Report to The Congress on
Depreciation Recovery Periods and Methods

Department of the Treasury
July 2000

DEPARTMENT OF THE TREASURY
WASHINGTON

ASSISTANT SECRETARY

July 28, 2000

The Honorable Bill Archer
Chairman
Committee on Ways and Means
House of Representatives
Washington, DC 205 15

Dear Mr. Chairman:

Section 2022 of P.L. 105-277, the Tax and Trade Relief Extension Act of 1998 (the 1998 Act), directed the Secretary of the Treasury to conduct a comprehensive study of the recovery periods and depreciation methods under section 168 of the Internal Revenue Code and to provide recommendations for determining those periods in a more rational manner. The 1998 Act directed the Secretary to submit the results of the study and recommendations to the House Committee on Ways and Means and the Senate Finance Committee by March 3 1, 2000. Pursuant to that directive, I hereby submit the "Report to the Congress on Depreciation Recovery Periods and Methods."

I am sending a similar letter to Senator William V. Roth, Jr., Chairman of the Committee on Finance, Senator Daniel P. Moynihan, and Representative Charles B. Rangel.

Sincerely,

Jonathan Talisman
Acting Assistant Secretary
Tax Policy

Enclosure

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CHAPTER 1

INTRODUCTION AND SUMMARY

A. Purpose of the Study

The Tax and Trade Relief Extension Act of 1998 directed the Secretary of the Treasury to conduct a comprehensive study of the recovery periods and depreciation methods under section 168 of the Internal Revenue Code, and to provide recommendations for determining those periods and methods in a more rational manner. The explanation of the directive in the 1998 Act indicates that the Congress was concerned that the present depreciation rules may measure income improperly, thereby creating competitive disadvantages and an inefficient allocation of investment capital. The Congress believed that the rules should be examined to determine if improvements could be made.[1]

This report provides the results of Treasury's analysis of depreciation recovery periods and methods under section 168. As discussed in this introduction and in more detail in the report, an analysis of the current U.S. depreciation system involves several issues, including those relating to proper income measurement, savings and investment incentives, and administrability of the tax system. The history of the U.S. tax depreciation system has shown that provisions intended to achieve certain of these goals (for example, attempting to measure income accurately by basing depreciation on facts and circumstances) may come at the cost of other worthwhile goals (for example, reducing compliance and administrative burdens). Accordingly, the present report identifies issues relating to the design of a workable and relatively efficient depreciation system, and reviews options for possible improvements to the current system with these competing goals in mind.

Resolution of the issue of how well the current recovery periods and methods reflect useful lives and economic depreciation rates would involve detailed empirical studies and years of analysis. In addition, the data required for this analysis would be costly and difficult to obtain. Thus, the report does not contain legislative recommendations concerning specific recovery periods or depreciation methods. Rather, the report is intended to serve as a starting point for a public discussion of possible general improvements to the U.S. cost recovery system.

B. Solicitation of Public Comments

As part of this study, the Treasury Department issued a notice soliciting public comment on depreciation recovery periods and methods.[2] In view of the directive to provide general recommendations for determining depreciation recovery periods and methods in a more rational manner, the notice requested information that would highlight general problems with the current depreciation system, rather than narrower problems with respect to particular class lives or types of property. It also requested analyses and commentary that could lead to improvements that would cause depreciation allowances to reflect more closely the expected reductions in tangible depreciable asset values over time or that would reduce taxpayer compliance burdens and IRS

[1] Joint Committee on Taxation (1998), 279.

[2] Notice 99-34, I.R.B. 1999-35, August 30, 1999.

administrative burdens with respect to depreciation issues. In response to that notice, written submissions were received from a number of organizations and individuals. These comments have been taken into account in the preparation of this report.

C. Organization of the Report

Chapter 1 of this report sets forth the purpose of the report, describes the principal issues and findings related to the current depreciation system, and discusses policy options for consideration by the Congress. Chapter 2 defines depreciation and describes the role of depreciation in income measurement. Chapter 3 describes capital cost recovery provisions under present tax law. Chapter 4 evaluates the effects of those provisions on income measurement and other criteria. Chapter 5 discusses approaches for comprehensive reform of the depreciation system. Chapter 6 discusses current issues in tax depreciation, including the desirability of an asset classification system and the need to keep it up to date. Chapter 7 summarizes the advantages and disadvantages of several options to overhaul or modify the depreciation system. Appendix 1 describes the Hulten-Wykoff (and related) studies of economic depreciation and Appendix 2 summarizes the history of Treasury's former Office of Depreciation Analysis and its reports to Congress on depreciation issues.

D. Principal Issues and Findings Related to the Current Depreciation System

Based on available estimates of economic depreciation, cost recovery allowances are more generous at current inflation rates, on average, than those implied by economic depreciation. This conclusion, however, is based on estimates of economic depreciation that may be dated. It also can change at a sufficiently high rate of inflation because current law depreciation allowances are not indexed for inflation. Furthermore, the average belies substantial variation among assets in the relationship between tax depreciation and economic depreciation. In general, accelerated cost recovery allowances generate relatively low tax costs for investments in equipment, public utility property and intangibles, while decelerated cost recovery allowances generate high tax costs for investments in other nonresidential structures. These differences in tax costs, standing alone, distort investment decisions, encouraging investors to underinvest in projects with high-tax costs that earn relatively high pre-tax returns.

The current depreciation system is dated. The asset class lives that serve as the primary basis for the assignment of recovery periods have remained largely unchanged since 1981, and most class lives date back at least to 1962. Entirely new industries have developed in the interim, and manufacturing processes in traditional industries have changed. These developments are not reflected in the current cost recovery system, which does not provide for updating depreciation rules to reflect new assets, new activities, and new production technologies. As a consequence, income may be mismeasured for these assets, relative to the measurement of the income generated by properly classified existing assets. Data requirements for keeping the system up-to-date, however, are significant.

The current depreciation system has been constructed using an ambiguous classification criterion. Most assets receive depreciation allowances that are determined by the length of their "class lives." However, current class lives have been assigned to property over a period of decades, under a number of different depreciation regimes serving dissimilar purposes, and with changed definitions of class lives. The ambiguous meaning of current class lives contributes to

administrative problems and taxpayer controversies. It also makes difficult the rational inclusion of new assets and activities into the system, and inhibits rational changes in class lives for existing categories of investments.

The current system creates cliffs and plateaus in the values of depreciation deductions that may favor some assets while penalizing others. These problems arise because of the way class lives are mapped into Modified Accelerated Cost Recovery System (MACRS) recovery classes. Cliffs, in which assets with similar class lives receive very different depreciation allowances, occur because the length of the MACRS cost recovery period (and sometimes the depreciation method) changes abruptly at the endpoints of recovery classes. Plateaus, on which assets with very different class lives receive the same depreciation allowances, occur because MACRS assigns the same depreciation allowances to assets with a wide range of class lives. By potentially mismeasuring income, these cliffs and plateaus can distort investment choices.

Because section 1245 property generally is depreciated more rapidly than is section 1250 property, the classification of an asset as a separate piece of equipment (section 1245 property) or as a building structural component (section 1250 property) has important tax consequences. However, the legal distinction between section 1245 and section 1250 property is fact-specific and often ambiguous. Anecdotal evidence suggests that taxpayers increasingly may be undertaking cost segregation studies that provide a basis for identifying certain building components as section 1245 property. These cost segregation studies are expensive for taxpayers to undertake and for the IRS to monitor and review. The use of such studies may provide an advantage for aggressive taxpayers and may otherwise provide depreciation allowances that inappropriately vary among taxpayers.

