disputes, the Bureau announced in 1945 that taxpayers could enter into binding written agreements with the government.[76] The agreements designated the useful lives, salvage values, depreciation rates, and other pertinent adjustments to procedures used by the taxpayer. The authority to enter into these agreements was later incorporated into the 1954 Internal Revenue Code.

Continued conflicts between taxpayers and revenue agents ultimately led to the promulgation of Revenue Rulings 90 and 91 in 1953. The stated purpose of these rulings was to reduce administrative controversies related to depreciation allowances. Revenue Ruling 90 stated that the revenue agents would not propose adjustments in depreciation deductions unless there was a "clear and convincing basis" for a change.[77] Revenue Ruling 91 stated that consideration would be given to whether claimed allowances were "fair and reasonable under the circumstances," whether the taxpayer had followed a "consistent practice" in arriving at the amount of deductions, and whether any proposed adjustments were "substantial."[78] These policies were incorporated into the regulations promulgated in 1956 under the Internal Revenue Code of 1954.

By requiring "clear and convincing" evidence for a change in taxpayer allowances, these rulings seemingly represented a partial return to pre-1934 administrative practice. Nevertheless, the change did little to limit the number of useful life disputes. One reason is that the new status quo represented significantly longer useful lives and higher tax rates than had existed in 1933. Also, the percentage of the population required to file income taxes had also grown enormously.[79] Furthermore, revenue agents were not particularly concerned with the discrepancies between tax lives and actual useful lives before 1934; by 1953, such differences were an important component of the audit process. Indeed, in a statement issued in 1957 concerning the new administrative procedures, the Internal Revenue Service made it clear that, even though a taxpayer's depreciation deductions might have been accepted in prior years, such acceptance did not preclude adjustments to those allowances in subsequent years.[80]

The administration of the law in this period was uneven. Given the uncertain nature of useful life and salvage value estimates, disputes between taxpayers and IRS agents were often settled through negotiation and compromise. By its very nature, this process could lead to different outcomes for taxpayers in similar circumstances. Differences in viewpoints among individual agents and between different Internal Revenue Service districts certainly added to this result. Studies conducted by the Treasury in 1960 found wide disparities in the depreciable lives being used for tax purposes within any given industry. While variation in useful lives should be expected because of the heterogeneous nature of the assets used by a given industry, differences also undoubtedly occurred because of the uneven administration of the law.[81]

C. The Liberalization of Depreciation Allowances (1954-1962)

Although the Bureau still preferred the use of the straight-line and unit-of-production methods, it recognized in the 1942 *Bulletin "F"* the possible application of the declining balance method. The pamphlet stated,

> This [declining balance] method gives satisfactory results for accounts that are being constantly replaced in substantially equal amounts, provided the rate used is somewhat higher than that applicable under the straight-line method. Its best application is to those accounts for property in which the greater proportion of the production is confined to the early part of the useful life.[82]

Nevertheless, before 1946, the Bureau would not approve nor disapprove the use of the declining balance method in advance of a taxpayer's audit. In that year, the Bureau announced that use of the declining balance method would be approved by the Commissioner, provided the method was also used for financial reporting purposes and resulted in a proper reflection of income.[83]

The introduction of accelerated write-offs into the Code occurred in 1940 as the threat of war increased. Legislation enacted in that year allowed a five-year amortization period for property considered necessary for the national defense, evidenced by possession of the required "certificate of necessity". This favorable treatment was extended to unincorporated businesses by the Revenue Act of 1942, and similar provisions were enacted during the Korean war in 1950. Another temporary measure, covering the years 1952 through 1956, provided for the 60 month amortization of grain storage facilities.

The enactment of the 1954 Internal Revenue Code represented a major change in depreciation policy. The new Code explicitly authorized the use of the double-declining balance and sum-of-the-years digits methods of computing depreciation deductions, and permitted a switch from a declining balance method to the straight-line method at the taxpayer's discretion. The authority for accelerated methods was not extended to intangible property nor to tangible property with a useful life of less than three years. It also was not available for property placed in service before 1954. Unlike prior legislation, however, this new authority for accelerated write-offs was intended as a permanent and general liberalization of depreciation allowances.

The declining balance method had been advocated for a number of years by many analysts as providing a better measure of net income. Contemporary studies had found that economic depreciation occurred more rapidly during the early years of use of certain property.[84] It was also claimed that the double-declining balance method was simpler and more convenient in its practical

application and that it provided at least a crude offset to inflation. The primary motive behind the introduction of the accelerated methods in 1954, however, was to provide a permanent investment incentive. The Senate Finance Committee reported,

> More liberal depreciation allowances are anticipated to have far-reaching economic effects. The incentives resulting from the changes are well timed to help maintain the present high level of investment in plant and equipment. The acceleration in the speed of the tax-free recovery of costs is of critical importance in the decision of management to incur risk. The faster tax write-off would increase available working capital and materially aid growing businesses in the financing of their expansion. For all segments of the American economy, liberalized depreciation policies should assist modernization and expansion of industrial capacity, with resulting economic growth, increased production, and a higher standard of living.[85]

The major obstacle to acceptance of the declining balance method was that only 90 percent of an asset's cost is recovered by the end of its estimated useful life. To alleviate this concern, Congress authorized the sum-of-years digits method and allowed taxpayers to switch from a declining balance method to the straight-line method at the taxpayer's discretion.[86]

A further acceleration of depreciation write-offs was allowed in 1958. The Technical Amendments Act of 1958 enacted section 179 of the Code, which authorized an additional first year depreciation allowance of twenty percent of cost (not reduced by salvage).[87] The additional allowance was available for tangible personal property acquired after 1957 with a useful life of six years or more. While intended primarily as a benefit to small businesses, the additional allowance was available to all investors. The amount of eligible cost, however, was limited to $10,000 for single taxpayers and $20,000 for married taxpayers filing a joint return. The remainder of the cost, less salvage, was subject to the usual depreciation rules.

Congress liberalized depreciation deductions again in 1962.[88] For personal property (except livestock) with a useful life of 3 years or more, a taxpayer was allowed to reduce the amount taken into account as salvage value. The reduction in salvage could be as high as 10 percent of the basis of the property. Consequently, allowances could be increased for methods other than the declining balance method, and eligible assets with expected salvage values below 10 percent of basis could be depreciated to zero.[89] This measure was intended to reduce the number of disputes over estimated salvage values.

D. Depreciation Guidelines and the Reserve Ratio Test (1962-1970)

The Treasury Department continued to be concerned with useful lives. From 1956 to 1958, the "Advisory Group on Bulletin F" undertook a study to again revise and update *Bulletin "F"* useful lives. The group collected data and visited taxpayers' facilities in an attempt to determine the normal useful lives of assets. The study recommended a number of changes in estimated lives. For most industries no change was recommended, but reductions in lives of up to 25% (for assets used in the manufacture of optical equipment) and increases in lives up to 15% (for aircraft, motor transportation, and assets used in the printing and publishing industry) were recommended.[90] The findings were subsequently dismissed as not being fully reflective of "increasingly rapid obsolescence and, consequently, did not indicate a sufficient shortening of useful lives in many cases."[91]

In 1960, the Treasury initiated several major studies to investigate existing depreciation practices. These studies were continued by the new Administration in 1961. The "Treasury Depreciation Survey" project sent surveys to 2,700 large corporations, asking for information on asset values, depreciation methods, deductions, and reserves, service lives and fully depreciated property, and received about 1900 usable responses from corporations owning about one-half of the nation's depreciable assets. The "Life of Depreciable Assets Study" obtained detailed depreciation information from more than 50,000 corporate returns for the 1959 tax year. Seven engineering studies were also conducted, covering the textiles, aircraft, autos, electrical machinery, machine tools, railroads, and steel industries.[92] Finally, a comparative study of foreign tax depreciation practices was conducted. These studies culminated, in late 1961 and early 1962, in the issuance of new guideline depreciation lives for the textile industry and then, in July 1962, in the promulgation of Revenue Procedure 62-21, *Depreciation Guidelines and Rules*.[93]

The adoption of *Depreciation Guidelines and Rules* represented a major modification of the procedures for administering the depreciation provisions of the Code. Effective for returns due after July 12, 1962, *Bulletin "F"* was "withdrawn as a guide to examining officers for the determination of depreciable lives."[94] In place of the *Bulletin "F"* "estimated average useful lives," Revenue Procedure 62-21 established a total of 99 composite "guideline" lives for depreciable assets arranged in industry-specific and asset-specific property classes. Taxpayers were allowed to cancel previous agreements with the Internal Revenue Service in order to take advantage of the new lives. Revenue Procedure 62-21 also created audit rules intended "to provide taxpayers with a greater degree of certainty in determining the amount of their depreciation deductions and to provide greater uniformity in the audit of these deductions by the Internal Revenue Service."[95] This was to be accomplished by making depreciation adjustments dependent upon an objective "reserve ratio test," rather than upon the individual judgements of tax examiners. Thus, a somewhat mechanical mechanism was envisioned under which taxpayers were to be eventually guided to using their true useful lives, based on their specific facts and circumstances. The guideline lives represented what was seen as a reasonable starting point for this search. The new audit rules were not mandatory, however; taxpayers could choose instead to have their depreciation practices examined in accordance with Revenue Rulings 90 and 91.[96]

1. Guideline Lives

The industry classes were generally defined according to groupings contained in the government's Standard Industrial Classification system. The new depreciation guideline lives were based primarily on the Treasury's survey of large corporation tax depreciation practices. The lives were fixed in the neighborhood of the bottom 30th percentile life, that is, the life below which 30 percent of the assets in the industry were reportedly being depreciated for tax purposes, but the lives were also influenced by the tax return study results.[97] The engineering studies of useful lives that had been conducted "proved inconclusive with respect to estimating historical obsolescence and were to a large extent ignored in setting the present guideline lives."[98]

The guideline lives were estimated to be "32 percent shorter than those established in *Bulletin F*," and were "15 percent shorter than the lives in actual use by 1,100 large corporations which hold two-thirds of all the depreciable assets in manufacturing."[99] However,

> In actual practice, we anticipate that these same companies will be able to take faster depreciation than that provided in the new guidelines. As a result, the depreciable lives they will actually use are expected to be twenty-one percent shorter than those in use now.[100]

A primary motive for the setting of guideline lives at these levels was the desire to lessen the tax burden on investment and to make United States more competitive in world markets. It was also believed that, by relying on specific asset replacement histories, the *Bulletin "F"* lives had "inadequately reflected the fast-moving pace of economic and technological change."[101] Furthermore, Treasury argued that one could more easily accommodate the pace of technological change by specifying industry-wide composite lives, "because it is difficult for any taxpayer to show the effect of technological change, etc., on the life of an individual asset."[102] Finally, a "vicious circle" rationale was use in which the *Bulletin "F"* lives were viewed as being self-sustaining. By restricting corporate cash flow, it was argued, the *Bulletin "F"* lives had prevented firms from making the transition to a more rapid asset replacement policy, which would result in lower actual useful lives. The lower guideline lives, even if only temporary, would thus enable firms to finance this transition to shorter actual useful lives.[103]

Treasury anticipated that the depreciation guideline lives would be periodically reviewed and corrected, if necessary.[104] However, because the application of the "reserve ratio" test was contemplated, no alternative regular and systematic methods for collecting data for monitoring actual asset retirement experience were established.

The introduction of shorter depreciable lives prompted Treasury to seek "recapture" rules for gains earned from the sale or other disposition of depreciable assets. Such rules require the portion of the total gain equal to the asset's accumulated depreciation (which was deducted at ordinary tax rates) to be treated as ordinary income. Although the Administration had requested recapture for all depreciable property, only personal property and certain "other tangible property" were subjected to this treatment in 1962.[105] Such property became known as "section 1245 property" after the section of the Code imposing the recapture requirement. The case for recapture on the sale of buildings was less strong, since the guideline lives assigned to buildings were identical to their *Bulletin "F"* lives. Nevertheless, a modified recapture rule was applied to "section 1250 property" in 1964, which covered all real depreciable property not covered by section 1245.[106]

2. Guideline Procedures

The new audit procedure was conceptually simple, but could be rather complex in its operation. A taxpayer had to first classify his assets to one or more guideline classes and then compute a "class life" for assets in each guideline class.[107] The class life was determined by dividing the annual depreciation allowance, determined on the basis of the straight-line method (using actual useful lives and salvage values) into the total basis (not reduced by salvage).[108] This class life was then compared to the guideline life. If equal to or longer than the guideline life, then the taxpayer's depreciation deduction would not be disturbed, provided that his retirement and replacement practices were consistent with the class life. Consistency could be demonstrated either by meeting the reserve ratio test (described below) or by a general facts and circumstances test. However, since the reserve ratio test was deemed met for the first three years, this implied that the guideline life could be safely used during the transition period. More complicated rules, which generally referred to the class life used in prior years as well as the reserve ratio test, applied in cases where the class life was shorter than the guideline life.

Taxpayers were not required to use the same depreciation method for assets in a given guideline class. They also were not required to regroup their assets for tax purposes in depreciation accounts corresponding to the guideline classes. Nevertheless, such a regrouping obviously simplified the application of the guideline procedures. Thus, Revenue Procedure 62-21 encouraged

the use of composite accounts corresponding to the guideline classes by offering simplified calculations to taxpayers if they replaced a myriad of useful lives for individual assets with relatively few composite lives.

3. The Reserve Ratio Test

The reserve ratio test was viewed as an integral part of the system established by Revenue Procedure 62-21. The test was intended to provide a mechanical method of checking whether the taxpayer's actual retirement practices conformed to the useful lives used for tax purposes. However, the application of the test was subject to a three year moratorium, and its application was further modified and delayed in 1965. As a result, the test was never effectively used as a check on actual retirement practices.

The reserve ratio test utilized the principle that the average useful life for assets in multiple asset accounts can be compared with the average actual period of use by examining the ratio of the amount of accumulated depreciation with the total investment in depreciable assets in the account. The test required the computation of the taxpayer's *reserve ratio*. The reserve ratio was computed by dividing the total accumulated depreciation for all the assets in a guideline class by the total original basis of all those assets.[109] The reserve ratio was then compared with a range of test ratios. The range of acceptable ratios depended upon the test life for the class (generally equal to the shorter of the guideline life or the taxpayer's class life), the depreciation method used by the taxpayer, and on the average growth rate of the asset base being depreciated (as determined generally over a period equal to the class life).[110] Application of the test required that the taxpayer had possessed assets in a given guideline class for a minimum of three years.

The reserve ratio test did not apply to new businesses (and was deemed satisfied in those cases), since they did not have sufficient asset retirement experience. In other cases, if the taxpayer's reserve ratio exceeded the upper bound of the test ratio, there was a presumption that (1) the particular asset account contained more than the acceptable amount of older assets, (2) the replacement cycle was therefore slower than the guideline life cycle, and (3) the tax life used to calculate depreciation for those assets was therefore unrealistic, and should be lengthened. A life too short would be lengthened by 25%. The converse applied when the taxpayer's reserve ratio fell below the lower bound of the test ratio. In the latter case, however, lives would be adjusted downward by approximately 15%.[111]

Revenue Procedure 62-21 contained transition rules whereby the reserve ratio test was assumed to be met for the first three taxable years following the promulgation of the guideline procedures. The taxpayer was also given a period of years equal to the guideline life (starting with 1962 for most assets) to bring his reserve ratio below the upper limit, provided the reserve ratio for any year was lower than it had been for any one of the three preceding taxable years.

A Treasury-Conference Board study indicated that nearly 90 percent of all adopting firms would fail the reserve ratio test in 1965.[112] Such a degree of noncompliance would have swamped the Internal Revenue's ability to audit depreciation deductions. As a consequence, Treasury released new rules in February, 1965, which were ultimately published as Revenue Procedure 65-13.[113] The new rules modified the reserve ratio test, made the test more lenient, and reduced the amount by which useful lives were to be lengthened if the taxpayer failed the test. It allowed the use of the "guideline form" of the reserve ratio test, which explicitly took into account the pattern of investment over the relevant period rather than rely on the average growth rate of assets.[114] Under the "minimal adjustment" rule, useful lives were to be lengthened under a sliding scale, depending on the amount

by which the test was failed. The 1965 rules made the test easier to pass by raising the upper limit values of the reserve ratio test by 15 percentage points. These new upper limits were referred to as "transition limits" because they were to be gradually reduced to the original upper limits over a period of time equal to the guideline life (starting in 1965). If the actual reserve ratio were to exceed the transition limit by less than ten percentage points, the useful life was to be raised by no more than 5%. If the upper transition limit was exceeded by more than ten percentage points, the useful life was to be raised by no more than 10%.