Some commentators question whether the replacement of structural components or investments in other building improvements should be depreciated over 39 years when such components have a shorter useful life. The inability to recognize a loss on the replaced component may compound the problem; taxpayers find themselves continuing to depreciate replaced or abandoned components. A system that depreciates replacement investment differently from initial investment could introduce compliance and enforcement problems. It would require the taxpayer and the IRS to identify improvements properly, and would create an incentive for taxpayers to recharacterize construction costs as improvements. It also is unclear whether the current system necessarily mismeasures income by inappropriately postponing deductions. This is an empirical question. To the extent that the components of a building (including replacements) have an average durability of 39 years, the current system may properly measure income.

Taxpayers frequently object that the 39-year recovery period for nonresidential real estate is too long. Some empirical evidence suggests that current tax depreciation for nonresidential buildings is slow relative to economic depreciation, implying that taxes may discourage investment in nonresidential buildings. This issue requires additional analysis and investigation.

E. Policy Options

The replacement of the existing tax depreciation structure with a system more closely related to economic depreciation is sometimes advocated as the ideal reform. While perhaps theoretically desirable, such a reform faces serious practical problems. An approach based on empirical estimates of economic depreciation is hampered by inexact and dated estimates of

economic depreciation, and by measurement problems that will plague new estimates. Economic depreciation also requires indexing allowances for inflation, and thus faces some of the issues involved with indexing discussed below.

Because of other inefficiencies in the tax code, it is unclear that switching to a system based on economic depreciation would necessarily improve investment decisions. Switching to economic depreciation could exacerbate some tax distortions at the same time that it alleviated others. At current inflation rates, switching to economic depreciation would raise the tax cost of most business investment. Thus, it would reduce overall incentives to save and invest. However, because current depreciation allowances are not indexed for inflation, a switch to economic depreciation at higher inflation rates would promote both lower and more uniform taxes on capital income.

Indexing depreciation deductions for inflation could help promote more uniform taxation of alternative investments, and could help ensure that inflation does not inappropriately increase the overall tax rate on capital income. Indexing helps stop inflation from reducing the incentive to save and invest. Indexing depreciation for inflation, however, raises several concerns. One problem is its revenue cost; indexing can be expensive, especially at high inflation rates. Indexing depreciation without addressing other problems with the tax system also has been criticized. The concern is that with interest deductions that are not indexed for inflation, and depreciation allowances that are non-neutral and accelerated at low rates of inflation, indexing depreciation may lead to undesirable tax shelter activity. Indexing also would add complexity to the tax system because it would require annual adjustments in depreciation allowances.

Comprehensively updating and rationalizing the existing asset classification system would address several income measurement and administrative problems. A systematic overhaul, however, would be an ambitious project. It would involve a significant (and costly) effort to collect and analyze data in order to determine the class lives of new and existing assets and activities. It also may require granting Treasury the resources and the authority to change class lives. Comprehensive reform of MACRS recovery periods and methods would be possible once the class-life system has been rationalized. These changes might move the system closer to one based on economic depreciation, or perhaps provide a more uniform investment incentive.

Less comprehensive changes could improve the functioning of the current depreciation system. These changes would address narrower issues, such as the determination of the appropriate recovery period for real estate, the possible recognition of losses on the retirement of building components, or the reduction of MACRS recovery period cliffs and plateaus. Chapter 6 of this report discusses these issues and Chapter 7 offers the pros and cons for various approaches to addressing several such issues.

CHAPTER 2

DEPRECIATION AND INCOME MEASUREMENT

A. Introduction

A tax system based on income generally does not allow a deduction for the cost of an asset in the year in which it is purchased. Instead, it spreads out the deduction over a period roughly consistent with the asset's useful economic lifetime. The amount allowed as an annual deduction reflects (however roughly) the reduction in the value of the capital asset as it ages, and is called depreciation.

B. Depreciation Defined

Economic income (i.e., Haig-Simons income) is a measure of the change in a household's real economic well-being occurring over some time period (typically taken to be one year). It is the household's consumption plus changes in its wealth.[3] Changes, up or down, in the value of its capital assets, including buildings and machines, are part of a household's overall change in wealth, and are included in economic income. A tax based on economic income must allow a deduction when assets fall in value. Otherwise, taxable income will be overstated.

Discussions of depreciation typically divide the total change in an asset's value over a year into two components. The first component is economic depreciation, which generally is defined as the decline in value of an asset as it ages.[4] For example, the difference in price between a typical four-year old and a typical five-year old metal lathe is due to economic depreciation.[5]

Other factors that might change an asset's value over the course of a year traditionally are lumped together into the second component and are called revaluation effects. Revaluation includes the effects of changes in the relative price of an asset caused by changes in tastes and by some improvements in the quality of new assets relative to old assets, i.e., obsolescence.[6] For

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[3] Goode (1977).

[4] Hulten and Wykoff (1981a), Hulten and Wykoff (1996), Fraumeni (1997). Gravelle (1979 and 1994) defines economic depreciation as the expected change in asset value over a year. This is very close to the definition in the text, to the extent that revaluation effects (other than those due to expected price inflation) can be considered unexpected effects.

[5] Of course, otherwise similar assets may depreciate – fall in value as they age – at different rates. For example, a car driven 75,000 miles per year would depreciate faster than would an otherwise identical car driven only 10,000 miles per year. How intensely an asset is used may affect how fast it depreciates.

[6] In tax policy discussions, obsolescence often is considered as a cause of depreciation (e.g., as in IRC §167 and Bradford, et al. (1984)), rather than as a separate revaluation effect. Some of the empirical economics literature that estimates economic depreciation, however, seems to view obsolescence as a revaluation effect, as most clearly stated by Fraumeni (1997), and echoed by Hulten and Wykoff (1981a). There is, however, ambiguity on this point within the empirical literature as Hulten and Wykoff (1979), Hulten and Wykoff (1996), Hulten (1986) and Taubman and Rasche (1969) argue that obsolescence is a reason for depreciation as distinct from revaluation. It is not clear, however, that resolving the issue of whether obsolescence induced declines in an asset's value are properly considered to be a component of "economic depreciation" as conceived in the empirical literature is crucial to

example, the price of a car might increase over a year because it has become more fashionable, and this would be a revaluation effect. The total change in the value of an asset over a year is the sum of economic depreciation and revaluation.[7]

C. Depreciation Versus Current Expenses

A distinguishing feature of capital is its durability. A capital asset has value beyond the end of the year in which it is purchased. Consequently, income would be mismeasured if an investor were allowed to deduct the full cost of a new capital asset in the year in which it is purchased. Indeed, the initial purchase of a capital asset, such as a machine, has no effect on economic income. When a businessman purchases the machine, he simply exchanges one asset, money, for another asset of equal worth, the machine.

Rather than the initial purchase price, it is the change in the value of the machine over time that affects economic income. Because the machine is durable, any annual fall in value typically will be much less than the full price paid for the machine. The decline in value is likely to continue for many years after the machine is purchased, and should reduce income in each of those years. Depreciation is an important component of the change in the machine's value over time.

D. Why Do Capital Assets Depreciate?

A capital asset might depreciate -- fall in value as it ages over its useful life -- for several reasons.[8] One reason is that as it ages it gets closer to the end of its useful life. The value of an asset is the present discounted value of the net cash flow it can produce. Older assets have fewer years left during which they can produce income, and therefore are worth less than otherwise similar, but newer, assets that will produce an income flow over a longer life span.[9] Another reason is that capital assets wear out as they age, and so are less productive, or require more maintenance, than do newer capital assets. Certain types of quality improvements in similar new assets will also reduce the value of older assets owing to obsolescence.[10]

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determining its tax treatment. From the perspective of an accrual-based income tax, the distinction between depreciation and revaluation is meaningless. All that matters for income measurement is the net change in the asset's real value. The overall change in real value should be taxed as it accrues, regardless of whether one wishes to label part of it depreciation and part revaluation. Indeed, in his influential 1964 paper, Samuelson (1964) defines economic depreciation as the decline in the value of an asset over time without distinguishing the cause of the decline. His view is that depreciation is the negative side of the coin that has capital gain as its positive side. From the perspective of a realization based tax system the depreciation/revaluation distinction may be important, but it is not clear how obsolescence should be treated. One might argue, as does Gravelle (1979 and 1994), that a normal allowance for depreciation might properly reflect anticipated changes in asset value, presumably including anticipated obsolescence. Unanticipated changes in asset value (including changes due to unanticipated obsolescence) might be treated as capital gains (i.e., as revaluation effects), and taxed when realized.

[7] Inflation is a third source of asset price change if nominal, as opposed to real, price changes are being measured.

[8] Hulten and Wykoff (1981), Fraumeni (1997).

[9] This argument assumes that each asset will be retired at the same age. This will not be the case, for example, if an innovation is anticipated to occur at a point in time in the future, causing both newer and older existing assets to be retired at the same time. The number of remaining years is important, not the number of years that have passed since the assets were placed in service. In most circumstances, however, the latter concept may serve as an adequate proxy for the former concept.

[10] See footnote 6 for a discussion of the contribution of obsolescence to asset depreciation.

E. Inflation, Real Changes in Asset Values, and Depreciation

Inflation can lead to changes in asset values that do not reflect changes in economic well being. Therefore, inflation's effects should be removed when measuring real income and economic depreciation. For example, suppose that over the course of a year the general price level doubles. If a businessman's assets also double in value, he is no better off in terms of the real (inflation adjusted) purchasing power of his assets than he was at the beginning of the year. He would be better off only if the value of his assets more than doubled. Consequently, purely nominal growth in asset values should not trigger tax liability under a tax system based on economic income.[11] Such a tax system should be adjusted (or "indexed") for inflation.

In indexing for inflation, asset values are measured at a consistent price level, e.g., in end-of-year prices. If the general price level doubles, measuring the real change in asset values first requires doubling all beginning-of-year asset values and asset bases. For a given depreciation rate, this will automatically double the calculated depreciation deductions. Thus, indexing asset values and asset bases will increase depreciation allowances proportionately with the increase in the general price level.[12] If depreciation deductions are not increased proportionately, then they will decline in real value over time, causing an acceleration of income recognition and possible over-taxation. The following example illustrates these points.

> Suppose that at the beginning of the year a businessman has an asset worth $100, the asset depreciates at the rate of 10 percent per year, and the relative price of a similar new asset does not change. If there is no inflation, then at the end of the year the asset is worth $90; $10 is the proper depreciation allowance. In contrast, suppose there is 50 percent general price inflation. At the end of the year the asset is worth $135 ($90x(1+0.5)). But the $45 nominal increase in the asset's value is due only to inflation in the general level of prices; it does not represent real purchasing power. Far from rising in value, measured in year-end prices, the asset has declined in value, or depreciated, from $150 ($100x(1+0.5)) to $135, or by $15. To account for the 50 percent inflation rate, the depreciation deduction allowed under the tax law must increase from $10 (when there is no inflation) to $15. Proper income measurement requires a 50 percent increase in the depreciation allowance, exactly equal to the increase in the general price level.
>
> If the tax system were not indexed for inflation, and the asset were sold at this point, the taxpayer would owe tax on $45 ($135 less $90) of nominal income. This gain may be decomposed as including $50 of capital gain on the nominal revaluation of the asset, less $5 that should have been deducted as depreciation.
>
> It is conceivable that depreciation allowances could be indexed for inflation, but that nominal capital gains and losses would still be taxed – perhaps at a reduced tax rate. In this example, if depreciation were not indexed, then the resulting mismeasurement would not only delay the timing of the $5 deduction, but would

[11] This statement abstracts from the gains realized by borrowers when debt's value is fixed in nominal terms.
[12] Proper measurement of taxable income requires that all items of income and expense be indexed, not solely depreciation, and that all sources of income be included in the tax base. This, in turn, requires that the bases of assets be indexed for inflation as well.

incorrectly offset the $5 against capital gain, not ordinary income. With a differential tax rate structure, this will increase the both the amount and timing of the associated tax liability.

In the following year, without inflation in either year, the depreciation allowance would be $9 (10 percent of $90). With a 50 percent inflation rate in both year one and year two, however, prices would have increased by a factor of 2.25 since the time the asset was purchased. Consequently, the appropriate depreciation deduction would be $9x2.25 = $20.25. In general, indexing depreciation requires that the historic cost depreciation deduction (e.g., the $9 deduction) be multiplied by a factor reflecting cumulative general inflation since the asset was initially purchased.[13]

Depreciation allowances should not be indexed for changes in the real value of capital. For example, suppose as before that depreciation occurs at a 10 percent rate, and that the initial undepreciated asset basis is $100. Depreciation would be $10 with zero change in the second price level. Now assume the real value of capital goods increases by 50 percent over the course of the year, but the general price level remains unchanged. With no general inflation, depreciation should remain at $10. The asset would be worth $135, and adjusted basis would be $90 (in dollars of unchanged purchasing power). This produces an appropriately measured real gain of $45, which is 50 percent of the adjusted basis of $90.[14]

F. Four Characteristics of Economic Depreciation

Gravelle notes that economic depreciation has three important characteristics.[15] First, it allows the investor to recover the initial investment tax free while applying the statutory tax rate to the return from that investment. This implies that (assuming there are no other distortions) the tax system taxes capital income at the statutory rate. With economic depreciation and no income measurement distortion, the marginal effective tax rate equals the statutory tax rate on all investments.[16] Second, if economic depreciation deductions can be reinvested in similarly profitable assets, the taxpayer would maintain the initial value of his investment.[17] Third,

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[13] The amount is (1+ the inflation rate in the first year of the investment)x(1+ the inflation rate in the second year of the investment)x...x(1+ the inflation rate in the current year). Alternatively, if the asset basis were adjusted for inflation each year using this same factor, then the same depreciation rates that are appropriate under zero inflation could be used. Asset basis needs to be adjusted for inflation in any case under a tax system based on economic income.

[14] Some authors advocate indexing depreciation for real gains if those gains are taxed as accrued. This argument incorrectly attributes fully to depreciation any interaction between the capital gain and depreciation, and leads to incorrect results at very high rates of inflation. See Aaron (1976), Samuelson (1964), Gravelle (1979 and 1994) on this issue.

[15] Gravelle (1979).

[16] The marginal effective tax rate is the hypothetical tax rate that if applied to economic income would offer the same after-tax return as offered by the existing tax code. Calculations of the marginal effective tax rate take into account many relevant features of the tax system, including the tax rate structure, depreciation provisions, and indexing provisions. Since economic depreciation is designed to have as the tax base economic income, if there are no other income measurement deviations in the tax code, conforming tax depreciation to economic depreciation will equate the marginal effective tax rate to the statutory tax rate. Marginal effective tax rates are discussed more completely in Chapter 4 below.

[17] This statement assumes that the investment's relative price does not change.

economic depreciation measures the expected decline in the real market value of the asset in each period.[18] A fourth characteristic, that economic depreciation is required if the tax system is not to affect asset values at given market interest rates, might be added to this list.[19] These characteristics assume that there are no income measurement distortions.