The complexity of the reserve ratio test ultimately led to its demise, and the lengthy transition rules associated with its use meant that the test was never effectively implemented. Without the test, however, Revenue Procedure 62-21 lost most of its original rationale as an improved audit procedure. Instead, the guideline lives developed into "safe harbor" useful lives. Thus, in fact, the 1962 changes permitted depreciation deductions based on industry-standard useful lives that were substantially shorter than the average useful lives previously used by the nation's corporations.

E. The Asset Depreciation Range System (1971-1980)

After the investment tax credit was repealed in 1969 and economic growth began to slow in 1970, the business community and several members of Congress pressed for tax reductions and depreciation liberalization to stimulate the economy. At the same time, it was clear that several features of the existing depreciation system, especially the reserve ratio test, were not administratively feasible.

Several analysts at the time advocated dropping the connection between economic depreciation and tax depreciation allowances. Perhaps most influential of these analyses was the report of the President's Task Force on Business Taxation. Released in September 1970, the report recommended the abandonment of the useful life concept for machinery and equipment (but not for real property) and advocated a capital cost recovery system based upon recovery periods equal to the guideline lives, reduced by 40 percent. The Asset Depreciation Range (ADR) system, announced the following January, was a variant of this proposal.[115]

1. Reasons for Adoption of the ADR System

A number of reasons were advanced by Treasury in justifying the adoption of the Asset Depreciation Range system.[116] The need for an administratively feasible system for dealing with depreciation allowances and repair and maintenance expenditures was one reason. The guidelines system was believed to have resulted in too much controversy in its administration, and the reserve ratio test was stated to be flawed. In particular, it was claimed that the reserve ratio test was inordinately complex, created competitive inequities between new and old businesses, artificially encouraged the scrapping of stand-by equipment, and placed too much weight on past experiences to judge the future useful life of new assets.

Methodological flaws of the reserve ratio test were noted by the Treasury Department. "To determine whether the upper limit has been exceeded, the time required would be a period equal to at least 120 percent of the tax life; ... Since a large proportion of businesses are short-lived or operate under conditions where part or all of their depreciable property would be characterized as a 'green account,' the reserve ratio test has only limited relevance."[117]

In addition, stand-by property was viewed as a problem since both new and old property were usually placed in a single account (vintage accounts were not required). "Thus, assets held in a stand-by or non-productive capacity, and assets not being used but not yet scrapped, could cause failure of the reserve ratio test. Consequently, a taxpayer who retained a moderate stock of fully depreciated property as stand-by ... risked a lengthening of the tax life of the great bulk of his depreciable assets in active use."[118]

Another argument focused on the use of historic data. Treasury stated that, "The reserve ratio test measures only the past practices of the particular taxpayer and does not take this [obsolescence] factor into account."[119] This was somewhat ironic, in that a similar argument had been used to justify the introduction of the guideline lives in 1962. Nevertheless, under the ADR system, depreciation allowances would not be "tied to the past history of the individual taxpayer -- an unreliable guide to the period of future productivity of the taxpayer's stock of capital assets."[120] An industry's investment and retirement history, rather than an individual's history, was thought to provide a sounder basis for predicting future investment and retirement policies. The policies of an individual taxpayer may vary from industry norms for a period of time, but he must conform in the long run to those norms or be driven from business.

2. Description of the ADR System

While the new depreciation system abandoned the idea of a system tailored to the specific conditions of individual taxpayers, it did not fully embrace the notion of a capital cost recovery system with arbitrary recovery periods. Instead, the ADR guideline periods lives were intended to reflect industry average lives, yet be somewhat shorter than the industry-wide average service lives.

The Treasury Department issued regulations for its Asset Depreciation Range System in June 1971. Because the ADR system imposed additional requirements on taxpayers, its use was made optional through an annual election. An electing taxpayer was required to set up "vintage accounts" in which only the property put in service during the taxable year would be recorded. Generally, if an election were made, all eligible property had to be depreciated under the ADR rules. Used assets had to be recorded in separate accounts, although taxpayers could elect to exclude used assets from the ADR rules if such assets comprised more than 10 percent of all assets purchased during the year.[121] In addition, section 1245 assets could not be placed in the same account as section 1250 assets.

The earliest asset guideline classes and guideline periods were identical to those published in Revenue Procedure 62-21, with a handful of exceptions. In the initial regulations, property eligible for election under the ADR system was limited to section 1245 property.[122] Consequently, there were no asset guideline classes for buildings and land improvements, and the industry-activity classes excluded all section 1250 buildings or land improvements. In addition, the ADR system eliminated the separate class for subsidiary assets that had existed under Revenue Procedure 62-21.[123] Such assets were to be included in the industry-specific classes.

For each asset class, the ADR system provided a range of depreciable lives ranging from 20 percent less than the asset guideline period to 20 percent greater. Taxpayers electing to use the ADR system could depreciate property over any life (at half-year increments) between the lower and upper ranges, *irrespective of their actual useful lives*. Thus, for the first time (in theory), the

Treasury offered to sever the link between depreciable lives used for tax purposes and taxpayer-specific actual useful lives. The link between economically useful asset lives and tax depreciation lives, however, was not completely severed; the ADR guideline periods were intended to be related to industry-wide composite lives.

The ADR system was also intended to limit controversies over whether expenditures for the repair, maintenance, rehabilitation, or improvement of depreciable property should be expensed or be capitalized and later depreciated. Expenditures which were clearly capital expenditures -- for example, those that unquestionably increased the productivity or capacity of an asset, continued to be required to be capitalized. However, for expenditures of a more ambiguous nature, the ADR system provided a "repair allowance". Taxpayers that elected the ADR system could make a separate annual election to be treated under the repair allowance provisions. For all asset categories, except livestock, an "annual repair allowance percentage" was provided. This percentage, (which ranged from between five and fifteen percent), when multiplied by the original basis of the assets in the account, yielded an annual repair allowance. Expenditures for repair, maintenance, and rehabilitation that were not clearly of a capital nature could be annually expensed up to the dollar limit of the repair allowance. The balance of such expenditures had to be capitalized.[124]

Because there was some question whether Treasury had the authority to establish depreciation rules that were not based on individual facts and circumstances, Congress provided a statutory basis for the ADR system in the Revenue Act of 1971.[125] In so doing, it eliminated a three-quarter first-year convention originally allowed under the Treasury's original ADR regulations.[126] Congress also specified that the new depreciation system must apply to section 1250 property. However, if taxpayers were required to include this property under ADR (as a condition of election), it was feared that many taxpayers would have to use significantly longer lives for real property than they had used in the past.[127] Consequently, Congress established a three-year transition rule under which electing taxpayers were allowed to exclude from their ADR election any section 1250 property for which a separate class existed.[128] Congress also felt that subsidiary assets, by being included with longer lived assets in the industry-activity classes, would be adversely impacted by the introduction of the ADR system. These assets were therefore provided with a three-year transition rule under which they could be excluded from an election, if the unadjusted basis of such assets being placed into service during a taxable year constituted three percent or more of the unadjusted basis of all eligible property in the class being placed into service during the taxable year.[129]

3. The Office of Industrial Economics

At the time the original ADR rules were promulgated, Treasury established the Office of Industrial Economics (OIE) within the Internal Revenue Service. OIE was directed to evaluate data on asset retirements and asset repair expenditures, and to recommend changes in the guideline periods and repair allowances based on their findings. The provisions of the ADR system initially required electing taxpayers to report special information concerning retirements and repair expenditures with respect to each of the required vintage accounts. This information was to have been made available to OIE for use in evaluating actual asset retention patterns within asset classes. However, because of the difficulties encountered in collecting and organizing this information, and the lag in its availability, these reporting requirements were soon dropped. Nevertheless, most of this information was required to be maintained by electing taxpayers, who were also required to respond to infrequent sampling surveys conducted by the Treasury Department. These surveys were used to obtain asset acquisition and retirement data for the purpose of keeping the asset classes and class lives up to date.[130]

The legislative history of the 1971 Act provided guidance for OIE to "redefine or subdivide classes of property both in order to provide a more reasonable classification for depreciation purposes and also as is required for the effective functioning of the new system."[131] The legislative history of this Act also indicated that OIE "may" set guideline lives at the 30th percentile of the distribution of useful lives. In practice, OIE generally estimated the age at which 30 percent of the value of a vintage of assets was no longer used or retained by its original owner. OIE then sought to determine whether, and to what degree, future economic, technological, or regulatory conditions might cause future useful lives to differ from the measured lives. When an asset guideline class contained several asset types, OIE usually recommended a guideline period which reflected an "average" guideline life computed by using as weights the share of investment in a recent year for each asset group included in the class.

A detailed description of the methods and findings of the empirical studies conducted by OIE is presented in the Appendix to this paper. It may be noted, however, that most of the Revenue Procedures issued under the ADR system were concerned with the creation of new asset classes, the consolidation of existing classes, or with the regrouping of assets (and the revision of lives to reflect the new mix of assets in the affected asset classes), rather than with the upward or downward revision of existing guideline periods based on new estimates of average useful life.[132] In 1973, OIE was transferred from the Internal Revenue Service to the Office of the Assistant Secretary for Tax Policy. OIE effectively ceased operations in 1981 when the Accelerated Cost Recovery System was adopted.

F. The Accelerated Cost Recovery System (1981-1986)

In February 1981, President Reagan forwarded a report to the Congress outlining his "Program for Economic Recovery."[133] In that report, the President identified persistent inflation as a major culprit behind rising tax burdens and lower real rates of return on investments. These factors, in turn, were said to be contributing to a slow rate of net capital formation and a stagnant economy. The existing depreciation system was perceived as being too complex and as offering too little incentive for capital investment, particularly in a period where rapid inflation was reducing the value of depreciation allowances based on historic cost. A major component of the President's program, therefore, was an accelerated cost recovery system for tangible depreciable property modeled on several proposals that had surfaced in the preceding years. The stated objectives of the President's cost recovery proposal were twofold: to simplify depreciation accounting procedures and to raise after-tax business profits.

The Economic Recovery Tax Act of 1981 generally adopted the President's depreciation proposals.[134] The Act established a separate cost recovery deduction under section 168 of the Code, although for legal purposes the cost recovery deductions were deemed to constitute the allowances for depreciation provided under section 167 of the Code. The new system of allowances was entitled the Accelerated Cost Recovery System (ACRS). Like many changes in depreciation policy, ACRS was designed to lower the effective rate of taxation on tangible depreciable investments. It differed from previous changes, however, since the cost recovery periods were not intended to reflect actual useful lives, or even some percentage of the useful lives. Depreciation "facts and circumstances," whether related to individual taxpayers or to industry averages, had little relevance to the design of the system.

1. Recovery Property and Classes

Participation in the system was mandatory for almost all eligible property. Only investment in tangible depreciable property was eligible for ACRS. Property was also excluded from ACRS if it were placed in service before 1981, obtained in certain specified "churning" transactions, or if it were public utility property and the taxpayer did not use a normalization method of accounting. If a taxpayer depreciated property under a method not expressed in terms of years (such as the unit of production method), he could elect to exclude such property from ACRS treatment. Eligible property was known as recovery property.

Unlike the ADR system, which had grown to over 125 different asset classes, only six classes of recovery property were established under ACRS. The recovery periods and cost recovery schedules were the same for both new and used property. ACRS ignored salvage value by allowing taxpayers to depreciate the entire basis of the property.[135] Furthermore, losses on normal retirements were allowed.

The ADR (midpoint) guideline periods, as they existed on January 1, 1981, were designated as "present class lives."[136] These present class lives were used as a basis for classifying recovery property into the six recovery classes:

1. "3-year property" consisted of section 1245 property with a present class life of less than four years, research and experimentation property, and some horses;

2. "5-year property" was recovery property not elsewhere classified;

3. "10-year property" included section 1245 public utility property with a present class life of more than 18 but not more than 25 years, section 1250 property with a present class life of 12.5 years or less, railroad tank cars, manufactured homes, and certain coal utilization property;

4. "15-year real property" was section 1250 property which did not have a present class life of 12.5 years or less;[137]

5. "15-year public utility property" included section 1245 public utility property with a present class life of more than 25 years; and

6. "Low-income housing" was given a 15-year recovery period.

2. ACRS Allowances

ACRS prescribed annual allowances for the recovery of capital costs that were based on the 175 percent declining balance formula (with a switch to the straight-line method) for real property, and the 200 percent declining balance formula (with a switch to the straight-line method) for low-income housing. As originally legislated, annual allowances for the remaining categories were based on the 150 percent declining balance formula (with a switch to the straight-line method) for years 1981 through 1984, the 175 percent declining balance formula (with a switch to the sum-of-years digits method) for 1985, and the 200 percent declining balance formula (switching to the sum-of-years digits method) for 1986 and beyond. Legislation passed in 1982, however, repealed the scheduled 1985 and 1986 phase-in to the more accelerated write-offs, leaving allowances based upon the 150 percent declining balance formula in place.[138] Pre-1981 law had allowed deductions

based on the 200 percent declining balance method for section 1245 property. Thus, for some personal tangible property that was now in the 5-year recovery class -- generally, assets with class lives of less than eight years -- ACRS represented a *reduction* in the present value of deductions.[139] For most assets, however, especially real property and other long-lived assets, ACRS provided a substantial benefit relative to prior law.

The additional first-year depreciation allowance that had been available for the benefit of small business since 1958 was replaced by a provision that allows a limited amount of property to be written off as an expense in the year of purchase.[140] The former six-year minimum useful life provision was removed. However, a dollar limit of $5,000 was imposed, beginning in 1982. This limit was scheduled to increase eventually to $10,000 and was established at that level beginning in 1987. The Tax Reform Act of 1986 denied expensing under this provision for taxpayers having annual investments in tangible depreciable property of $210,000 or more.[141]

ACRS represented a tremendous simplification in tax compliance and administration. This simplification was achieved by completely removing the estimation of useful life and salvage value as issues of contention, by eliminating most asset classification problems that had existed under the ADR system, and by imposing uniform cost recovery schedules. The primary "cost" of these changes was that the ACRS allowances did not reflect the economic loss in the value of assets due to wear and tear and obsolescence. As a consequence, returns on investments in different assets were taxed at different effective rates. Observers noted that ACRS allowances led to increased "tax shelter" activity and to other perceived inequities. Such concerns brought about additional legislation intended to curb "abuses" and eventually persuaded Congress to adopt a modified ACRS in 1986.

As mentioned above, the Tax Equity and Fiscal Responsibility Act of 1982 repealed the scheduled phase-in of accelerated cost recovery schedules. That Act also denied the use of ACRS allowances for property financed with tax-exempt funding.[142] The Deficit Reduction Act of 1984 increased the recovery period for real property by 20 percent to 18 years. It also slowed depreciation for "luxury" automobiles by capping the annual cost recovery, and required straight-line write-offs for certain "listed" property (cars, home computers, and certain other property that lends itself to personal use) unless such property was used more than 50% for business. The 1984 Act also sharply curtailed the availability of accelerated depreciation for property leased to tax-exempt entities, and denied use of ACRS for motion pictures and films.[143]

G. Modified ACRS and ADS (1987-Present)

The growing complexity of the Code and its uneven treatment of different sources of income led in the early 1980s to various proposals for tax reform. In his State of the Union message in January 1984, the President requested from his Treasury Secretary "a plan for action to simplify the entire tax code ... " The Treasury issued a tax reform plan the following November.[144] As part of that plan, the Treasury proposed a "Real Cost Recovery System" (RCRS) which would have substantially modified the existing depreciation rules.[145] It would have established seven classes of assets, four of which contained former ACRS 5-year recovery property. Classification of equipment among these four classes was to be based entirely upon their identified type rather than by industry of use. For example, "Metalworking Machinery" was to be classified to Class 4, "Engines and Turbines" to Class 5, etc. The recovery schedules for the seven RCRS classes were based on the declining balance method using depreciation rates which ranged between 32 percent for Class 1 (former ACRS 3-year property) to 3 percent for class 7 (buildings). The most innovative part of the proposal, however, was that the asset's adjusted basis would be adjusted upward to reflect the

preceding year's average inflation. Thus, the allowances would be based on a contemporary cost basis rather than on a historical cost basis. A close-out deduction was to be allowed once the asset's adjusted basis was reduced to 15 percent of its inflation-adjusted original cost.