G. Why Is Depreciation Important?

Depreciation is important both theoretically and practically. As discussed above, it is important from a theoretical (or conceptual) perspective because depreciation deductions are required in order to measure properly income from capital, and thus depreciation is a necessary component of an income tax. Depreciation also is important from a practical perspective because it is a deduction of considerable size, has important implications for the tax actually paid on capital income, and for the investment incentives offered by the tax system.

Depreciation allowances are an important determinant of the tax cost of investment and hence of tax incentives to invest. For example, by slowing tax depreciation allowances for nonresidential structures, the Tax Reform Act of 1986 (1986 Act) raised the estimated marginal effective corporate tax rate for nonresidential structures from 34 percent to 42 percent.[20]

Ignoring market failures (i.e., externalities), an ideal tax system would not favor investment in one asset over another. In practice, however, tax provisions often have provided greater depreciation deductions and investment tax credits to favor certain investment. For example, prior to the 1986 Act, the investment tax credit (ITC) greatly favored investment in machinery and equipment over investment in nonresidential structures. The repeal of the ITC and other changes introduced by the 1986 Act reduced the inequalities in the taxation of alternative investments and thereby encouraged a more productive allocation of capital.[21]

The recovery of investment cost also is a central feature in the debate over replacing the current U.S. income tax with a tax system based on consumption.[22] Under a consumption-based tax, the cost of business investments would not be depreciated. Instead, the cost would be deducted in the year the asset was acquired (i.e., gross investment would be expensed). While this report does not focus on expensing, the tax issues relevant to expensing are briefly summarized at the end of Chapter 5.

H. Cost Recovery for Assets Other than Equipment and Structures

Under a tax based on economic income, the net return from all investments should be subject to tax. Capitalization of the cost of an asset, combined with depreciation allowances based on the asset's fall in value as it ages, is required to ensure that the net return is properly taxed. While depreciation generally is considered in relation to investment in equipment and structures, the logic of capitalization and cost recovery applies to all investments, including those

[18] See footnote 4 above.
[19] Samuelson (1964).
[20] Fullerton, Gilletee and Mackie (1987).
[21] Fullerton, Gillette, and Mackie (1987).
[22] See, e.g., Bradford and Slemrod (1996) and Aaron and Gale (1996).

in natural resources (e.g., oil and gas reserves), intangibles (e.g., values created through advertising and research and experimentation), inventories and land. To the extent that these assets maintain value beyond the year in which they are purchased or constructed, proper income measurement suggests that it is inappropriate to deduct their cost as a current expense. Rather, income measurement principles suggest that their cost should be capitalized. If their value falls with age, the cost of these assets should be recovered gradually over time. Otherwise, proper income measurement requires that their costs should be recovered upon disposition of the property (as in the case of inventory and land).

CHAPTER 3

CAPITAL COST RECOVERY UNDER CURRENT LAW

A. Introduction

This chapter describes the main features of the capital cost recovery system under current tax law.[23]

The tax law distinguishes capital expenditures, such as amounts paid out for new buildings or for permanent improvements to increase the value of any property or estate, from ordinary and necessary expenses paid or incurred in carrying on any trade or business.[24] While business expenses are deductible in the year incurred, a capital expenditure usually is amortized or depreciated over the life of the relevant asset, or where no useful life can be ascertained, generally is deducted upon disposition of the asset. "Through provisions such as these, the code endeavors to match expense with the revenues of the taxable period to which they are properly attributable, thereby resulting in a more accurate calculation of net income for tax purposes."[25]

Under current law, the cost of investments in capital is recovered in a variety of different ways, depending on the particular characteristics of the investment and the investor. Most investments in physical equipment and structures are recovered through depreciation allowances. Depreciation allowances vary according to whether the investor is calculating regular tax or alternative minimum tax. In addition, certain investments in equipment by small businesses may be expensed, rather than depreciated. Land is not depreciated, and its cost is recovered only upon sale. Inventory costs are generally deducted when the final goods are sold. The costs associated with intangible assets are treated separately; some are expensed; some are capitalized and amortized; some are capitalized and recovered only upon dissolution of the enterprise. Many investments in natural resources and agriculture receive special treatment, such as percentage depletion and expensing, respectively. Tax credits are available for certain types of investments.

B. Description of Current Law

This section first describes depreciation under the regular income tax. It next discusses depreciation under the corporate alternative minimum tax, expensing provisions for small business, investment credits, the treatment of repairs and improvements, used assets and recapture provisions, and special cost recovery provisions for certain agriculture and natural resource activities. This section closes with a discussion of the recovery of the costs of nondepreciable assets (i.e., land, inventories, and intangibles).

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[23] Tax depreciation history is discussed in Chapter 6.B.

[24] Compare §§263(a) and 162(a).

[25] INDOPCO, Inc. v. Comm., 503 U.S. 79 (1992). The distinction between deductible repairs and maintenance expenses and capital expenditures associated with depreciable property is discussed infra.

1. Depreciation

The Internal Revenue Code explicitly allows, as a current expense, a depreciation deduction that represents a "reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence) —(1) of property used in a trade or business, or (2) of property held for the production of income."[26] Since 1981, the depreciation deduction for most tangible property has been determined under rules specified in section 168 of the Code.[27] The Modified Accelerated Cost Recovery System, or MACRS, specified under section 168 applies to most tangible property.[28] A small fraction of investment is governed by MACRS's alternative depreciation system (ADS).[29] The ADS is less accelerated than is MACRS, and applies to property used outside the United States, tax-exempt use property, tax-exempt bond-financed property, and certain imported property.[30] It also may be elected by other taxpayers and is used to calculate corporate earnings and profits. Other consistent methods of depreciation, such as the units of production method, and the income-forecast method, also may be used in some cases.[31] In addition, some long-lived property is still being depreciated under the ACRS system that was repealed by the 1986 Act or under previous depreciation regimes. Less accelerated depreciation methods generally are used to calculate depreciation for purposes of computing alternative minimum taxable income.

Under MACRS, tax depreciation allowances are computed by determining a recovery period and an applicable recovery method for each asset.[32] The recovery period establishes the length of time over which capital costs are to be recovered, while the recovery method establishes how capital costs are to be allocated over that time period. The present value of the depreciation allowances is higher for short recovery periods and faster (more accelerated)

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[26] §167(a).

[27] Five categories of property are explicitly excluded from using the section 168 rules. These include (1) property which the taxpayer properly elects to depreciate using a method not expressed in a term of years, such as the units-of-production method, (2) public utility property for which the taxpayer fails to use a normalization method of accounting, (3) motion picture films and video tapes, (4) sound recordings, and (5) certain existing property placed in service in churning transactions designed to take advantage of a newly legislated depreciation methods. §168(f). These properties are depreciated under rules specified under section 167. In particular, items (3) and (4) listed above may be depreciated using the income forecast method described in §167(g). Most depreciable computer software is depreciated on a straight-line basis over 36 months. §167(f)(1).

[28] As originally enacted in 1981, §168 introduced the Accelerated Cost Recovery System. Because the provisions of §168 were substantially modified in 1986, the system encompassed by §168 was renamed the Modified Accelerated Cost Recovery System.

[29] Only 6 percent of investment in 1997 was depreciated under the alternative MACRS method.

[30] Under the so-called Pickle lease rules, property leased to any tax-exempt entity under a disqualified lease is tax-exempt use property.