The RCRS system was intended to correct the problems associated with the ACRS system. The existing system was seen as incorrectly measuring inflation-adjusted incomes (and thereby adding to investor uncertainty as to the future value of the cost recovery allowances). It also was criticized for creating distortions in investment decisions by taxing alternative investments at different effective rates. Finally, the system was faulted for adding to the complexity of the Code by generating tax shelter activity (leading to the proliferation of anti-abuse rules) and by requiring complex recapture rules.

However, the RCRS system was criticized as not offering the needed degree of investment incentive. Therefore, in submitting a tax proposal to Congress in 1985, the President included a revised cost recovery system with more accelerated schedules relative to RCRS.[146] The number of recovery periods was reduced to six, but the asset-based classification system was kept. The double-declining balance method (with a switch to straight line) was to be used over recovery periods ranging between four and ten years for section 1245 property and 28 years for section 1250 property. Inflation indexing was also maintained. In addition, the President proposed that a formalized process be established within the Treasury Department to study actual depreciation rates and promulgate regulations, when necessary, to reclassify asset-types.

The House-passed Tax Reform bill modified this system slightly.[147] In its "Incentive Depreciation System," it created a ten class system based on the existing ADR midpoint class lives, generally lengthened recovery periods relative to the President's proposal, and substituted straight-line allowances in place of declining balance allowances for real property. The inflation adjustment was also modified so that adjustments were to only cover one-half of the price increase in excess of five percent. The House bill also created a "Nonincentive Depreciation System" using straight-line allowances over ADR midpoint lives. With some modifications, including a shortening of some of the recovery periods, these two depreciation systems were incorporated into the Tax Reform Act of 1986.[148]

1. Incentive Depreciation

The new system partially renewed the traditional connection between the allowed methods of capital cost recovery and the actual depreciation of assets. Known as Modified ACRS, or MACRS, this new system more closely matches actual recovery periods with ADR class lives by having two additional recovery periods (7 and 20 years) for section 1245 property than had existed under the original ACRS. The 1986 Act also generally lengthened the applicable recovery periods by altering the placement of assets into recovery period classes, and created real property recovery periods of 27.5 and 31.5 years. Like ACRS, MACRS is applicable to only tangible property.

Due to a different treatment of the final partial-year allowance, the cost of property under MACRS must be recovered over an additional year compared to the treatment of ACRS property with the same recovery period.[149] However, to partially make up for the repeal of the regular investment tax credit under the 1986 Act, the cost recovery method was accelerated to 200 percent declining balance (with a switch to straight-line) for assets with recovery periods of 10 years or less. The cost of 15- and 20-year property can be recovered using the 150 percent declining balance method. The straight-line method is used for the recovery of the cost of 27.5 year residential rental property and 31.5 year nonresidential real property.

2. Nonincentive Depreciation

The Tax Reform Act also created an Alternative Depreciation System (ADS) that is based on the ADR class life structure. This depreciation system must be used for the purpose of calculating alternative minimum tax income and for certain property deemed ineligible for MACRS depreciation.[150] Assets are generally depreciated under this system by using a straight-line formula with a depreciable life equal to the class life (and no salvage value). However, the depreciation allowance used for computing alternative minimum tax income after 1986 requires that the 150 percent declining balance method (with a switch to straight-line) be used for property not subject to the straight-line method for regular tax purposes.[151]

3. Class Lives and the Depreciation Analysis Division

Under the current system, class lives (generally the former ADR midpoint lives) have a dual function. They are used as the actual depreciable lives under ADS, and are also used to assign recovery periods to assets under MACRS. Under ACRS, most section 1245 property (including property whose classification was in doubt) had been treated as 5-year recovery property. As a result, controversies over the proper classification of assets were few in number. With the creation of ADS, and the fact that most 1245 property is now spread among four recovery periods instead of two, classification issues can be expected to increase in importance. MACRS maintained most of the other simplifications introduced by ACRS.

The Tax Reform Act of 1986 instructed the Treasury Department to establish an office to study the actual depreciation of assets. As originally enacted, the Treasury Department had the authority to promulgate changes in existing asset classifications or class lives, and to prescribe class lives for assets that have no class life. The Act specified that class lives recommended by Treasury "must reflect the anticipated useful life, and the anticipated decline in value over time, of an asset to the industry or other group."[152] The useful lives of assets were no longer intended to measure the average retention period in the hands of a single taxpayer, but rather the average retention period over all users in the industry. The Technical and Miscellaneous Corrections Act of 1988, however, repealed Treasury's authority to promulgate changes in class lives. Instead, Treasury is to continue to study the actual depreciation of assets, but report its findings to Congress.[153]

The Depreciation Analysis Division of the Office of Tax Analysis was established in September 1987 to carry out the mandate to study the depreciation of assets and, when appropriate, to recommend changes in class lives and asset classifications. The *General Explanation of the Tax Reform Act of 1986* suggested that the depreciation practices of taxpayers for financial accounting purposes, and the duration of property leases, service contracts, and loans be considered in making these determinations. The *General Explanation* also suggested that resale price data, adjusted for inflation, might be used as evidence of the decline in value of assets over time, and provided a formula for determining a class life from the measured decline. Under this formula, the suggested class life is that straight-line life which yields the same present value as the measured economic depreciation.[154]

4. Neutrality

These changes in depreciation policy, along with the elimination of the investment tax credit, were motivated by a desire to provide a capital recovery system that was "neutral" with respect to different depreciable assets. A "neutral" tax system provides equal effective tax rates on accrued

income for all investments, for a given set of after-tax rates of return. To achieve a higher degree of neutrality, the current system calls for industry-specific class lives that are reflective of the anticipated average economic decline in value of assets. Of course, any system which relies on average industry-specific lives will introduce nonneutralities due to variations in asset values across individual taxpayers in a given defined industry group. Presumably, such variations are of a second order of importance relative to the inter-industry differences in asset characteristics. Deductions under ADS, which are based on class lives, are thus intended to approximate actual average economic depreciation, while the differences between the MACRS and ADS deductions are intended to provide a gross correction for inflation and a degree of incentive for investment.

H. Targeted Depreciation Policies (1969-Present)

The same political atmosphere that allowed depreciation policy to move away from an emphasis on the measurement of individual net income also contributed to the use of depreciation allowances for the furtherance of macroeconomic countercyclical goals and of other specific social or political goals.

1. Depreciation as a Countercyclical Policy Instrument

The introduction of accelerated depreciation allowances in 1954 was intended by many as a permanent investment incentive. However, by restricting the availability of accelerated depreciation to tangible property with a useful life of three years or more, the 1954 Code had reinforced the idea of targeting investment incentives through the depreciation system.

By the mid-1960s, the idea that the present value of depreciation allowances could be used as a tool to control short-run aggregate demand had become acceptable. The introduction of the guideline lives in 1962 were intended, in part, to help stimulate the economy. However, the most transparent use of depreciation as a countercyclical fiscal tool occurred in 1966. In that year, accelerating inflation rates and low unemployment rates were indicative to policy makers that fiscal "restraint" was needed. The investment tax credit, which had been introduced in 1962 as a permanent incentive for tangible equipment investment, was suspended in October 1966. The use of accelerated depreciation methods for real property not eligible for the investment tax credit, was suspended at the same time. Originally scheduled to last until December 1967, the suspension period was lifted in March 1967, in part because of a (temporary) weakening in economic indicators. It had also become apparent that much investment activity would be delayed as the end of the suspension period approached, perhaps precipitating a recession in the meantime.

The Congress and the Administration were faced with a similar "overheated" economy in 1969, and the investment tax credit and accelerated depreciation allowances were again viewed as being counterproductive to the "tight" monetary and fiscal policies then being pursued. This time, however, Congress repealed the investment tax credit (only to reinstate it again in 1971) and permanently curtailed accelerated depreciation on section 1250 property (which generally was not eligible for the investment tax credit). Beginning in July 1969, depreciation on new section 1250 nonresidential property was limited to either the straight-line or 150 percent declining balance methods. Depreciation on used section 1250 property was limited to either the straight-line method (if nonresidential) or the 125 percent declining balance method (if residential with a useful life of 20 years or more). Only new residential properties could continue to be depreciated using the double declining balance or the sum-of-years digits methods.

A countercyclical policy rationale was less evident in 1971 during the adoption of the ADR system. Nevertheless, unemployment rates throughout 1971 were at recessionary high levels, a fact not lost on policy makers. The Treasury reported,

> ADR is being adopted at an appropriate time; sufficient supply resources exist and an accommodating monetary policy is in effect. Thus, the increased investment will be converted to increased GNP, increased employment, and higher tax revenues.[155]

These perceived short-run economic effects were a secondary consideration in the Treasury's justification of the ADR system, however. The major reasons given for adoption of the ADR system were (1) an anticipated improvement in the administration of the depreciation system, and (2) the need to recognize the technological and international competitive changes that had occurred since 1962.

Introduction of the ACRS system was similar to that of the ADR system in that unemployment rates were at historic highs, and an additional investment incentive was thought desirable. However, the incentive offered by ACRS was not generally viewed as a short-term countercyclical measure, but rather as a longer term inducement for investment and as an enormous simplification of depreciation law.

2. Promoting Specific Social Policies

The Tax Reform Act of 1969 ushered in a era of using depreciation allowances for promoting specific non-tax policy objectives. While rapid amortization and expensing rules had been used extensively before (for example, with respect to research and experimental expenditures, trademark expenditures, etc.), those provisions were generally concerned with the accounting treatment of nondepreciable intangible property, depletable assets, or assets whose depreciable status was questionable.[156] The 1969 Act introduced a new policy that targeted investment incentives and disincentives by directly varying the allowed degree of acceleration of deductions for specific items of depreciable property. For example, the 1969 Act established rapid depreciation and amortization rules for certain pollution control facilities, low income housing rehabilitation expenditures, railroad rolling stock, and certain coal mine safety equipment. Additional incentive write-offs were introduced during the 1970s. These are listed in Table 1.[157] Most of these incentive write-offs were temporary provisions which have since expired or been repealed. Today, only the amortization of certain pollution control expenditures and the expensing of expenditures for the removal of barriers to the handicapped and elderly remain.

Special provisions have also been introduced into the Code in order to discourage tax shelter activity or to further non-tax policy objectives. For example, part of the reason for the cutback in accelerated depreciation for buildings in that year was Congress' belief that such depreciation was encouraging real estate tax shelters. Between 1976 and 1981, a building constructed on the site of a demolished or substantially altered certified historic structure was limited to straight-line write-offs over its useful life.[158] Energy policy goals in 1978 led to a similar restriction on the depreciation of boilers fueled by oil and gas.[159] Since 1981, property used predominantly outside the United States has been allowed less favorable depreciation deductions than domestically sited property.[160]

Table 1
Targeted Depreciation Incentive Provisions

Current Code Section	Targeted Property	Allowed Deduction	Applicable Years
169	Pollution Control Facilities	Straight-line over 60 months[a]	1969-Present
167(k)	Rehabilitation Expenditures for Low-Income Rental Housing	Straight-line over 60 months	1969-1986
184	Railroad Rolling Stock	Straight-line over 60 months	1970-1975
187	Certain Coal Mine Safety Equipment	Straight-line over 60 months	1970-1975
188	Child Care Facilities On-the-Job Training Facilities	Straight-line over 60 months	1972-1981 1972-1976
190	Removal of Architectural and Transportation Barriers to the Handicapped and Elderly	Expensed	1977-1982, 1984-Present
191	Rehabilitation Expenditures for Certified Historic Structures	Straight-line over 60 months	1976-1981
167(o)	Substantially Rehabilitated Historic Property	Treat as new section 1250 property.	1976-1981

[a]The amortizable basis of corporate property eligible for rapid amortization under section 169 was reduced by 15 percent beginning in 1983. This percentage was changed to 20 percent beginning in 1985.

I. Tax Preferences and the AMT (1969-Present)

Although the Tax Reform Act of 1969 had introduced several new depreciation-related tax benefits, that Act was nevertheless primarily concerned with restricting the use of tax preferences which had allowed some taxpayers to pay little or no income tax.[161] To this end, Congress introduced the add-on minimum tax on tax preferences for taxable years ending after 1969.[162] This tax imposed a 10 percent tax on the amount of tax preferences that exceeded the sum of (i) $30,000 and (ii) the amount of regular tax paid. As originally formulated, regular taxes not used to offset tax preferences could be carried forward as offsets for seven years.

1. Depreciation Deductions as "Tax Preferences"

The list of tax preferences included several depreciation items. Accelerated depreciation on section 1250 property (including the rapid amortization of low-income housing rehabilitation expenditures) was viewed as a tax preference. The amount of the preference was equal to the excess of the depreciation allowance over the deduction that would have been allowable if the straight-line method had been used over the useful life of the property. The calculation was to be performed separately for each item of property. Consequently, the excess of the straight-line depreciation over the accelerated allowances in the later years of an asset's life could not be used to offset other preferences.

The preference on personal property was computed in the same manner, but only accelerated depreciation on personal property subject to a "net lease" was considered a preference item.[163] This preference did not apply to corporations (other than subchapter S corporations, and personal holding companies). Amendments passed 1976 broadened this preference in two respects. First, all non-corporate leased property was included, not just assets subject to "net" leases. Second, the amount of the preference was to be determined by reference to straight-line allowances over the ADR midpoint lives, rather than the regular useful lives.

Additional depreciation-related preferences included rapid amortization for certified pollution control facilities and railroad rolling stock. Amortization of employer-provided child care and on-the-job training facilities were added in 1971. In each of these cases, the preference equaled the amount by which the amortization deduction exceeded the regular depreciation deduction.[164] The railroad rolling stock and employer-provided facilities preferences were deleted beginning in 1983.[165]

The minimum tax could substantially reduce the value of depreciation allowances. For taxpayers not subject to the add-on minimum tax with positive regular tax liability, an additional dollar of accelerated depreciation reduced tax liability by an amount equal to the applicable marginal tax rate. For taxpayers subject to the minimum tax with positive regular tax liability, however, the marginal reduction in tax liability was reduced to 90 percent of the marginal tax rate, less 10 percent of the percentage difference between the accelerated depreciation rate and the applicable reference rate.[166] Thus, for a corporation facing a 48 percent tax rate (ignoring the corporate surtax in existence in 1970) the marginal after-tax value of a dollar of accelerated depreciation would have fallen from 48 cents to a value between 33.2 and 43.2 cents if that corporation were to find itself subject to the add-on minimum tax.

The Tax Reform Act of 1969 also introduced a maximum rate of tax on earned (personal service) income. While the highest tax rate on other income remained at 70 percent, the maximum rate of tax on wages, self-employment income, and other personal service income (including pension income after 1976) was 60 percent in 1970 and 50 percent thereafter. The amount of earned income eligible for the maximum tax was reduced by the share of a taxpayer's deductions allocable to earned income and by the amount of tax preferences in excess of $30,000. The Tax Reform Act of 1976 removed the $30,000 exemption from the tax preference offset. Thus, accelerated depreciation would result in added tax on earnings for an individual subject to the maximum tax on earned income. The maximum tax rules were repealed in 1981.

The Tax Reform Act of 1976 increased the rate of minimum tax to 15 percent and lowered the preference exemption level for corporations to the larger of $10,000 or the regular tax liability. In addition, the carryforward of ordinary tax offsets was eliminated. These changes were effective for taxable years ending after 1975.

2. The Alternative Minimum Tax

The add-on minimum tax for individuals was repealed in 1982, but was maintained for corporations. At that time, the alternative minimum tax (AMT), originally introduced by the Revenue Act of 1978, was changed to incorporate depreciation-related (and other) tax preferences.[167] Any positive excess of the AMT over the regular tax constituted an additional tax liability. The AMT was based on an alternative measure of taxable income, computed using an individual's adjusted gross income, reduced by certain itemized deductions and increased by the amount of tax preferences. A flat rate of 20 percent was applied to this income measure, starting at $40,000 (for a joint return).

The Tax Reform Act of 1986 substantially altered the computation of the alternative minimum tax for years after 1986.[168] The AMT was applied to corporations as well as to individuals, and the corporate add-on minimum tax was repealed. The depreciation tax preference was no longer a simple add-on for property placed in service after 1986 under MACRS. Instead, for such property, a separate AMT depreciation accounting system must be maintained for computation of "alternative minimum tax income." For property put in place after 1986, the ADS class lives are to be used with the 150 percent declining balance method (straight-line for real property). This new approach takes into account the fact that AMT depreciation allowances in the later years of an asset's class life exceed the regular depreciation allowances.