[31] The units of production method and the income forecast method are not time-based methods. The units of production method permits the recovery of the depreciable basis of an asset over the anticipated useful life of depreciable property measured in terms of anticipated units expected to be produced over the property's entire useful life. Thus, a property's depreciable cost is recovered each year in the same proportion as the units of property produced during the year bears to the property's total anticipated lifetime production. Under the income forecast method of depreciation, the depreciable basis of property is recovered over the anticipated lifetime income expected to be earned therefrom (limited under a special statutory rule to income anticipated to be earned prior to the end of the tenth taxable year following the year in which the property is placed in service). Depreciation therefore arises in the same proportion that the income from the property for the year bears to the property's total anticipated lifetime income.

[32] CCH (1995), Maule (1994).

recovery methods. All tax depreciation is based on the original, historical cost of the asset and is not indexed for inflation. Thus, depreciation allowances are not determined by directly observing the change in the value of each asset as it ages. Rather, depreciation allowances are determined by reference to statutory provisions that provide a schedule for deducting the cost of the asset over its recovery period.

a. Regular Tax Depreciation under MACRS

As noted, depreciation of most new investments made by a business operating under the regular tax are governed by the MACRS system. Each investment is assigned a recovery period, which determines the number of years over which depreciation allowances are spread, a recovery method, which determines how depreciation allowances are allocated over the recovery period and an applicable convention that determines when the property is deemed to have been placed in service during the year.[33]

Equipment

For equipment, the recovery period depends either on the type of asset or the employing industry. Certain assets, such as computers, office furniture, and cars and trucks are assigned the same recovery period in all industries. To a large extent, however, the current depreciation system is industry based rather than asset based. Most investments in equipment are assigned a recovery period that depends on the employing industry. For example, the cost of a metal lathe would be recovered over 7 years if employed in agriculture, but over 5 years if used in offshore drilling for oil.

Equipment generally is assigned under the tax code to one of seven recovery periods that range in length from three years to 25 years, based generally on its class life.[34] Class lives for most assets are listed in Rev. Proc. 87-56.[35] Generally, assets with longer class lives are assigned longer recovery periods. Statutory recovery periods that are not determined directly by class life, however, are assigned to certain assets, such as certain horses, automobiles, light trucks, railroad track, and municipal sewers.

Three-year property includes property with a class life of four years or less.[36] Also included are certain horses and certain "rent to own" consumer durable property.[37]

Five-year property generally includes property with a class life of more than four years and less than 10 years.[38] Five year property also includes: (1) cars and light general purpose trucks, (2) semi-conductor manufacturing equipment, (3) computer-based telephone central office switching equipment, (4) qualified technological equipment, including computers and

[33] §168(a).
[34] See §168(e).
[35] Rev. Proc. 87-56, 1987-2 C.B. 674. As is discussed in more detail in Chapter 6, the class life system was originally formulated as a tool to permit taxpayers and the IRS to agree on the useful lives of assets, and later evolved into an elective system that allowed taxpayers to choose a useful life from within an acceptable range.
[36] §168(e)(1).
[37] §168(e)(3)(A).
[38] §168(e)(1).

peripheral equipment, (5) certain property used in the conduct of research and experimentation, (6) geothermal, solar and wind energy property, and (7) certain biomass properties.[39] As shown in Table 1, 5-year property comprises the largest single category of investment, accounting for 48 percent of corporate MACRS investment in 1997.

Seven-year property includes property with a class life of 10 years or more but less than 16 years, including office furniture and fixtures.[40] This class of property includes railroad track and any property that does not have a class life and is not otherwise classified.[41] This category accounted for 23 percent of corporate MACRS investment in 1997.

Ten-year property is property with a class life of 16 years or more but less than 20 years, including vessels, barges and tugs.[42] Single purpose agricultural and horticultural structures are also included.[43]

Fifteen-year property is property with a class life of 20 years or more but less than 25 years.[44] It includes municipal wastewater treatment plants, telephone distribution plants and other comparable equipment used for the two-way exchange of voice and data communications, and retail motor fuels outlets.[45]

Twenty-year property includes property with a class life of 25 years or more, other than certain structures (i.e., section 1250 real property) with a recovery period of 27.5 years or more.[46] Water utility property and municipal sewers placed in service before June 13, 1996 as well as farm buildings are included in this category.

Twenty-five-year property includes water utility property and municipal sewers placed in service after June 12, 1996.[47]

The applicable method of depreciation depends on the asset's recovery period. Assets with a recovery period of three, five, seven or ten years generally use the double declining balance method.[48] Assets with a fifteen or a twenty-year recovery period generally use the 150 percent declining balance method.[49] Assets with a twenty-five year recovery period use the straight-line method.[50]

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[39] §168(e)(3)(B).
[40] §168(e)(1) and Rev. Proc. 87-56, supra.
[41] §168(e)(3)(C).
[42] §168(e)(1) and Rev. Proc. 87-56, supra.
[43] §168(e)(3)(D)(i).
[44] §168(e)(1).
[45] §168(e)(3)(E).
[46] §168(e)(1).
[47] 27.5- and 39-year property are described below under "structures."
[48] See §168(b). An exception is provided for equipment used in farming, all of which receives the 150 percent declining balance method, even if three-, five- or seven-year property.
[49] Id.
[50] Id.

Table 1

MACRS Investment in 1997[a]

Recovery Period	Investment ($ millions)	Percent of Total[b]
3 years	21,584	4
5 years	296,963	48
7 years	145,045	23
10 years	11,129	2
15 years	27,737	4
20 years	18,576	3
25 years	829	0
27.5 years	8,176	1
39 years	88,372	14
Total	618,410	100

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[a] This table excludes the $37 million investment depreciated under the alternative depreciation system (ADS).
[b] The numbers sum to less than 100 because of rounding.

Straight-line depreciation allows the asset's historical cost to be deducted ratably over the asset's recovery period. It gives a constant annual deduction equal to the product of a depreciation rate of 1/L times the (historical) cost of the asset, where L is the asset's recovery period. For an asset that originally cost $200 and that has a 5-year recovery period, the straight-line depreciation allowance would be $40 ((1/5)x$200) each year for five years.

The declining balance method calculates depreciation each year as the product of a depreciation rate times the remaining undepreciated basis of the investment. If L is the asset's cost recovery period, the double declining balance method has a depreciation rate of 2/L. This is twice the straight-line depreciation rate, whence the "double" in double declining balance.[51] Under the double declining balance method, the base against which the depreciation rate is applied falls each year to reflect the previous year's depreciation, whence "declining balance." For an asset that originally cost $200 and has a 5 year recovery period, double declining balance depreciation would be $80.00 ((2/5)x$200) in the first year, $48.00 ((2/5)x($200-$80.00)) in the second year, $28.80 ((2/5)x($200-$80.00-$48.00)) in the third year, and so on.

[51] The depreciation rate would be 1.5/L if the method were 150-percent declining balance.

Both the double declining balance and the 150-percent declining balance methods are referred to as accelerated methods because these declining balance methods concentrate a larger proportion of deductions in the early years of an asset's recovery period than does straight-line depreciation. This is illustrated in the calculations above. For example, over the first two years of the investment's life, straight-line depreciation would allow cost recovery of $80, while double declining balance would allow cost recovery of $128.

Depreciation based on a declining balance method would never fully recover the cost of an investment. Consequently, MACRS mandates a switch to straight-line depreciation of the assets remaining unrecovered basis over the years remaining in the asset's recovery period at the point where straight-line depreciation yields a larger deduction than does declining balance depreciation.[52] This also allows the taxpayer to close out its depreciation account on terms more favorable than obtained were it to continue under a declining balance method.