Beginning in 1990, calculation of corporate AMT income requires an adjustment based on "adjusted current earnings," or ACE. Additional depreciation rules have been devised for the computation of ACE. For example, the depreciation deduction for property placed in service after 1989 must be determined under either ADS or the method used by the firm for non-tax accounting purposes. The method that yields deductions with a smaller present value must be used. Other rules apply to property placed in service prior to 1990.

The AMT and ACE rules for property placed in service after 1989 are summarized in Table 2. That table also lists the depreciation accounting requirements for computing regular tax liability and corporate earnings and profits. It shows that, in principle, a different set of depreciation accounts must be maintained for each of the separate required systems of accounts.

IV. Summary

In 1913, when the modern U.S. income tax was enacted, there had been little experience with depreciation accounting outside the regulated transportation and communications fields. Consequently, the depreciation standards set by the Bureau of Internal Revenue played an important role in fostering the adoption of depreciation accounting in the manufacturing sector and elsewhere. As the tax depreciation system developed, however, it became clear that without an active administrative role by the Treasury Department, taxpayers were going to be very conservative in their choice of useful lives and salvage values. The Bureau adopted a more active role in auditing these variables beginning in 1934. Nevertheless, attempts by a revenue agents to impose useful lives based on average asset retirement histories met with only partial and uneven success; most taxpayers before 1962 continued to use lives shorter than the *Bulletin "F"* lives.[169]

Table 2
Depreciation Rules to be Used for
Property Placed in Service After 1989

Asset Type	Accounting Purpose			
	Regular Taxable Income	**Alternative Minimum Taxable Income**	**ACE Adjustment for Computing AMTI[a]**	**Earnings and Profits[a]**
Tangible Property				
Section 1245 Property	MACRS	ADS, with 150% Declining Balance Method	ADS or Book Method	ADS
Section 1250 Property	MACRS	ADS	ADS or Book Method	ADS
ADS Property[b]	ADS	ADS	ADS or Book Method	ADS
Intangible Property and Other Property Excluded From MACRS[c]	§ 167 Method	§ 167 Method	§ 167 Method or Book Method	§ 167 Method

[a]Corporations only.

[b]Includes foreign use property, tax-exempt use property, tax-exempt bond financed property, certain imported property, and property for which ADS was elected.

[c]Includes property depreciated under the unit-of-production or similar method, public utility property for which the taxpayer fails to use a normalization method of accounting, films, video tapes, and sound recordings. Except for the first category of property mentioned, the applicable § 167 method generally requires use of the straight-line method over the asset's useful life.

This experience made it clear to policy makers in the Treasury Department that standardized techniques for setting useful lives and salvage values were needed. The issuance of the guideline procedures in Revenue Procedure 62-21 provided the first real attempt at standardizing the process by which useful lives would be chosen. The net result of the depreciation guidelines experience, however, was the acceptance by the Treasury Department and Congress of industry-wide standard lives as a reasonable compromise between a policy based on individual "facts and circumstances" and administrative practicality. This compromise focused on industry-standard lives and was formulated as the Asset Depreciation Range system in 1971.

These attempts to create an administratively practical system combined with an increased sophistication in the analysis of the determinants of investment behavior to lead to demands for an ever greater acceleration of depreciation deductions and an increased willingness to forego the economic income tax standard in order to reduce the investment disincentives created by a tax on capital income. These demands climaxed in 1981 with the adoption of ACRS. However, while the depreciation system was approaching a consumption tax standard, most of the remainder of the Code was not. This situation allowed opportunities for tax arbitrage, and tax practitioners were quick to take advantage of those opportunities. With the lack of a single tax policy standard, Congress proceeded to identify tax "loopholes" and "shelters," but was only willing to pass legislation that discouraged the "abuse" of tax preferences, rather than to repeal the preferences outright or to adopt a consumption-based tax standard. Depreciation policy was in the forefront of this battle, which culminated in the passage of the Tax Reform Act of 1986.

Conflicting tax policy goals have thus led to an "uneasy compromise" which is reflected in the use of MACRS "incentive" depreciation, ADS "nonincentive" depreciation, and the continued demand for an AMT and other rules to provide a check on perceived tax "abuses."[170] While depreciable lives, methods, and accounting rules have become standardized, the complexity and compliance burden of the system has increased in other ways.

Appendix: Summary Of OIE Studies

I. Introduction

This Appendix summarizes the results obtained in studies of the useful lives of assets conducted by the Office of Industrial Economics (OIE). Only those studies which attempted to measure actual useful lives are reported; other studies which, for example, simply examined the lives taxpayers were using to depreciate their assets for tax purposes are not reported. The data and methods used by OIE for estimating the useful lives are also reviewed. The useful life which OIE generally sought to measure was the retention period, or length of time assets were held by firms. The survey questionnaires used to obtain this information generally instructed the respondents to ignore assets which were not in current service, even though the firm may not have actually disposed of the assets.

OIE conducted a total of 46 studies between 1971 and 1981. Of these 46 studies, 27 provided estimates of useful lives based on evidence of the actual retention periods for the assets examined. One study, that of assets used in the machine tool industry, used resale prices of used assets to estimate economic depreciation. These 27 studies are summarized in Appendix Table 1. Most of the other 19 studies recommended class lives based on the useful lives as reported on tax returns. In a few cases, where the industries that were being studied employed new technologies, and there were no historical data relating to the useful life, OIE based its estimate of useful life on the lives of assets which were considered similar to those being studied. For example, the useful life of waste reduction plants was estimated by reference to the lives of assets used in production of pulp and paper, steam and electricity, and manufactured gas, as these activities were considered to utilize similar technologies.

Asset mortality studies, such as are described here, can only indicate historical retirement practices. Recognizing that many changes in assets and in economic conditions can take place within an asset group's life cycle, OIE frequently adjusted their statistical results to account for perceived influences of technological change, market conditions, and other factors. Thus, the recommended lives often diverged from the purely statistical measures of mean, median, or 30th percentile lives obtained from the asset retirement studies.

II. Methods Used by OIE

Four methods were used by OIE to estimate useful lives of assets: the survivor curve method, the turnover method, the asset survival ratio method (ASRM), and the asymptotic retirement or investment ratio method. Each method requires different information in order to estimate useful lives. OIE sought to utilize methods using relatively limited data in order to reduce the burden placed on the survey respondents. In some cases, only certain data may have been available, thus forcing OIE to use analytical methods consistent with the available data. The specific methods used by OIE to estimate useful lives are described in this section.

Appendix Table 1
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
An Analysis of Telegraph, Ocean Cable and Satellite Communications Assets (Aug. 1972)	Service life data from FCC filings/ averaging of reported asset longevities	Electrical power generating and transmission	19.2 years
		High frequency and microwave systems	13.1 years
		Cable and long-line systems	26.6 years
		Central office control equipment	16.4 years
		Computerized switching, channeling and associated equipment	10.7 years
		Satellite ground segment property	10.2 years
		Satellite space segment property	7.8 years
		Equipment installed on customers' premises	10.0 years
		Support and service equipment	13.6 years
Motor Vehicles (May 1973)	Asset acquisition & retirement data/ 20-year survivor curves	Assets other than special tools	12.7 years
		Special tools	2.5 years

Appendix Table 1 (Page 2)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
A Study of Subsidiary Assets Used in the Production of Whiskey (July 1973)	1971 retirement data/ simple averaging	Whiskey barrels	5 years
Report on Depreciation and Repair Cost Study of U.S. Shipbuilding Industry Capital Assets (Aug. 1973)	1952-71 asset addition and retirement data/ survivor curves, asymptotic method	Machinery and equipment	12 years
		Dry docks	15 years
		Buildings	25 years
		Overall	14 years
An Analysis of Nuclear Fuel used by Electric Utilities (Sept. 1973)	Average fuel assembly lives between 1969-81	Fuel assemblies	4.3 years
An Analysis of the Special Tooling Used in the Manufacture of Metalworking Machinery (Jan. 1974)	Asset retention data/ average of stated retention periods	Special tools	5.5 years
Manufacture of Glass Products (March 1974)	1967-71 asset balance and acquisition data/ turnover method	All refractory assets	4 years
		Subsidiary assets	2 years
Economic Depreciation in the Machine Tool Industry (by Carl R. Biedleman under OIE contract), (Sept. 1975)	1965-73 asset acquisition & disposal prices/adjusted used asset prices regressed on time variables to estimate economic depreciation rates	Assets used in the production of machine tools (weighted average; individual asset lives also estimated)	18 years

Appendix Table 1 (Page 3)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
Anticipated Economic Useful Lives of Commercial Transport Aircraft and Airline Ground Property (Dec. 1975)	Aircraft: averaging of ages upon disposition Ground property: 1965-74 asset acquisition, disposition and balance data/turnover method.	Jets/post-piston aircraft	12 years
		All aircraft	10.7 years
		Ground property	18.6 years
The Textile Industry: A Study of Capital Investment, Technology and other Factors, Affecting Prescribed Capital Recovery Allowances of Textile Machinery (Feb. 1976)	1973-74 asset balance data by vintage/ASRM	Assets used in production of:	
		Total textiles	17.2 years
		Textured yarn	13.4 years
		Knitted goods	7.8 years
		Knitwear and knit products	10.2 years
		Textile mill products except knitwear	20.0 years
		Spun yarn and thread	17.8 years
		Carpets, rugs and tufted products	13.0 years
		Non-woven fabrics	22.5 years
		Woven fabrics	22.8 years
		Finished textile products	13.3 years

Appendix Table 1 (Page 4)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
The Textile Industry (cont.)		Dyeing and finishing of textile products	12.7 years
Depreciation and Repair Cost Study For Assets Used in the Manufacture of Metalworking Machinery (June 1976)	1958-72 asset retirement data/ survivor curves	Assets used in production of:	
		All metalworking machinery (SIC 354)	25 years
		Machine tools, metal cutting types (SIC 3541)	28 years
		Machine tools, metal forming types (SIC 3542)	30 years
		Special dies, die sets, jigs & fixtures (SIC 3544)	26 years
		Machine tool accessories & measuring devices (SIC 3545)	30 years
		Metalworking machinery, except machine tools & power-driven hand tools (SIC 3548)	17 years

Appendix Table 1 (Page 5)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
A Study of Factors Affecting Prescribed Capital Cost Recovery Allowances of Aerospace Manufacturing Machinery (July 1976)	1973-74 asset balance data by vintage/ASRM	Assets used in production of:	
		All aerospace products	17 years
		Aircraft	25 years
		Missiles and spacecraft	12 years
		Avionics	11 years
		Turbines	13.5 years (median)
A Report of a Study on Depreciation Factors Affecting Assets Used in the Manufacturing of Pulp and Paper (Sept. 1976)	1972-73 asset balance data by vintage/ASRM	Assets used in production of:	
		Pulping assets (non-integrated)	13.6 years
		Paper and paperboard (non-integrated)	24.1 years
		Paper and paperboard (integrated)	17.9 years
		"Conversion" assets (integrated)	13.4 years
		Pollution control facilities	20.0 years
		Manufacturing buildings	25.0 years

Appendix Table 1 (Page 6)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
Assets Used in the Manufacturing of Pulp and Paper (cont.)		Industrial steam and electric generation and distribution	12.0 years
Study of ADR Class 35.2, Manufacture of Other Machines (Jan. 1977)	1962-74 asset acquisition and retirement data asymptotic method	All assets, including special tools	11.4 years
		Machinery & equipment	13.1 years
		Special tools	7.9 years
Depreciation and Repair Cost Study For Assets Used in the Manufacture of Fabricated Metal Products (April 1977)	Survivor curves for 15 vintages of assets (1958-72)	Assets used in production of:	
		All products	30 years
		Metal furniture and fixtures (SICS 2514, 2515, 2522, 2531, 2542, 2571, 2599)	19 years
		Metal cans (SIC 3411)	20 years
		Cutlery, handtools, hardware (SICS 3421 3423, 3425, 3429)	25 years
		Plumbing and non-electric heating (SICS 3431, 3432, 3433)	16 years

Appendix Table 1 (Page 7)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
Assets Used in the Manufacture of Fabricated Metal Products (cont.)		Fabricated structural steel (SICS 3441)	22 years
		Metal doors, sash, trim (SIC 3442)	18 years
		Other structural metal products (SICS 3443, 3444, 3446, 3449)	30 years
		Screw machine products, bolts (SICS 3451, 3452)	25 years
		Metal stampings (SIC 3461)	18 years
		Metal services n.e.c. (SICS 3471-3479)	23 years
		Fabricated wire products (SIC 3481)	40 years
		Other fabricated metal products (SICS 3491-99)	25 years
		Motor vehicle bodies (SICS 3712-3713)	28 years
		Motor vehicle parts & accessories (SIC 3714)	32 years

Appendix Table 1 (Page 8)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
A Study of Factors Affecting Prescribed Capital Cost Recovery Allowances of Steel Industry and Foundry Equipment (Oct. 1977)	1974-75 asset balance data by vintage/ASRM	Steelmaking	27 years
		Foundry	18 years
A Report of a Study on Depreciation Factors Affecting Assets Used in Industrial Steam and Electric Generation and/or Distribution (Jan. 1978)	1973-75 asset balance data by vintage/ASRM	Boilers (weighted average)	26 years
		Field-erected boilers	35 years
		Package boilers	20 years
		Waste reduction and resource recovery assets	13.6 years
The Chemicals and Allied Products Industry (Dec. 1978)	1974-75 asset balance data by vintage/ASRM, asymptotic method	Using ASRM:	Mean: 16.6 years Median: 12.5 years
		Using asymptotic method:	15 years
The Electrical and Electronic Industries (June 1979)	1974-75 asset balance data by vintage/ASRM	Assets used in production of:	
		Electro-mechanical products	15.1 years (median retention period)
		Electronic products	8.3 years (median retention period)

Appendix Table 1 (Page 9)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
The Manufacture of Professional, Scientific and Controlling Instruments (July 1979)	1974-75 asset balance data by vintage/ASRM	Assets used in production of:	
		Mechanical and electric instruments and dental, medical and opthalmic equipment and supplies	14.1 years
		Manufacture of electronic instruments	11.5 years
Distributive Trades and Services Industries: Wholesale and Retail Trade, Personal and Professional Services (Sept. 1979)	1960-73 asset balance and retirement data/ turnover method	Overall	10.4 years
		Services	11.0 years
		Wholesale/retail trade	10.1 years
Depreciation and Repair Cost Study For Assets Used in the Construction Industry and assets used in Offshore Oil and Gas Drilling (Oct. 1980)	1966-73 data/turnover method	Construction assets	10 years
		Offshore assets	11 years
Useful Lives of Automobile Manufacturing Assets (Dec. 1980)	1960-79 asset balance & purchase data/turnover method	Assets other than special tools	21 years
		Special tools	5 years

Appendix Table 1 (Page 10)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
A Study of the Useful Life and Allowance Percentage for Assets Used in the Manufacture of Glass Products (July 1981)	Asset balance data; sources, years unknown/ turnover method	Assets used in production of:	
		Flat glass	20.2 years
		Glass containers	16.4 years
		Pressed & blown glassware	11.8 years
		Fiberglass products	21.3 years
Report on the Useful Life of Assets Used to Manufacture Fabricated Rubber Products and Finished Plastics Products (July 1981)	1960-79 asset balance data/turnover method	All assets	14 years
		Assets used in the production of:	
		Tire & tube, excluding special tools	17 years
		Special tools for tire and tube production	6 years
		All tire & tube	15 years
		Fabricated rubber (excluding special tools)	13 years
		All fabricated rubber	13 years

Appendix Table 1 (Page 11)
Summary of OIE Depreciation Studies

Title of Study	Data/Methods	Assets Studied	Estimated Mean Retention Period (unless otherwise indicated)
Assets Used to Manufacture Fabricated Rubber Products and Finished Plastics Products (cont.)		Assets used in the Production of:	
		Finished plastics products	14 years
		Special tools for fabricated rubber	7 years
		Special tools for finished plastics products	9 years
Useful Lives of Non-Automobile Motor Vehicle Manufacturing Assets (Aug. 1981)	1960-79 annual gross assets, asset purchases/ turnover method	Overall	18.2 years
		Assets other than special tools	19.4 years
		Special tools	8.3 years
Useful Lives of Telecommunications Common Carrier Assets (Dec. 1981)	1928-78 data/survivor curves	Satellites	5 years
		Electronic equipment	20 years
		Transmission structures	58 years
		Switching station equipment	48 years

A. The Survivor Curve Method

A survivor curve shows the proportions of an initial set of assets that are still in use at various ages. Both the "survivor curve" method and the "asset survival ratio" method are intended to generate survivor curves from which median and mean asset service lives can be derived. The former method focuses on the actual retirement histories of assets of one or more given vintages.[171] The latter method (described below in subsection C) estimates retirement probabilities by investigating asset retirements from several asset vintages at either a single point in time or over a small band of years.

Two kinds of data can be used to generate a survivor curve under the survivor curve method: the number of units surviving at each age for assets of a given vintage, expressed as a fraction of the original number of units in the vintage, or the original gross value of those assets of a given vintage which remain in use at various ages, expressed as a fraction of the total original value of the entire vintage of assets placed in service. However, whether one uses units or original cost to derive a survivor curve, the required data is available only if firms have kept "vintage accounts" which list asset balances by year of acquisition.

Appendix Table 2
Survivor Curve Example

Age (1)	Survival Probability (2)	Marginal Retirement Probability (3)	Weighted Ages (4)
1	1.0000	.0489	.0489
2	.9511	.0858	.1716
3	.8653	.1100	.3300
4	.7553	.1246	.4984
5	.6307	.1307	.6535
6	.5000	.1307	.7842
7	.3693	.1246	.8722
8	.2447	.1100	.8800
9	.1347	.0858	.7722
10	.0489	.0489	.4890
Sums:	5.5000	1.0000	5.5000

If the survivor curve does not extend to zero (i.e. if not all of the assets of a vintage have been disposed of or retired), a "stub", or partial survivor curve can be plotted. The median retention period for each vintage is determined by finding the age at which 50 percent of the original group is still in use. When applying the "30th percentile" rule under this method, OIE determined the age at which 30 percent of the assets remained in use. Provided that a stub survivor curve extends below the desired percentile, speculation as to the shape of the full curve is unnecessary. However, to determine the mean (average) retention period, it is necessary to extrapolate the stub curve to zero

For example, the 1908 vintage of locomotives were entirely retired within 32 years, with an average service life of about 27 years. However, of 147 locomotives acquired in 1906, 144 were still in service after 40.5 years.[75]

The method may be further illustrated through use of the 1887 and 1888 locomotive vintage data, for which full survivor curves are obtainable. Appendix Figure 1 shows the survivor curves for locomotives acquired in 1887 (right curve) and 1888 (left curve). The curve for the 1887 vintage shows the percentage of the 27 locomotives acquired in 1887 that survived to each of the ages shown on the horizontal axis. The curve for the 1888 vintage shows the percentage of the 104 locomotives acquired in that year which survived to each age; the larger sample size suggests that the results for this vintage might be more representative. The mean life of the 1887 vintage locomotives is 45.3 years, and the median life 48 years. For the 1888 vintage, the mean life is 38.5 years, and the median life 37 years. However, since retirement records were available only beginning in 1918, both curves were derived under an assumption that zero retirements occurred during the first 30 years. Thus, one might suspect that the service life estimates obtained from these survivor curves are biased upwards to an unknown extent.

B. Turnover Method

The turnover method generates an estimate of the useful life of a group of assets by determining the number of years of asset acquisitions that are required to accumulate to the level of the current stock of such assets. The method may also be used with information on asset dispositions. The turnover method provides an approximation of the useful life when much less detailed information than would be required for the survivor curve method is available. It only requires a knowledge of the current capital stock and a history of prior asset acquisitions (or all prior year capital stocks and a history of asset dispositions). The validity of the turnover method is based on the assumption that all assets acquired each year have the same useful life, say, ten years. If assets are measured by their gross value, the method also assumes that inflation is negligible. Under these assumptions, the capital account balance (which reports the gross asset value of the current stock of capital) equals the total of the investments made over the most recent ten years, since any assets acquired prior to this period will (by assumption) have been retired. This holds whether the capital account is growing, shrinking, or at a steady level.

It is not likely that all the assets acquired have precisely the same useful life. However, if there is no growth or shrinkage in the capital account, the turnover method is still valid, provided the actual retirement distribution is fixed and symmetric around the mean retirement age. This is because the newer assets in the capital account which are retired from service before their mean useful life are offset by the older assets which remain in the capital account longer than their mean useful life. Under these conditions, the mean life of all of the assets in the capital account equals the "turnover period", or the number of previous years of investment which must be summed to obtain the current capital account balance.

To illustrate this method, consider its application for a firm with a steady capital account and a symmetric distribution of retirements. For example, assume assets are retired according to the marginal retirement probability pattern shown in Appendix Table 2. Under a no-growth scenario, assets are acquired at the beginning of year 1, and each dollar of assets retired is replaced by a dollar of new investment at the end of each year. This pattern implies that after ten years the account has some assets in each age group. The level of retirements becomes fairly steady after twenty years. The account balance, annual retirements, and investment are shown in the left portion of Appendix Table 3 for years 21 through 26.

Appendix Table 3
Turnover Method Example
(End of Year Values)

Year	Static Account			Growing Account (5% Per Year)		
	Account Balance	Retirements	Investment	Account Balance	Retirements	Investment
21	$ 100.00	$ 18.07	$ 18.07	$ 278.60	$ 44.35	$ 57.62
22	100.00	18.21	18.21	292.53	46.70	60.63
23	100.00	18.25	18.25	307.15	49.08	63.70
24	100.00	18.24	18.24	322.51	51.52	66.88
25	100.00	18.21	18.21	338.64	54.07	70.20
26	100.00	18.18	18.18	355.57	56.75	73.68
		Sum, Years 22-26:	91.09		Sum, Years 22-26:	335.09
		Sum, Years 21-26:	109.16		Sum, Years 21-26:	392.71

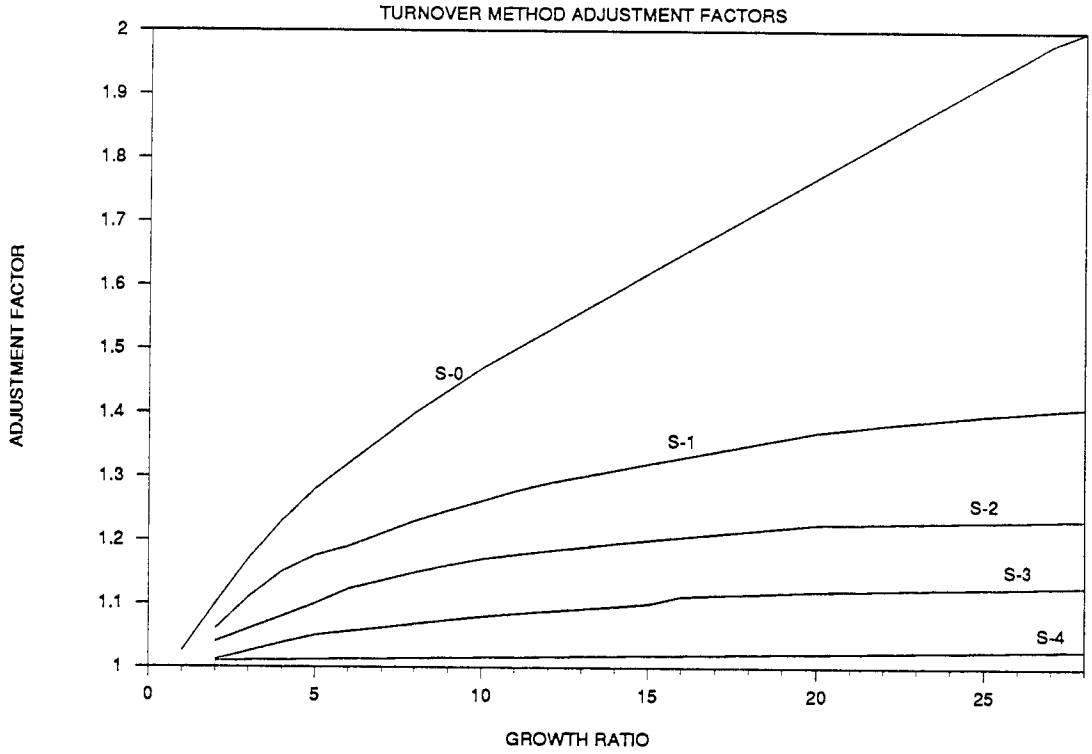
The turnover period for the static account is found by determining the number of years of investment required to achieve the current (year 26) account balance. The sum of investments made at (the end of) years 26, 25, 24, 23 and 22 is $91.09, which is less than the year 26 balance. The sum of the previous six years investments is $109.16. Clearly the turnover period is between 5 and 6 years. Indeed, the difference between the current asset balance and sum of investments over a most recent five year period is $8.91, which is approximately one-half of the investment in year 21, the sixth prior year. Hence the turnover method indicates that the mean life of the assets in this account is 5.5 years.

The turnover period is not an accurate estimate of mean life when the capital account is growing or shrinking, because the short-lived portion of the newer assets are not balanced by the long-lived portion of the older assets. In a growing account, there are more short-lived assets of the newer vintages than there are long-lived assets of the older vintages. With a growing account, the turnover method thus results in a turnover period shorter than the actual mean useful life.

When the capital account is growing or shrinking, the useful life as estimated by the turnover method must be adjusted by a "correction factor." The size of the correction factor depends on both the asset retirement distribution and the rate of growth or shrinkage of the capital account. For example, the right side of Appendix Table 3 shows the capital account when the account balance is assumed to grow 5% per year. Although we know the mean asset life is 5.5 years, the turnover method yields an estimate of 5.36 years for the average service life (5 + ($355.57 - $335.09)/$57.62). Because this example was constructed using the same fixed 5.5 year asset life, the required correction factor is 5.50/5.36 or 1.03. A table of correction factors can thus be derived for various assumed

retirement distributions. Appendix Figure 2 shows the correction factors based on the assumption that the distribution of useful lives follows a Iowa type "S" curve.[176] Appendix Figure 3 shows three Iowa type "S" asset survival probability curves. Appendix Figure 4 shows the retirement frequency distribution (marginal retirement probability) curves that correspond to the survivor curves shown in Appendix Figure 3.

APPENDIX FIGURE 2



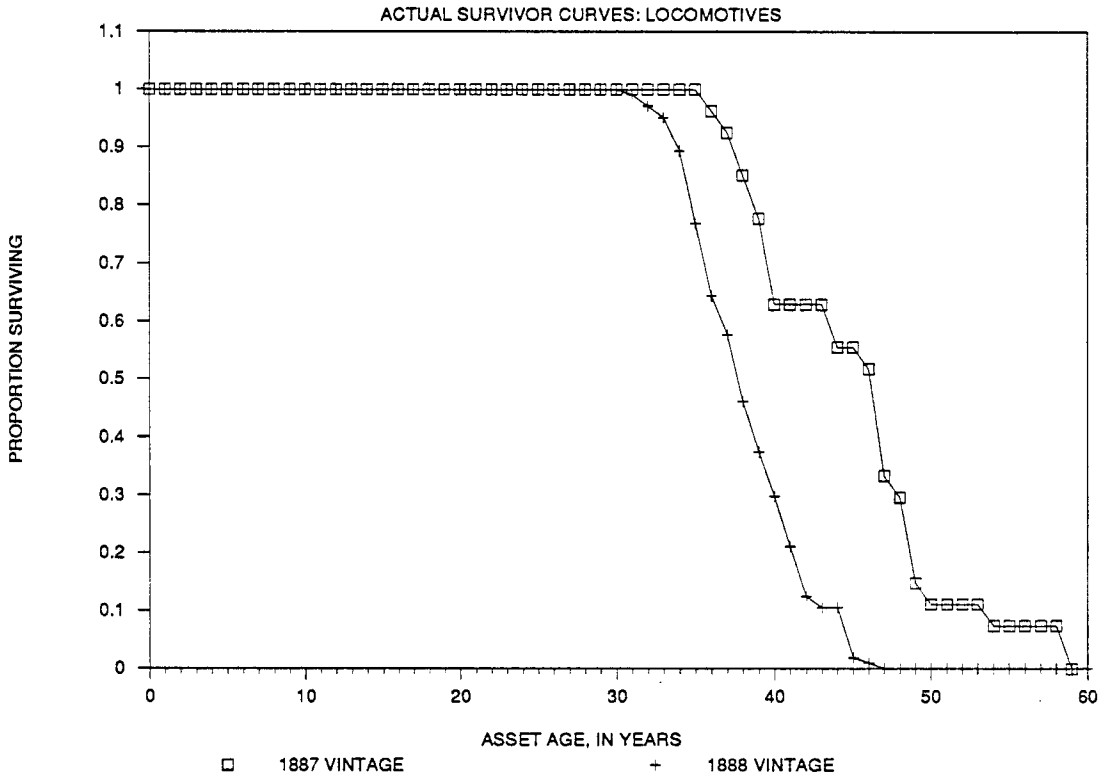
As may be seen from Appendix Figure 2, a larger variance of the assumed retirement distribution (indicated by a lower subscript number on the type "S" curve) implies a larger correction factor. Some of the OIE studies which used the turnover method assumed that retirements follow the Iowa S_0 distribution; if the actual retirement distribution had a lower variance, the mean life estimate would have been overstated. Price inflation could also cause the turnover method to overstate useful lives. If asset price inflation occurs, a given quantity of assets purchased in a later year costs more than the same quantity purchased earlier. Thus, more years of investment will be required to get a sum of annual investments that equals the nominal current balance. A similar distortion occurs if asset prices were unusually low during some of the years of acquisitions being summed. Although the turnover method was generally applied to asset account balance data, it can also be applied to the number of units in the capital stock and number of units acquired. In this case price inflation would not cause a problem.

To further illustrate the turnover method, we may apply it to the locomotive retirement data used by Grant and Norton. For example, in 1925 the railroad had 1661 locomotives in use. This balance is approximately equal to the number of locomotives acquired from 1893 through 1924, or 32 years worth of investment. Thus the unadjusted turnover period suggests the mean life of locomotives is around 32 years. However, the number of locomotives in use in 1925 is 7.7 times

(using various estimation techniques). The mean life of the vintage is equivalent to the area under the complete survivor curve, that is, the sum of the survival probabilities. Equivalently, one can find the probability that an asset of a given age is retired during each year (the "marginal" retirement probability), multiply these probabilities by the corresponding asset ages, and sum the products.

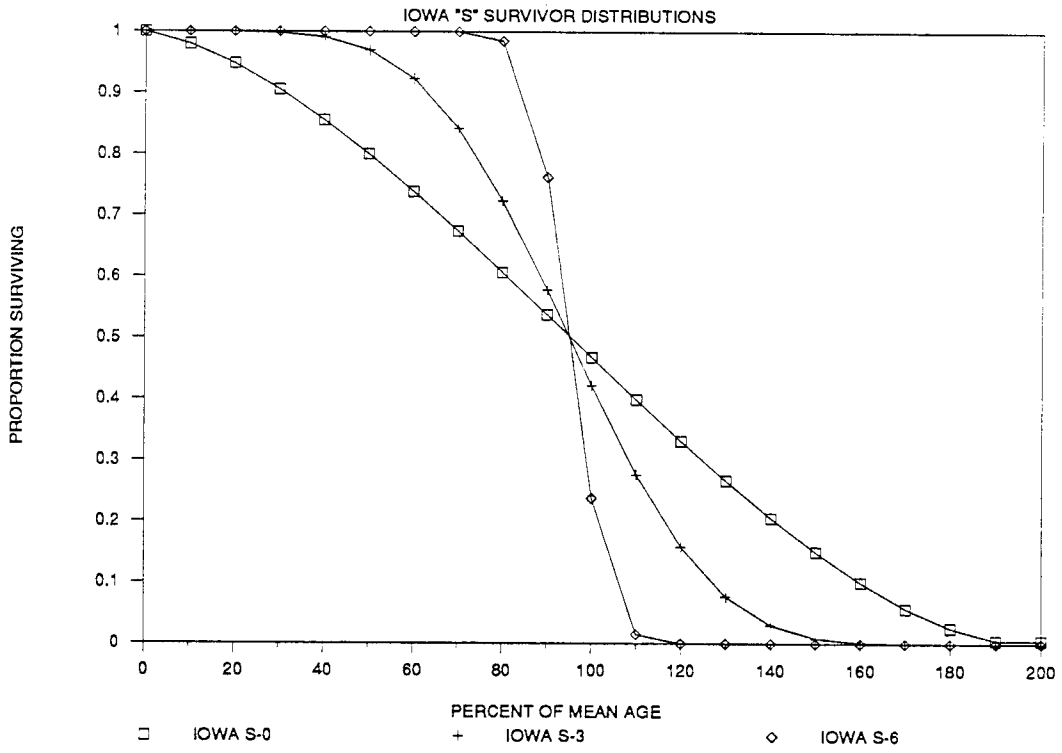
These calculations are illustrated in Appendix Table 2. That table shows a symmetric distribution of retirements around an assumed 5.5 year mean asset life.[172] For simplicity, assets are assumed to be purchased at the beginning of the year and retired at year's end. All assets are retired by the end of ten years. Column (2) shows the expected percentage of assets surviving to each age. This column would also be the survivor curve, assuming actual retirements occurred according to the probabilities shown in this table. In that case, the mean life could be estimated by summing the survival percentages in column (2). Alternatively, the marginal retirement probabilities in column (3) could be derived from column (2). These probabilities could be multiplied by column (1) to yield column (4), which could then be summed to yield the mean life.