MACRS also employs an applicable convention that specifies when during the year the asset is deemed placed in service. For most assets, the half-year convention provides a deemed placed-in-service date providing effectively that depreciation begins in the middle of the tax year of acquisition.[53]

As an example of the declining balance method with a half-year convention and a switch to the straight-line method, consider a $1,000.00 investment in an asset that has a ten-year MACRS recovery period (see Table 2). For this asset, MACRS depreciation is generally calculated using the 200-percent declining balance method, so the applicable depreciation rate is 20 percent (2/10). Given the half-year convention, the 200-percent declining balance method produces a depreciation allowance of $100.00 (0.5x0.20x$1,000) in the first year. In the second year, a full deduction of $180.00 (0.20x($1,000.00-$100.00)) is allowed. The deduction is $144.00 (0.20x($1,000.00-$280.00)) in the third year, $115.20 (0.20x($1,000.00-424.00)) in the fourth year, and so forth, as shown in Table 2. Under MACRS, however, the taxpayer does not remain on the 200-percent declining balance method for the entire recovery period. Rather, the taxpayer switches to the straight-line method in the first year that such a switch allows a higher annual depreciation deduction. As shown in Table 2, this occurs in year seven for ten-year MACRS property. In the beginning of that year, the asset has a remaining life of 4.5 years after allowing for the application of the half-year convention. The straight-line depreciation rate is 22.2 percent (1/4.5), and provides a depreciation deduction of $65.54, which is larger than the $58.98 deduction computed using the 20 percent rate under the 200-percent declining balance method. Thus, the taxpayer switches to the straight-line method in the seventh taxable year, and remains on that method for the remainder of the recovery period, as shown in Table 2.[54]

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[52] If the taxpayer switched to straight-line in the investment's xth year, the taxpayer would recover the remaining depreciable basis using a straight-line rate of 1/(L - (x-1.5)), where L is the asset's recovery period. The 1.5 term reflects the half-year convention discussed below.

[53] §168(d)(1). The half-year convention arises from the simplifying presumption that assets generally will be acquired evenly throughout the tax year. In circumstances where large amounts of property are placed in service during the last three months of a taxable year, this presumption is overridden and a mid-quarter convention applies. See §168(d)(3).

[54] By accelerating his deductions, switching to straight-line depreciation increases their present value, and thus offers a benefit to the taxpayer, relative to remaining on the double declining balance method.

The IRS publishes tables of percentage allowances per dollar of investment that free taxpayers from making these calculations.[55]

Table 2

200-Percent Declining Balance Depreciation with Optimal Switch to Straight-Line and Half-Year Convention

Taxable Year	Remaining Depreciable Life (Years)	Depreciation Rates (Applied to Adjusted Basis) 200% Declining Balance	Straight-Line	Beginning of Year Adjusted Basis	Depreciation Allowance
1	10.0	10.0%	5.0%	$ 1,000.00	$ 100.00
2	9.5	20.0%	10.5%	$ 900.00	$ 180.00
3	8.5	20.0%	11.8%	$ 720.00	$ 144.00
4	7.5	20.0%	13.3%	$ 576.00	$ 115.20
5	6.5	20.0%	15.4%	$ 460.80	$ 92.16
6	5.5	20.0%	18.2%	$ 368.64	$ 73.73
7	4.5	20.0%	22.2%	$ 294.91	$ 65.54
8	3.5	20.0%	28.6%	$ 229.37	$ 65.53
9	2.5	20.0%	40.0%	$ 163.84	$ 65.54
10	1.5	20.0%	66.7%	$ 98.30	$ 65.53
11	0.5	20.0%	100.0%	$ 32.77	$ 32.77

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Buildings

Non-residential buildings generally are depreciated over a 39-year recovery period using the straight-line method.[56] Nonresidential buildings include commercial buildings like office buildings and shopping malls, as well as industrial buildings such as factories. About 14 percent of corporate MACRS investment was in this category in 1997. Residential buildings (e.g., apartment complexes) are depreciated over a 27.5-year period using the straight-line method.[57] Only one percent of corporate MACRS investment was in this category in 1997. The recovery period for buildings is the same regardless of which industry uses the building. Tax depreciation allowances for buildings employ a mid-month convention; the first year's depreciation assumes that the asset was placed in service on the 15th day of the month during which the asset was actually placed in service.[58]

[55] These tables are published annually in IRS publication 946.
[56] §§168(c) & 168(b)(3)(A).
[57] §§168(c) & 168(b)(3)(B).
[58] §168(d)(2).

For tax purposes, a building includes all of its structural components. The cost of these components is not recovered separately from the building; rather these costs are recovered using the life and method appropriate for the building as a whole.[59] As is discussed more fully in Chapter 6, the determination of what is a building is a matter of significant controversy under the present rules.

General Asset Accounts

Special rules obviate the need to separately track all investments.[60] These rules permit taxpayers to elect to group by recovery class investments made in a given year (and a given month, for structures) into "general asset accounts." The general asset account is depreciated as if it were a single asset and the disposition of an asset placed in a general asset account does not affect the future depreciation of the account. In addition, the proceeds realized on any disposition of property in a general asset account are included in income as ordinary income.

b. Corporate Alternative Minimum Tax

Description

The corporate alternative minimum tax (AMT) is a parallel tax system designed to insure that corporations with significant "economic" income pay some minimum level of tax on that income.[61] One way that it accomplishes this goal is by eliminating or reducing tax benefits available under the regular tax. The AMT expands the base of the regular tax by adding back in certain tax preferences and by making a number of other adjustments that modify certain items of income and expense. Corporations generally must compute their tax under both the regular tax and the AMT, and pay whichever is higher.[62] The Taxpayer Relief Act of 1997 repealed the AMT for small corporations.[63]

Under the AMT, depreciation historically has been computed using a longer recovery period and a slower recovery method than allowed under MACRS, and this difference in depreciation allowed has been an important factor in making firms pay AMT. In the 1990s, however, statutory changes have reduced the importance of depreciation as a factor generating AMT liability.

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[59] In 1986, Congress modified and renumbered prior law §168(f)(1). In doing so, Congress expressly stated that the prohibition against component depreciation was retained. See S. Rept. No. 99-313, 99th Cong., 2d Sess. 105 (May 29, 1986).

[60] §168(i)(4).

[61] The AMT's income concept differs substantially from the economic income discussed in Chapter 2 above.

[62] The AMT tax rate for corporations is 20 percent, well below the 35-percent top rate under the regular corporate income tax. Small corporations and individuals also receive an exemption amount. The rate differential and exemption amount helps explain why only a small fraction of firms are on the AMT in any given year. Corporations are entitled to a credit for AMT taxes paid. This credit may be used to reduce future regular tax payments (subject to limitations), once a firm moves off the AMT and back onto the regular corporate income tax.

[63] A corporation that had average gross receipts under $5 million for 1994-1996 is exempt from the AMT and continues to be exempt so long as its average gross receipts do not exceed $7.5 million.

Until recently, there were two ways that depreciation could place a firm on the AMT. The first was through the adjusted current earning (ACE) adjustment.[64] For investments undertaken after 1994, however, the Omnibus Budget Reconciliation Act of 1993 removed from ACE the adjustment for accelerated depreciation. The second way was through the depreciation adjustment taken in calculating AMT income. The 1997 Act, however, dramatically reduced the importance of the depreciation adjustment by conforming recovery periods for tangible personal property under the AMT to those under the regular tax. For investment after December 31, 1998, AMT recovery periods for such property are identical to MACRS recovery periods. The remaining difference between regular tax depreciation and AMT depreciation will be that, for some types of equipment, the AMT will base depreciation allowances on a somewhat slower method (150-percent declining balance) than allowed under MACRS (200-percent declining balance). For most buildings, there will be no difference between AMT depreciation and MACRS depreciation.