APPENDIX FIGURE 1

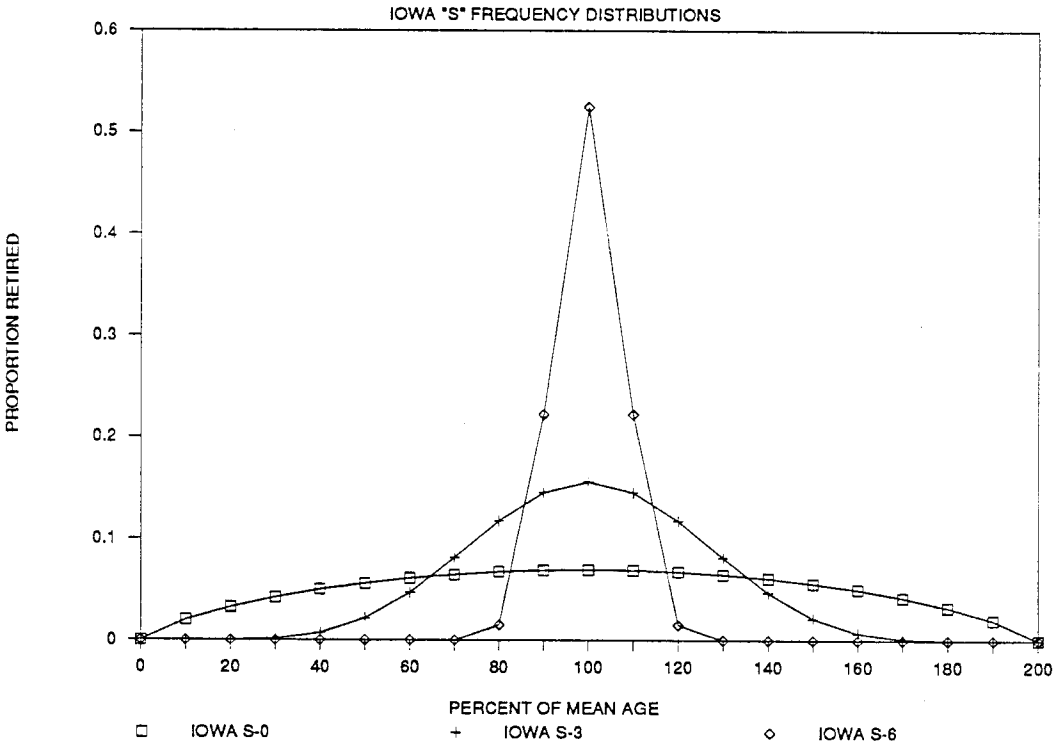


Grant and Norton (1955) demonstrate the survivor curve method using acquisition and retirement patterns for locomotives acquired by an American railroad from 1866 through 1946.[173] Choosing the 1907 vintage, they were able to derive a stub survivor curve which extended down to the 66th percentile (at an age of 39.5 years). The 30th percentile estimated life was 26.5 years, while the median age was 32.5 years. Assuming the average expected remaining life of the surviving locomotives to be 8 years, Grant and Norton estimated a mean service life for the 1907 vintage at 34.5 years.[174] The survivor curve method can give vastly different results for successive vintages.

APPENDIX FIGURE 3

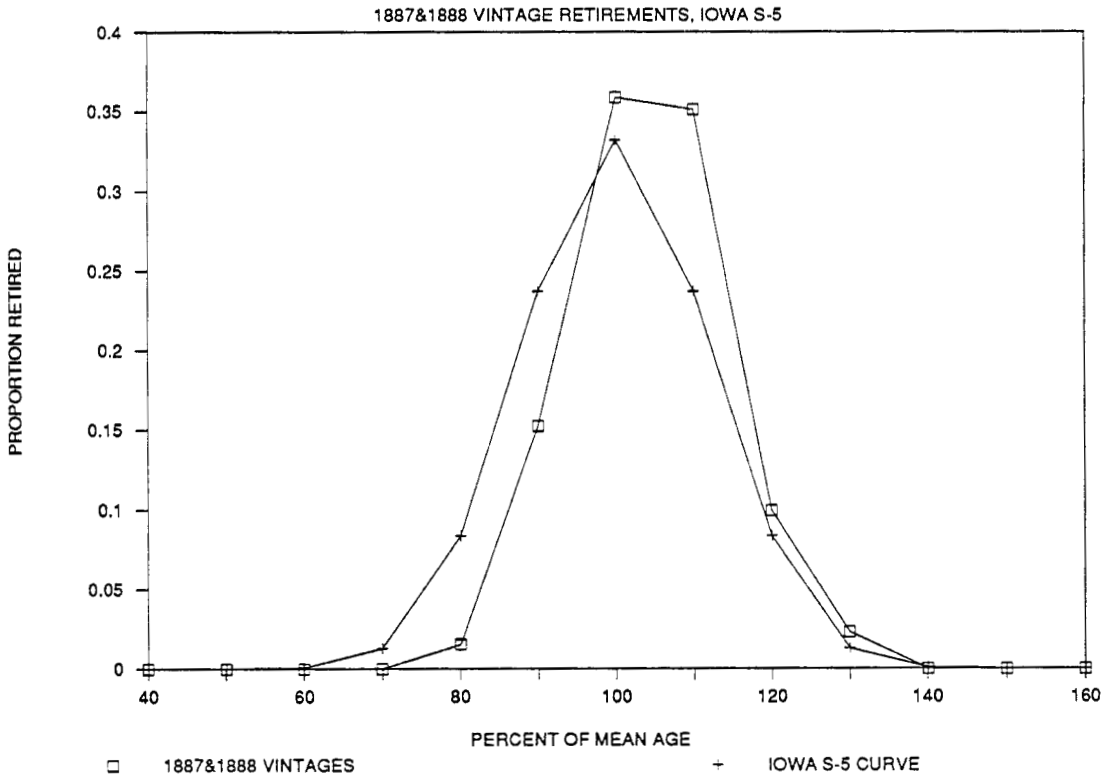


APPENDIX FIGURE 4



that in use in the "initial" year, 1893, implying roughly a 6.6 percent average rate of growth. The unadjusted turnover period must then be multiplied by a growth correction factor corresponding to a growth rate of 6.6 percent. To obtain the appropriate growth correction factor, the retirement distribution pattern is needed. Appendix Figure 5 shows the distribution of locomotive retirements for the 1887 and 1888 vintages taken together, as well as the Iowa S_5 distribution. This distribution appears to adequately represent the observed retirement pattern. The growth correction factor for a growth rate of 6.6 percent and an S_5 retirement distribution is about 1.03. Thus the turnover method estimate of useful life is 1.03×32 or 33 years.

APPENDIX FIGURE 5



In this example, "acquisitions" prior to 1918 were actually the number of locomotives in use in that year. Therefore, the calculations reported above assumed that no retirements occurred in post-1892 vintages before 1918. Also, the number of locomotives "in use" in 1893 was assumed to equal the number of pre-1983 locomotives still in use in 1918. The obvious difficulties associated with these assumptions emphasizes the turnover method's need for an investment time series of a length equal to the mean service life and, where a growth adjustment is involved, the need for an estimate of the initial stock. In addition, where the turnover method must be resorted to, it is unlikely that the analyst will have sufficient information on retirements to provide a reasonably valid estimate of the appropriate retirement pattern for use in the growth adjustment.

C. Asset Survivor Ratio Method

Another method used for estimating the survivor curve and the useful life of assets is the Asset Survival Ratio Method (ASRM). This approach requires a knowledge of the capital stock, by vintage, for at least two successive years in order to estimate the retirement frequency distribution. Alternatively, a single year's vintaged stock, plus a short history of asset retirements will suffice.[177]

1. Theoretical Rational of the ASRM

When using the ASRM, the information in Appendix Table 4 might be obtained from a responding firm. In this example, it is assumed that no assets in use in 1984 were acquired before 1981. The superscripts on the A's refer to the calendar year of use. That is, assets in use at the end of the first year (1984) have superscript 1; assets in use at the end of the second year (1985) have superscript 2. The subscripts refer to the age of the assets as of the end of the year. (Assets are assumed to have been placed in service at the beginning of each year and retired at the end of the year). Unless some 1 year-old used assets are acquired during year 1, A_j^1 will always be greater than or equal to A_{j+1}^2. Assuming there are no purchases or sales of used assets, any difference between A_j^1 and A_{j+1}^2 will be equal to asset retirements during the second year.

Appendix Table 4
ASRM Required Data

Year of Asset Acquisition	Unadjusted Basis of Assets In Use on December 31	
	1984	**1985**
1985	-	A_1^2
1984	A_1^1	A_2^2
1983	A_2^1	A_3^2
1982	A_3^1	A_4^2
1981	A_4^1	A_5^2

Let P_1 represent the proportion of a given vintage of assets that are retired at age 1; P_2 represents the proportion of assets of that vintage retired at age 2, and so on. Eventually all assets of a given vintage will be retired, so that

(1) $$\sum_{i=1}^{n} P_i = 1$$

where n is the age at retirement of the longest-lived asset. One may think of each P_i as the probability that an asset is retired at age i.

After an asset has attained age i, the conditional probability of its attaining age $i+1$ (denoted by π_i) is

(2)
$$\pi_1 = 1 - P_1$$

$$\pi_i = \frac{1 - \sum_{g=1}^{i} P_g}{1 - \sum_{g=1}^{i-1} P_g} \qquad \text{for} \quad i = 2, 3, \ldots n.$$

The P's and the π's are unknown. However, we can estimate π_i for a given aggregate of firms in an industry by forming "survival ratios" (the observed fraction of assets which survived to age i that continued in use through age $i+1$, denoted as SR_i):

(3)
$$SR_i = \frac{\sum A_{i+1}^2}{\sum A_i^1}, \qquad \text{for} \quad i = 1, 2, \ldots n.$$

where the summations are over all companies. Substituting the observed survival ratios calculated according to equations (3) for the conditional survivor probabilities π_i in equations (2), we have n equations in n unknown P_i.. By successive substitutions these equations can be solved for the P's:

(4)
$$P_1 = 1 - SR_1$$

$$P_k = \prod_{g=1}^{k-1} SR_g - \prod_{g=1}^{k} SR_g \qquad \text{for} \quad k = 2, 3, \ldots n$$

where $\prod$ is the product operator. Note that each P_k depends only on SR_g, $g \le k$..

The "survivor curve" corresponding to the asset life distribution may be obtained more directly:

(5)
$$PS_i = 1 - \sum_{g=1}^{i} P_g \qquad \text{for} \quad i = 1, 2, \ldots n.$$

where PS_i is the proportion of assets of a given vintage surviving after i years. Using (4) and (5), we obtain:

(6)
$$PS_i = \prod_{g=1}^{i} SR_g \qquad \text{for} \quad i = 1, 2, \ldots n.$$

Note that PS_i depends only on SR_g, $g \leq i$.

2. Numerical Example of the ASRM

Assume that a survey is taken in 1985 and the data in Appendix Table 5 are obtained. From this information we calculate survival ratios as in equations (3):

$SR_1 = 450/500 = 0.9$

$SR_2 = 100/180 = 0.556$

$SR_3 = 90/150 = 0.6$

$SR_4 = 0/30 = 0.0.$

Appendix Table 5
ASRM Example

Year of Asset Acquisition	Unadjusted Basis of Assets In Use on December 31	
	1983	**1984**
1984	-	100
1983	500	450
1982	180	100
1981	150	90
1980	30	0
1979	0	0

We can calculate the retirement probabilities given in equations (4):

$P_1 = 1 - 0.9 = .1$

$P_2 = 0.9 - (0.9)(0.556) = .4$

$P_3 = (0.9)(0.556) - (0.9)(0.556)(0.6) = 0.2$

$P_4 = (0.9)(0.556)(0.6) - (0.9)(0.556)(0.6)(0.0) = 0.3.$

The survivor curve may be found with equations (5). Alternatively, we can skip this step and determine the survivor curve directly through equations (6):

$$PS_1 = 0.9$$

$$PS_2 = (0.9)(0.556) = 0.5$$

$$PS_3 = (0.9)(0.556)(0.6) = 0.3$$

$$PS_4 = (0.9)(0.556)(0.6)(0.0) = 0.0.$$

One can plot the survivor curve, interpolate to fill in the missing portions of the curve, then compute a mean asset life estimate based on the curve. The mean life equals the area under the curve, it also equals the sum of the retirement probabilities multiplied by the corresponding ages. These retirement probabilities are the P_i calculated above, so that the mean asset life for this example is estimated to be $0.1 \times 1 + 0.4 \times 2 + 0.2 \times 3 + 0.3 \times 4$, or 2.7 years.

3. Some Problems in the Practical Application of ASRM

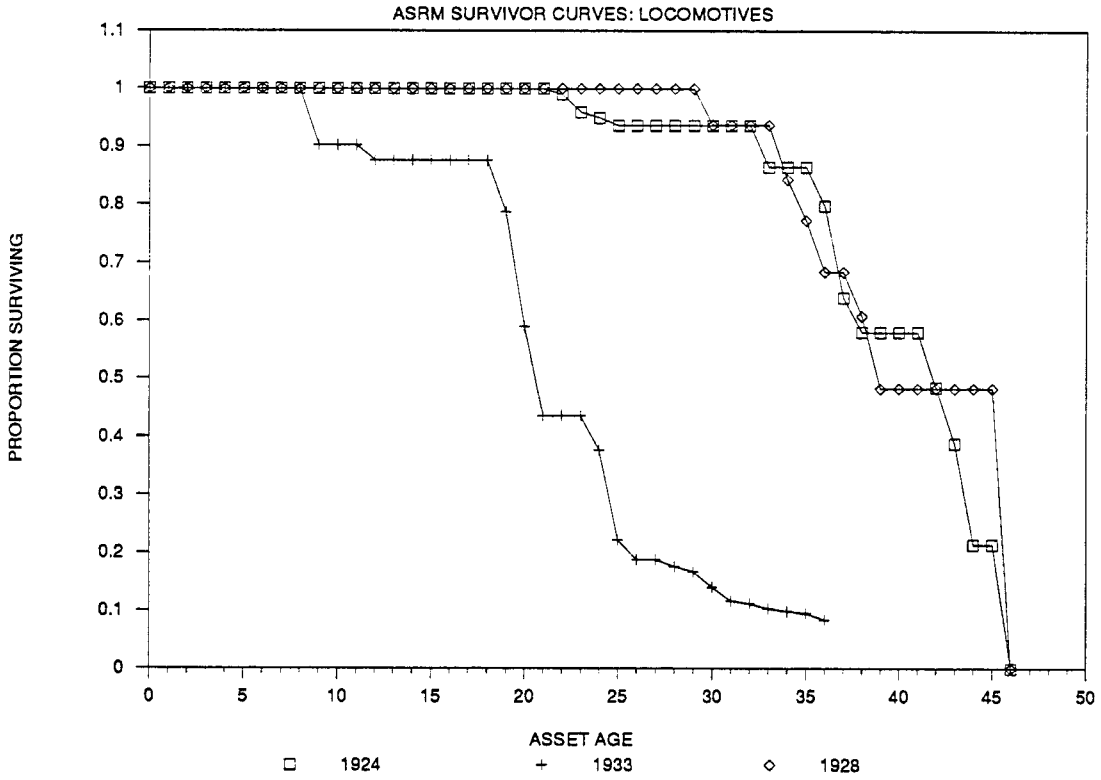
Two types of difficulties may arise from use of the ASRM. One results in an incomplete survivor curve, the other results in a survivor curve which prematurely intersects the horizontal axis. If taxpayers are only able to provide data for vintages going back, say, only ten years, while some assets last longer than this, the survivor curve will be incomplete. This problem could be remedied, for example, by fitting standard survivor curves to the stub curve obtained from the ASRM.