Data on Depreciation Adjustments under the AMT

In the past, depreciation was the major reason for a firm to be on the AMT (see Table 3). In 1992, the AMT depreciation adjustment totaled $22.8 billion and accounted for nearly55 percent of total AMT adjustments and preferences. In 1997, the AMT depreciation

Table 3

Corporate AMT Adjustments and Preferences

	1992	1994	1996	1997
Depreciation				
Amount ($ billions)	22.8	18.1	18.3	15.9
Percent of total adjustments And preferences	54.9	61.2	82.0	75.3
Adjusted Current Earnings (ACE)				
Amount ($ billions)	18.9	11.2	8.2	6.6
Percent of total adjustments And preferences	45.4	37.8	37.0	31.5
Other Adjustments and Preferences				
Amount ($ billions)	-0.1	0.3	-4.2	-1.4
Percent of total adjustments And preferences	-0.3	0.9	-19.1	-6.8

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[64] ACE is closely related to earnings and profits, but is calculated by adding to AMT income certain particular items, including an adjustment for accelerated depreciation. Taxpayers must include in their AMT income 75 percent of the difference between AMT income (determined without regard to either the ACE adjustment or alternative tax net operating losses) and ACE.

adjustment fell to $15.9 billion, but accounted for over 75 percent of all AMT adjustments and preferences.[65] The statutory changes discussed above will reduce significantly the future size of the AMT depreciation adjustment.

2. Expensing under Section 179

Small businesses can immediately deduct (i.e., expense), rather than capitalize and depreciate, some of their investment in equipment. In 2000, the first $20,000 of investment may be deducted immediately rather than depreciated over time, and that amount increases to $24,000 in 2001 and 2002, and $25,000 in 2003 and thereafter.[66] The maximum amount that may be expensed, however, is reduced by one dollar for each dollar by which a taxpayer's total investment in qualifying property exceeds $200,000. In addition to this general tax provision, other sections of the tax code provide partial expensing for certain narrowly defined investments (e.g., clean-fuel burning vehicles, investments in empowerment zones, and certain environmental remediation costs). In 1997, corporations expensed nearly $10 billion of investment.[67]

3. Investment Related Tax Credits

Depreciation is not the only way for an investor to recover the cost of its investment for tax purposes. The Government also can directly bear part of an investment's cost through a tax credit equal to a fraction of the cost of a qualified investment. Prior to 1986, the United States allowed a tax credit of up to 10 percent of the cost of qualified investment in certain equipment. This general investment tax credit was repealed by the 1986 Act. However, tax credits for certain types of investments remain in the tax code. These include a credit for qualified research and experimentation expenditures and a reforestation credit. In addition, tax credits are available for low income housing investments, for rehabilitation of historic buildings, for the purchase of electric vehicles, and for certain energy property.

Data from corporate tax returns show that in 1997 corporations claimed over $6.9 billion in general business tax credits of all types.[68] Of this total, 65 percent or about $4.5 billion was due to the credit for qualified research and experimentation expenditures. Corporations claimed over $1.5 billion in credits for low income housing in 1997. No other investment related general business tax credit claimed by corporations accounted for more than $300 million in 1997.

4. Repair Expenditures vs. Capitalizable Improvements

Under current law, repair and maintenance expenditures are deducted when incurred, i.e., they are expensed. However, substantial improvements that enhance the value of property must be capitalized and depreciated.[69]

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[65] The separate depreciation adjustment understates the overall importance of depreciation in generating AMT liability. The ACE adjustment has been the second most important AMT adjustment, and accelerated depreciation was a major component of the ACE adjustment prior to 1993.
[66] See §179(b)(1).
[67] This is equivalent to about 1.5 percent of corporate investment subject to MACRS (Office of Tax Analysis calculations).
[68] Office of Tax Analysis calculations.
[69] §263(a).

The distinction between a repair expenditure and an improvement that must be capitalized, however, is a difficult one to draw in practice, and significant controversy exists in this area.[70] Part of the reason for the controversy is that there are no clear criteria on which to base a tight, logical differentiation between a repair and an improvement; the legal distinction between the two often is one of degree[71] and intention.[72]

A useful description of the rationale that supports the legal distinction between repair and improvement is:

> In determining whether an expenditure is a capital one or is chargeable against operating income, it is necessary to bear in mind the purpose for which the expenditure was made. To repair is to restore to a sound state or to mend, while a replacement connotes a substitution. A repair is expenditure for the purpose of keeping the property in an ordinarily efficient operating condition. It does not add to the value of the property, nor does it appreciably prolong its life. It merely keeps the property in an operating condition over its probable useful life for the uses for which it was acquired. Expenditures for that purpose are distinguishable from those replacements, alterations, improvements or additions which prolong the life of the property, increase its value or make it adaptable to a different use. The one is a maintenance charge, while the others are additions to capital investment that should not be applied against current earnings.[73]

Repairs that neither materially add to the value of the property nor appreciably prolong its life are referred to as "incidental repairs,"[74] and may be expensed. A costly disbursement undertaken to keep an asset operational may be an incidental repair depending on the nature of the work in relation to the taxpayer's operations.[75]

Capital expenditures generally materially extend a property's life or increase its value. While all repair or maintenance spending prolongs a property's life to some extent, capitalization is required if the expenditure extends the life of the property compared to its life prior to the condition necessitating the expenditure.[76] Capital expenditures include expenditures for permanent improvements or betterments made to increase a property's value, to restore the

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[70] 2000 TNT 28-2, No easy Answers to INDOPCO Issues. February 9, 2000; Pavano, Byron, NOTE: Life in All Its Fullness: A Discussion of Capitalization v. Deduction, 39 B.L.C. Rev 253 (Dec 1997).

[71] Red Star Yeast & Prods. Co. v. Comm.., 25 T.C. 321. (Jetties constructed to arrest erosion added value to lakefront property and were required to be capitalized.)

[72] Bank of Houston v. Comm., T.C. Memo 1960-110 (1960) (Costs of rehabilitation, remodeling and improvement of a bank were capital expenditures.)

[73] Illinois Merchants' Trust Co. v. Comm., 4 B.T.A. 103 (1926)(acq.) (Deduction permitted for costs of replacing wooden piles with concrete so as to prevent the collapse of a warehouse).

[74] Treas. Reg. §1.162-4.

[75] American Bemberg Corp. v. Comm., 10 T.C. 361 (1948) (Expenses of subsoil drilling and grouting made to forestall imminent disaster and permit continued operation of a plant on the same scale held deductible).

[76] Plainfield-Union Water Co. v. Comm., 39 T.C. 333 (1962) (Deduction allowed for costs to clean and reline water pipes to restore water transportation capacity following damage from the introduction into the water system of more acidic water.), See also Illinois Merchants' Trust Co., supra.

property, or to make good the exhaustion thereof.[77] Expenditures that adapt property to new or different uses are capital expenditures,[78] as are costs to put property in operating condition.[79] Expenditures that arrest deterioration and appreciably prolong the life of the property must be capitalized.[80] Capitalization also is required for replacements of major components or elements of an asset,[81] and for the reconditioning of property or the improvement of property as part of an overall plan of rehabilitation.[82]

5. Used Assets and Recapture

Used assets generally are depreciated according to the same rules that apply to new assets. The buyer of a used asset recovers its cost over the same period and with the same methods as the buyer of a similar new asset. The seller of a used (depreciated) asset recognizes gain or loss from the sale of the asset, computed as the difference between the sales price and the adjusted basis of the asset. Thus, for an asset that has been completely depreciated, the seller is taxed on gain essentially equal to the price it receives for the asset.