The second problem arises if there are no observations of assets of a given age, although older assets are observed. The possibility of this occurring for the aggregate data obtained from many firms is fairly low. If it does occur, however, estimates of PS_i for i equal to or greater than the age for which there are no observations are zero, even though the data may show assets surviving beyond that age. One solution to this problem is to terminate the analysis at the greatest age before the zero stock occurs, and work with stub survivor curve as described above. Another possible solution is to measure age in two-year units. This can be done simply by combining vintages into pairs, and proceeding to apply the formula to the resulting figures.

A more fundamental problem with the ASRM is the possibility that the retirement rates observed during the chosen time frame are not representative of all retirements. Because the retirement of an asset is an economic choice influenced by exogenous events such as changes in input or output prices or changes in expected sales, these factors may cause retirements to differ greatly in different years.

Appendix Figure 6 shows three survivor curves derived using the Asset Survival Ratio Method as applied to the locomotive data. The ASRM was applied to retirements that occurred in 1924, 1928, and 1933; these three resulting survivor curves have implied mean lives of 39.0, 39.7, and 21.6 years, respectively. The mean life estimates implied by the 1924 and 1928 ASRM method are quite close to the actual mean life of the 1888 vintage. The difference between the ASRM curve for 1933 and the other two curves demonstrates how economic conditions present during the year the data is collected can affect the estimate of the mean asset life.

APPENDIX FIGURE 6



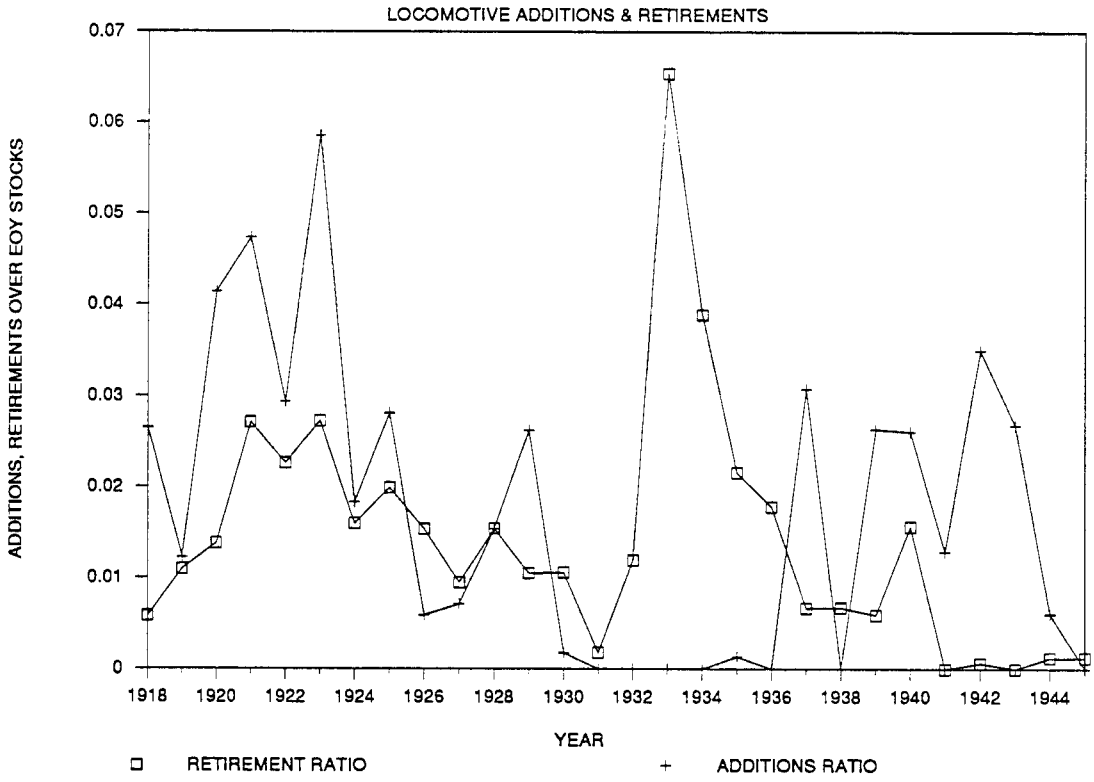
The bias of asset life estimates based on unrepresentative years of retirements can be reduced by including more retirement years in the analysis. Instead of computing the proportion of assets that are retired during a single year, the overall retirement proportion for a "band" of many different vintages of assets retired at various ages can be computed. This procedure will also reduce the probability that data will be missing for specific asset ages or that the method will result in a stub survivor curve. Note, however, that estimates of asset lives can still differ when based on different "bands" of vintages and retirements. For example, Grant and Norton (1955), using a 20 year band, estimated the mean life of locomotives retired between 1918 and 1937 to be 35.5 years. These authors also computed ASRM estimates over four five-year bands. Those survivor curves proved to be rather stable, resulting in the following mean life estimates: 1918-22: 36 years, 1923-27: 37 years, 1928-32: 36 years, and 1933-37: 34 years.[178] As might be expected, use of depression years' retirements leads to slightly lower mean life estimates. They also found that locomotives were retained much longer during the 1938 to 1946 time period (a time dominated by wartime needs) as compared to the earlier period from 1918 to 1937.

D. Asymptotic Method

The asymptotic method was employed in only three of the studies reported in Appendix Table 1. This method uses asset balance data from the beginning and end of a year, as well as additions to and retirements from that balance during the year. The theory behind this method is that with a homogeneous group of assets, where the total number of units grows at a constant rate, the ratio of retirements to the total number of active units will asymptotically approach some constant level. Similarly, the ratio of additions to total units will approach a limiting value. Furthermore, in a

no-growth steady state, the limit of these retirement and addition ratios are both equal to the reciprocal of the average service life of the assets. However, as noted by Feldstein and Rothschild (1974), the existence of a limiting value is highly dependent upon these assumptions, and thus not likely to be found in practice.

APPENDIX FIGURE 7



Appendix Figure 7 shows the erratic pattern of the annual retirements and additions as a fraction of annual stocks from the locomotive data discussed above. Because the required assumptions are not valid, these ratios do not approach a limit or constant value during the time period covered by the data. If one nevertheless were to apply this method to the mean of the retirement and addition ratios over the 1918-1946 time period, one would obtain mean life estimates of 70 and 58 years, respectively. The ratios occurring during the years having the largest retirement and additions ratios yield implied mean lives of 15 and 17 years.

E. Summary

Appendix Table 6 summarizes the estimates of the mean life of locomotives obtained using these various approximation methods, as well as those obtained by Grant and Norton. It is clear that, with the exception of the asymptotic method, each of the methods is capable of providing a reasonable estimate of the useful life of locomotives provided some care is taken to ensure that undue weight is not given to periods with unusual economic conditions.

Appendix Table 6
Summary of Mean Locomotive Lives

Method	Mean Life
Actual Survivor Curves, (Grant and Norton)	
1907 Vintage	34 Years
1908 Vintage	27 Years
Actual Survivor Curves,	
1887 Vintage	45 Years
1888 Vintage	38 Years
Turnover Method, 1925	33 Years
ASRM,	
1924 Retirements	39 Years
1928 Retirements	40 Years
1934 Retirements	22 Years
ASRM, 20-Year Band, (Grant and Norton)	
1918-1937	36 Years
ASRM, Four 5-Year Bands (Grant and Norton)	
1918-22	36 Years
1923-27	37 Years
1928-32	36 Years
1933-37	34 Years
Asymptotic Method, 1918-46	
Mean Additions Ratio	58 Years
Mean Retirements Ratio	70 Years

Notes

1. *Internal Revenue Code*, § 162(a). Section 212 of the Code contains similar language for an individual with respect to expenses paid or incurred for (1) the production or collection of income; (2) the management, conservation, or maintenance of property held for the production of income; or (3) in connection with the determination, collection, or refund of any tax.

2. *Income Tax Regulations*, § 1.263(a)-1.

3. *Internal Revenue Code*, § 167(a).

4. U.S. Treasury Department, Internal Revenue Service (1988a), Table 2, p. 30. The cited figures are financial non-tax accounting values and do not include assets subject to depletion allowances.

5. *Ibid.* The net income figure includes the deficits of corporations reporting net losses and the income of S-corporations and regulated investment companies, whose distributed income is not subject to corporate tax. It does not reflect net operating loss and dividends-received deductions.

6. U.S. Treasury Department, Internal Revenue Service (1988b), p. 78.

7. This example assumes no behavioral response by taxpayers and is only intended to indicate the importance of the allowable depreciation method. It uses an eight percent discount rate, a 34 percent tax rate, a 15-year average depreciable life, and a mid-year timing convention. The declining balance alternative employs a switch to the straight-line method at the point which maximizes the present value of deductions.

8. Other studies on the history of depreciation policy include Chapter 11 of Grant and Norton (1955), Lischer (1978), Gravelle (1979), and Perlis (1988).

9. American Telephone and Telegraph (1957), p. 24.

10. *American Railroad Journal* (1841), reported in A.C. Littleton, *Accounting Evolution to 1900* (New York: American Institute Publishing Company, 1933), p. 228, and quoted in American Telephone and Telegraph (1957), p. 25.

11. American Telephone and Telegraph (1957), p. 25.

12. Under the retirement method, a deduction is taken only when the asset is removed from service. It is equivalent to the usual treatment of nondepreciable property. The replacement method is similar, but the recorded expense is equal to the cost of a replacement unit. Thus, the book value remains equal to the cost of the original asset performing the particular service. If the replacement unit is not identical to that of the retired unit, then usually the cost of an identical replacement is estimated and taken as an expense, while the remainder of the replacement cost is capitalized. This last technique is referred to as the betterment method.

13. See, for example, Wixon *et. al.* (1970).

14. *Eyster v. Centennial Board of Finance*, 94 U.S. 500, and *United States v. Kansas Pacific Railroad Co.*, 99 U.S. 459.

15. *United States v. Kansas Pacific Railroad Co.*, 99 U.S. 459, quoted in American Telephone and Telegraph (1957), p. 26.

16. Marshall M. Kirkman, *Railway Expenditures*, Vol. 2 (Chicago: Railway Age Publishing Co., 1880), pp. 32-33, quoted in American Telephone and Telegraph (1957), p. 26.

17. The American Bell Telephone Company, organized in 1880, was a strong proponent of depreciation accounting. American Telephone and Telegraph (1955), pp. 29-30.

18. *San Diego Land and Town Co. v. National City*, 174 U.S. 739, quoted in American Telephone and Telegraph (1957), p. 54.

19. *Knoxville v. Knoxville Water Company*, 212 U.S. 1, quoted in American Telephone and Telegraph (1957), p. 55.

20. P.L. 63-16 (October 3, 1913), section II.B. Similar language in section II.G.(b) applied to corporations.

21. U.S. Treasury Department, Bureau of Internal Revenue (1914), Article 129, p. 69. The term "obsolescence," as used in this definition refers to the actual retirement of an obsoleted asset and not to the process of its becoming obsolete, for which no allowance was provided. This interpretation is provided in U.S. Treasury Department, Bureau of Internal Revenue (1920b), p. 16.

22. U.S. Treasury Department, Bureau of Internal Revenue (1914), Article 134, p. 70.

23. *Ibid.*, Article 130, p. 70.

24. *Ibid.*, Articles 129, 132, and 133, pp. 69-70, and U.S. Treasury Department, Bureau of Internal Revenue (1918), Article 161, pp. 80-81.

25. U.S. Treasury Department, Bureau of Internal Revenue (1914), Article 137, p. 71.

26. U.S. Treasury Department, Bureau of Internal Revenue (1918), Article 168, p. 83 and (1920a), Article 163, p. 63. The specific prohibition against goodwill, trademarks, etc., was dropped in later editions of the regulations, apparently since the general requirement of having a life with a definite limited duration was deemed sufficient to prohibit depreciation deductions of such property. The specific prohibition against depreciation of goodwill, however, was reinstated in U.S. Treasury Department, Bureau of Internal Revenue (1929), Article 203, p. 53.

27. U.S. Department of the Treasury, Bureau of Internal Revenue (1920a), Articles 161, 162, and 166, pp. 62-64.

28. *Ibid.*, Article 162, pp. 62-63.

29. *Ibid.*, Article 169, p. 65.

30. U.S. Treasury Department, Bureau of Internal Revenue (1920b), p. 5.

31. On obsolescence, see U.S. Treasury Department, Bureau of Internal Revenue (1920b), p. 16, (1931a), pp. 10-11, (1942), pp. 3-4, and section 1.167(a)-9 of the current income tax regulations.

32. Under group accounting principles, the loss is usually recognized if the retirement is of a nature which was not taken into account in the determination of the asset's useful life.

33. U.S. Treasury Department, Bureau of Internal Revenue (1920a), Article 169, p. 65. Emphasis is added. This language was maintained even after composite accounts were expressly allowed. It was not discarded until the depreciation regulations were substantially rewritten after enactment of the Internal Revenue Code of 1954.

34. *Ibid.*, Article 170, pp. 65-66.

35. U.S. Treasury Department, Bureau of Internal Revenue (1920b), p. 36.

36. P.L. 68-176 (June 2, 1924), § 202(b)(2), and P.L. 69-20 (February 26, 1926), § 202(b)(2).

37. P.L. 72-154 (June 6, 1932), § 113(b)(1)(B).

38. U.S. Congress (1932), p. 29.

39. U.S. Treasury Department, Bureau of Internal Revenue (1935), Article 23(l)-5, p. 58.

40. P.L. 82-539 (July 14, 1952).

41. U.S. Treasury Department, Bureau of Internal Revenue (1920b).

42. *Ibid.*, pp. 26-27.

43. The "clear and convincing" language first appeared in U.S. Treasury Department, Bureau of Internal Revenue (1922), Article 165, p. 76. The word, "must" was changed to "will" in U.S. Treasury Department, Bureau of Internal Revenue (1929), Article 205, p. 54. The sentence was dropped in 1934. Compare U.S. Treasury Department, Bureau of Internal Revenue (1935b), Article 23(l)-5, p. 57.

44. U.S. Treasury Department, Bureau of Internal Revenue (1920a), Article 165, p. 64.

45. Grant and Norton (1955), p. 91.

46. U.S. Treasury Department, Bureau of Internal Revenue (1931a) and (1931b).

47. While the listing was arranged by industry, it was composed entirely of lives and depreciation rates for specific assets. Certain assets were assigned lives independent of industry classifications. These nonindustry-specific assets were grouped under the headings of buildings, building equipment, motor and other vehicles, office equipment, and power generation and electrical equipment. Buildings were characterized both by type of construction material (e.g., wood, frame, brick, etc.) and by building type (e.g., factories, warehouses, office buildings). U.S. Treasury Department, Bureau of Internal Revenue (1931b).

48. *Ibid.*, p. 1.

49. *Ibid.*

50. *Ibid.*, p. 2.

51. U.S. Treasury Department, Bureau of Internal Revenue (1931a), p. 14.

52. Grant and Norton (1955), p. 90.

53. *Ibid.*, p. 218.

54. In a group account, failure to remove an asset from the asset account upon its retirement means that depreciation allowances will continue to be taken with respect to that particular asset beyond its useful life and in excess of its original basis. The account itself, however, will not be depreciated in excess of 100 percent of basis.

55. U.S. Treasury Department (1971), p. 10.

56. U.S Congress (1934), pp. 8-9.

57. U.S. Treasury Department, Bureau of Internal Revenue, (1934a).

58. U.S. Treasury Department, Bureau of Internal Revenue (1934b).

59. *Ibid.*, p. 61.

60. *Ibid.*, p. 59.

61. *Ibid.*, p. 61.

62. *Ibid.*, pp. 61-62.

63. Grant and Norton (1955), p. 214.

64. U.S. Treasury Department, Bureau of Internal Revenue (1935a).

65. *Ibid.*, p. 134.

66. Grant and Norton (1955), p. 220.

67. Grant and Norton (1955), p. 215. A part of the general taxpayer response to T.D. 4422 may be traced to the somewhat obscure meaning of "useful life." Given the prior leniency in enforcing any particular standard, the term was subject to various interpretations. It was not explicitly defined in either the regulations or in *Bulletin F*. Consequently, it was subject to varying interpretations. For example, it could refer to either the period over which an asset was held or the period of its most profitable utilization, e.g., excluding its use as a part-time or standby asset.

68. P.L. 73-216 (May 10, 1934), Section 117.

69. P.L. 75-554 (May 28, 1938), Section 117.

70. P.L. 77-753 (October 21, 1942), Section 150.

71. *Ibid.*, Section 151.

72. U.S. Treasury Department, Bureau of Internal Revenue (1942).

73. Grant and Norton (1955), p. 222. The study was conducted by the Machinery and Allied Products Institute.

74. U.S. Treasury Department (1963a), Table I., p. 302.

75. U.S. Treasury Department, Bureau of Internal Revenue (1942), p. 29.

76. Grant and Norton (1955), p. 232.

77. U.S. Treasury Department, Internal Revenue Service (1953a), p. 43.

78. U.S. Treasury Department, Internal Revenue Service (1953b), p. 44.

79. Most of the increase took place during World War II. The number of individual taxpayers had jumped from 3.9 million in 1939 to 42.6 million in 1945. Brownlee (1988), p. 94.

80. U.S. Treasury Department, Internal Revenue Service (1957).

81. Pollock (1968), Table 2-1, p. 6.

82. U.S. Treasury Department, Bureau of Internal Revenue (1942), p. 5.

83. U.S. Treasury Department, Bureau of Internal Revenue (1947).

84. See, for example, Terborgh (1954).

85. U.S. Congress (1954), p. 26.

86. Grant and Norton (1955) report that they could find no instance of the actual use of the sum-of-years digits method prior to 1954. *Op cit.* p. 206.

87. P.L. 85-866, (September 2, 1958), Section 204.

88. P.L. 87-834 (October 16, 1962), Section 13.

89. Under the declining balance method, the depreciation rate is applied to the account's basis, adjusted for depreciation, but unadjusted for salvage. Therefore, the reduction in salvage value did not accelerate deductions under this method, but it did allow more of the asset's basis to be recovered through allowances for depreciation. Under general rules for the straight-line and sum-of-years digits methods, the relevant rates are applied to original cost less salvage. Thus, the reduction in salvage value directly impacted on allowances determined under these methods.

90. U.S. Treasury Department (1971), p. 12, footnote 22.

91. U.S. Treasury Department (1963a), p. 299.

92. The study of the textile industry was conducted in response to a 1961 Presidential request to provide depreciation guideline lives for the industry. U.S. Treasury Department (1963a), pp. 299-304.

93. U.S. Treasury Department, Internal Revenue Service (1962).

94. U.S. Treasury Department, Internal Revenue Service (1964), p. 16.

95. *Ibid.*, p. 15.

96. *Ibid.*, pp. 15-16. The guideline lives could not be used to determine what was "allowable" depreciation for purposes of determining adjusted basis. Thus, a taxpayer was not forced to use the guideline lives in order to prevent a future adjustment to basis because use of the guideline lives would have resulted in larger depreciation allowances. The taxpayer was not required to choose the guideline procedures upon filing a tax return, but could wait until audit to so elect. *Ibid.*, pp. 58, 75.

97. Pollock (1968), Table 2-1, p. 6.

98. U.S. Treasury Department (1971), p. 29, footnote 52.

99. U.S. Treasury Department (1963b), pp. 335-6.

100. *Ibid.*

101. *Ibid.*, p. 335.

102. U.S. Treasury Department (1964), p. 51. Underlying this argument was a belief that the rate of anticipated technological change was *increasing* over time, resulting in a shortening of asset lives. Continued change at the same rate would not necessarily lower useful lives below those experienced in the past.

103. Pollock (1968), p. 6

104. U.S. Treasury Department (1963b), p. 335.

105. P.L. 87-834 (October 16, 1962), Section 13.

106. P.L. 88-272 (February 26, 1964), Section 231. The amount to be recaptured as ordinary income under section 1250 is generally limited to the excess of allowed deductions over those allowable under the straight-line method after 1963. Originally, the recapture amount was phased out over a 120-month period. The Tax Reform Act of 1969 removed the phase-out for nonresidential property, but retained a 200-month phase-out period for residential property. P.L. 91-172 (December 30, 1969), Section 521. The Tax Reform Act of 1976 retained the 200-month phase-out period for certain low income housing, but eliminated any other phase-out for recapture of excess depreciation taken after 1975. P.L. 94-455 (October 4, 1976), Section 202.

107. Taxpayers could choose to use the guideline procedures for some classes of assets, but not for others. However, all assets in any single guideline class had to be examined under the same procedure. Affiliated corporations could be treated separately, but all divisions within a corporation were considered to be a single unit for the purposes of applying Revenue Procedure 62-21. A firm with multiple activities that spanned two or more guideline classes was required to classify assets to the separate classes, unless the assets in a class constituted less than three percent of the total industry-specific assets. An asset with multiple uses that spanned two or more guideline classes was to be classified to its primary use. Leased equipment was to be classified according to its use by the lessee.

108. If C_i, S_i, and L_i represent, respectively, the cost, salvage, and useful life of assets in account i, then the "class life" computed for the assets contained in a particular guideline class was

$$\frac{\sum_i C_i}{\sum_i \frac{C_i - S_i}{L_i}}.$$

109. The portion of any basis or accumulated depreciation that was subject to special rules, such as the additional first-year allowances under section 179, was excluded from this calculation.

110. Where different depreciation methods were used for assets within a guideline class, the test range for the class was to be computed as the weighted average of the separate ranges determined for the different methods of depreciation. The upper limit of the test range was set equal to the reserve ratio that would result if all assets were held for a period 20 percent longer than the test life. The lower limit of the test range was set equal to the reserve ratio that would result if all assets were held for a period 10 percent shorter than the test life.

111. For example, a test life of 10 years under the double declining balance method yielded an upper bound of 63 percent and a lower bound of 56 percent, assuming a 2 percent rate of growth. These numbers were obtained from the published Reserve Ratio Table. If the taxpayer's reserve ratio exceeded 63 percent, then the useful life would be revised upwards to 12.5 years. If the taxpayer's reserve ratio was less than 56 percent, a life of 8.5 years was assumed justifiable.

112. Frederick Stevenson, "Tax Depreciation and Business Resources," *The Conference Board Record* (July 1965), p. 9, cited in Pollock (1968), p. v.

113. U.S. Treasury Department, Internal Revenue Service (1965).

114. The original version of the test remained available, and was referred to as the "tabular form."

115. Lischer (1978), p. 587.

116. U.S. Treasury Department (1971), pp. 24-26.

117. *Ibid.*, p. 20.

118. *Ibid.*, p. 21.

119. *Ibid.*, p. 22.

120. *Ibid.*, p. 24.

121. *Income Tax Regulations* § 1.167(a)-11(a)(5)(iii).

122. *Income Tax Regulations* § 1.167(a)11-(b)(2)(ii), as first published in Treasury Decision T.D. 7128. See U.S. Treasury Department (1971), p. 59.

123. Subsidiary assets under the Guidelines consisted of short-lived assets such as jigs, dies, molds, and patterns; returnable containers and pallets; crockery, glassware, linens, and silverware . No guideline life had been provided for these assets; depreciable lives were determined purely by facts and circumstances.

124. *Income Tax Regulations.* § 1.167(a)-11(d)(2).

125. P.L. 92-178 (December 10, 1971), Section 109. The statutory authority for repair allowances was repealed in 1981. P.L. 97-34 (October 13, 1981), Section 201.

126. This convention would have allowed taxpayers to determine depreciation allowances by assuming all new additions occurred on the first day of the second quarter of the taxable year.

127. It was generally believed that many taxpayers, using facts and circumstances, had been able to justify lives for buildings that were shorter than the guideline lives for those assets. U.S. Congress (1971), p. 49.

128. Any useful life for the excluded 1250 property that was shorter than the specified class life had to be justified in accordance with the rules of Revenue Procedure 62-21. The transitional rule was to remain in effect until the earlier of (1) January 1, 1974, or (2) the date on which an asset class including such property was established. Revenue Procedure 72-10 implemented this transitional rule by establishing temporary asset classes for buildings (and their structural components) and a separate class for section 1250 land improvements. The depreciation periods were the same as those listed in Revenue Procedure 62-21. No asset depreciation ranges were provided. The end of the transition period implied that electing taxpayers would have to include those assets specified in the buildings and land improvements classes in any ADR election. The Treasury Department informed Congress that it had not completed a study for these assets and requested that the 1971 provision requiring that they be included in the ADR system be repealed. This was done for years after 1973. P.L. 93-625 (January 3, 1975), Section 5. The buildings classes were eliminated and thus, buildings were to be ineligible for ADR election. The land improvements class, however, was redefined to include both section 1245 and section 1250 property.

129. This exclusion provision would terminate at the earlier of (1) January 1, 1974 or (2) the date on which a new asset class incorporating the subsidiary assets was established. Several new asset guideline subclasses for subsidiary assets (renamed as "special tools" and "service assets") were created for property placed into service after December 31, 1973. In later years, many of these special tools and service asset subclasses were incorporated into the broader industry-activity asset classes, whose assigned depreciation periods were adjusted to reflect the inclusion of the shorter lived assets.

130. Compare § 1.167(a)-11(f)(4) of the current regulations with the same section of the original ADR regulations as presented in U.S. Treasury Department (1971), p. 94.

131. U.S. Congress (1971) p. 46.

132. Only six of the roughly forty revenue procedures issued regarding the ADR classification system clearly dealt with the revision of a guideline period without, at the same time, involving the creation or consolidation of one or more asset classes. Nearly all of these revenue procedures shortened the applicable guideline periods; they included the following broad categories of assets:

Industrial Steam and Electric Generation, Textiles, Pulp and Paper, Chemicals, and Telephone Central Office Equipment. Only one revenue procedure, that dealing with Air Transport assets, lengthened the original guideline period.

133. Executive Office of the President (1981).

134. P.L. 97-34 (August 13, 1981) Section 201.

135. Beginning in 1982, the depreciable basis of property for which a full investment tax credit was given was reduced by 50 percent of the credit amount. In lieu of this basis adjustment, taxpayers had the option of reducing the regular investment tax credit by two percentage points. P.L. 97-248 (September 3, 1982), Section 205. Reduction in basis was usually the more desirable choice, except for taxpayers not in a position to use the credit fully.

136. In 1984, Treasury was granted the authority to assign a present class life for section 1245 property which did not have an ADR class life as of January 1, 1981. P.L. 98-369 (July 18, 1984), Section 31. This authority was never used.

137. This recovery class was changed to "18-year real property" in 1984, and to "19-year real property" in 1985, with corresponding changes in the associated recovery periods. P.L. 98-369 (July 18, 1984), Section 111, and P.L. 99-121 (October 11, 1985), Section 103. The President's original proposal had a fifteen-year recovery period for nonresidential buildings, but would have restricted rental residential property to eighteen years.

138. P.L. 97-248 (September 3, 1982), Section 206.

139. This calculation includes the effect of the investment tax credit basis adjustment but not the credit itself. It uses an 8 percent discount rate. Excluding the basis adjustment, 5-year recovery property with class lives of 6 years or less had higher present values of deductions under ADR.

140. P.L. 97-34 (August 13, 1981), Section 202.

141. P.L. 99-514 (October 22, 1986), Section 202.

142. P.L. 97-248 (September 3, 1982), Section 216.

143. P.L. 98-369 (July 18, 1984), Sections 31, 113, and 179.

144. U.S. Treasury Department (1984).

145. *Ibid.*, pp. 152-172.

146. Executive Office of the President (1985), pp. 132-159.

147. U.S. Congress (1985), pp. 137-169.

148. P.L. 99-514 (October 22, 1986), Section 201.

149. Under ACRS, the final half-year allowance (arising from using a half-year timing convention) was allocated to one or more earlier years for most recovery property. For example, the cost of three year ACRS property was recovered according to the following pattern: 25 percent in year one, 38 percent in year two, and 37 percent in year three. Three year MACRS property is recovered according to the pattern: 33.3 percent in year one, 44.5 percent in year two, 14.8 percent in year three, and 7.4 percent in year four.

150. The list of assets required to use the Alternative Depreciation System includes foreign-use property, tax-exempt use property, tax-exempt bond-financed property, and property imported from countries determined to be maintaining trade restrictions or engaging in discriminatory acts. Farming enterprises electing out of cost-capitalization rules must also use the Alternative Depreciation System, except for livestock. This system is also used for the purpose of calculating corporate "earnings and profits" and for computing the "adjusted current earnings" adjustment under the post-1989 rules for determining alternative minimum tax income.

151. However, straight-line allowances must be used for purposes of computing the adjusted current earnings adjustment under the alternative minimum tax.

152. *Internal Revenue Code* § 167(i)(1), as it existed before the enactment of the Technical and Miscellaneous Revenue Act of 1988. P.L. 100-647 (November 10, 1988), Section 6253.

153. *Internal Revenue Code*, § 167(i)(1).

154. U.S. Congress, Joint Committee on Taxation (1987), p. 103.

155. U.S. Treasury Department (1971), p. 41.

156. An exception was the 60-month amortization period given to grain storage facilities in 1952-56 mentioned previously. Another exception involves the expensing of intangible drilling and development costs for oil and gas wells, introduced explicitly in subsection 263(c) of the 1954 Code. A minor portion of these expenditures are for the construction of depreciable property. In many cases, these rapid amortization and expensing provisions were intended as direct subsidies to the identified activity; in others, the primary motive appears to have been an attempt to obtain greater uniformity among taxpayers concerning the treatment of the item in question.

157. Not included in Table 1 are assets given preferential treatment due to their classification into specific ADR classes or ACRS and MACRS recovery periods, based on characteristics other than their ADR midpoint lives. The table also does not treat the different allowable methods used for ACRS or MACRS recovery classes as indicative of an intended incentive provision.

158. *Internal Revenue Code*, § 167(n).

159. *Internal Revenue Code*, § 167(p).

160. *Internal Revenue Code*, former section § 168(f)(2) and current section § 168(g).

161. U.S. Congress (1970), pp. 166-177.

162. P.L. 91-172 (December 30, 1969), Section 301.

163. A "net lease" was one in which the lessor was either guaranteed a specific return or was otherwise guaranteed in some degree against the loss of income. It also included situations where trade or business expense deductions (i.e., deductions other than interest, taxes, and depreciation) were less than 15 percent of the property's rental income.

164. Beginning in 1983, the preference for pollution control facilities for corporations was to be reduced to 71.6 percent of its value to reflect the 15 percent cutback in the availability of the amortization provision. P.L. 97-248 (September 3, 1982), Section 204. See footnote in Table 1. Beginning in 1985, the preference was to be reduced to 59 5/8 of its value otherwise determined. P.L. 98-369 (July 18, 1984), Section 68.

165. P.L. 97-248 (September 3, 1982), Section 201.

166. An extra dollar of deduction lowered the regular tax preference offset, increasing the minimum tax by ten cents, regardless of whether the deduction was or was not a tax preference item.

167. P.L. 97-248 (September 3, 1982), Section 201.

168. P.L. 99-514 (October 22, 1986), Section 701.

169. U.S. Treasury Department (1971), p. 46.

170. See Aaron, *et. al.* (1988). Besides the AMT, numerous other measures have been resorted to in attempts to limit the scope of income-tax preferences without eliminating them outright. These measures have included "at-risk" rules, interest deductibility limitations, limitations on savings incentives, and passive loss limitations.

171. Grant and Norton (1955) refer to the survivor curve method as the "original group method," a term which emphasizes the tracking of a vintage of assets over time.

172. This retirement pattern is similar to the Iowa type "S" (symmetric) curves reported in extensive studies of useful lives of assets conducted during the 1930's and 1940's at Iowa State University by Robley Winfrey and others. See Winfrey (1936).

173. The locomotive data are shown in Grant and Norton (1955), pp. 50-53.

174. *Ibid.*, p. 57.

175. *Ibid.*

176. Appendix Figure 2 is taken from Edison Electric Institute (1952)

177. The following discussion of the ASRM is based on unpublished material developed by Dennis Cox, former Deputy Director of the Office of Industrial Economics. The method is also discussed in Grant and Norton (1955), where it is referred to as the "annual rate method." *Op. cit.*, pp. 57-74.

178. Grant and Norton (1955), p. 66.

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