Moreover, for the sale of personal property (e.g., equipment), the recapture provisions of section 1245 limit the extent to which the seller can benefit from a lower rate of tax on capital gains of individuals. Upon the sale of a piece of machinery, for example, the seller pays tax at the ordinary income tax rate on the gain to the extent of depreciation allowances claimed. Only the gain in excess of total claimed depreciation is taxed at the lower capital gains rate.

In contrast, recapture is not required for most real property (e.g., commercial, industrial and residential buildings). However, there are several qualifications to the statement that depreciation on real estate is not recaptured. First, all depreciation is recaptured if the asset is not held for at least one year and on nonresidential real property depreciated under the Accelerated Cost Recovery System (ACRS). Second, the excess over straight-line depreciation is recaptured on buildings and improvements (other than nonresidential real ACRS property) that were placed in service prior to MACRS or otherwise use an accelerated method of depreciation. Third, corporations must recapture gain on up to 20 percent of accumulated depreciation.[83] Fourth, and most important, on many investments in real estate individuals must pay tax at the lesser of their ordinary tax rate or 25 percent on gain attributable to prior depreciation. While not called recapture, this provision, enacted in 1997, eliminates the benefits of lower capital gains

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[77] Treas. Reg. §1.263(a)-1(a).

[78] Treas. Reg. §1.263(a)-1(b). Bee Holding v. Comm., 17 T.C. M. (CCH) 963 (1958) (Expenditures to modify rental property to permit an existing tenant to expand its store to incorporate the two adjoining storerooms were capital outlays).

[79] M.A. Stoeltzing v. U.S., 266 F.2d 374 (3rd Cir., 1959) (Costs to restore a dilapidated building were capital expenditures.)

[80] Treas. Reg. §1.162-4. Mountain Fuel Supply Company v. U.S., 449 F.2d 165 (10th Cir., 1971) (Costs to recondition a pipeline held capital where they extended the life of the pipeline.)

[81] Treas. Reg. §1.162-4.. P. Doughtery Co. v. Comm., 159 F.2d 269 (4th Cir., 1946) (Costs of replacing the stern of a barge were capital), The Phillips and Easton Supply Co, 20 T.C. 455 (1953) (Factory floor replacement held capital).

[82] I. M. Cowell v. Comm., 18 B.T.A. 997 (1930) (Taxpayer must capitalize expenditures for reconditioning and improvement of a hotel), Alexander L. Allen v. Comm,, 15 T.C. M. 464 (1956) (Remodeling of buildings for taxpayer's use held capital), M.A. Stoeltzing v. U.S., supra.

[83] This provision was more relevant when corporations had a capital gains rate preference.

tax rates for low bracket individual investors and reduces the benefit of lower capital gains tax rates for high bracket individual investors.[84]

6. Natural Resources and Agriculture

A number of special capital cost recovery provisions apply to certain mining and agricultural activities.[85]

Some costs (e.g., acquisition costs and some exploration costs) of investing in fuel, timber and mineral deposits are recovered through depletion deductions. Depletion is similar in concept to depreciation, and refers to the exhaustion of a natural resource as a result of production. "Cost depletion" is the basic method of computing depletion deductions.[86] Cost depletion allocates the cost of a natural resource over the total anticipated reserve to yield a cost depletion per unit (expressed in tons, barrels, etc.). A depletion deduction is then allowed each year based on the units exploited. An alternative method of computing depletion is known as "percentage depletion."[87] Under this method, a flat percentage of gross income from the property is taken as the depletion deduction. Percentage depletion may be used for most investments in depletable property; however, it may not be used for timber, and its use for oil and gas properties is subject to limits.[88]

Many of the costs of finding oil, gas and mineral reserves may be expensed rather than depleted.[89] These costs include intangible drilling and mining costs (labor, supplies, and repairs) and the costs of unproductive properties, wells, and mines. Large integrated oil producers, however, must capitalize 30 percent of intangible drilling costs, and amortize them over five years.[90] Many costs of growing timber also are expensed, and reforestation costs are eligible for a limited 10 percent tax credit and a seven-year amortization period.[91] Many noncorporate farmers can deduct costs that normally would be capitalized (feed, fertilizer, soil conservation costs and various livestock and crop production costs).[92]

In 1997, corporations claimed over $10 billion in depletion deductions.[93] The excess of percentage depletion over cost depletion has a corporate tax revenue cost of about $400 million annually.[94] Some of the other special rules also convey substantial benefits. For example, the estimated corporate revenue cost for the expensing of multiperiod timber growing costs is about $305 million annually.[95]

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[84] §1(h).
[85] Some of these are tax expenditures and are discussed in U.S. Office of Management and Budget (2000).
[86] §612.
[87] §613.
[88] Only independent oil businesses may use percentage depletion.
[89] §263(c),§616 and §617.
[90] §291(b).
[91] §263A(c)(5),§48(b), §194.
[92] Reg. §1.162-12, §180, §175, §263A(d)(1)(A).
[93] Internal Revenue Service (2000).
[94] The revenue loss estimates are from the Tax Expenditure Budget. See U.S. Office of Management and Budget (2000).
[95] U.S. Office of Management and Budget (2000).

7. Nondepreciable Assets

a. Inventory

Inventory is also an asset, because its value may be long-lived. The cost of investment in inventory is neither depreciated nor expensed. Rather, it is added to an inventory account (i.e., capitalized), and deducted when the associated goods sold.[96] There are two primary methods of inventory accounting: first-in, first-out (FIFO), and last-in, first-out (LIFO).[97] Neither attempts to track the particular goods that are sold in a given year. Instead, both methods track the unit sales of goods in a particular year and then use a cost flow assumption to determine the cost of the units sold. Under FIFO, the assumption is that the oldest items of inventory (the first in) are the first to be sold (first out). Under LIFO, the rule is that the youngest items of inventory (the last in) are the first to be sold. When real or nominal costs are changing over time, which rule a firm adopts can substantially affect its taxable income. LIFO helps protect the firm from the taxes on inflationary increases in the value of inventory, because the last items in inventory will be valued at current (i.e., higher) cost, while FIFO offers no such protection. Most firms would face lower taxes under LIFO, yet only about 24 percent of total inventories actually use LIFO.[98] One reason for this is that tax rules permit the use of LIFO only when LIFO is concurrently used for financial accounting purposes. Electing to obtain the tax benefits of LIFO, therefore, entails reporting lower book profits.[99]

In 1997, corporate inventories totaled $1,114 billion, and cost of goods sold was $9,114 billion.[100] The cost of goods sold was the largest single item reducing taxable income that was reported by corporations in 1997.

b. Land

Land cannot be depreciated.[101] Rather, the cost of a purchase of land is capitalized in the investment's basis, and deducted against sales proceeds when the asset changes hands at some future date. Certain improvements to land, however, can be depreciated.

According to data from the Board of Governors of the Federal Reserve System, in 1994 the total value of private land in the U.S. in 1994 was $4,364 billion.[102] Of this total, $3,015.30 billion was held by households and nonprofits, $605 billion by farms, $550.90 billion by nonfarm, noncorporate business, $93.30 billion by nonfinancial corporate business, and $99.40 billion by private financial institutions.

[96] The capitalized value of inventories includes depreciation expense attributable to assets used in the production of the inventory.
[97] Other methods, such as the lower of cost or market (LCM), are allowed in some cases.
[98] This calculation is for the combined manufacturing and trade sectors and based on Census data, obtained in a telephone conversation with Jennifer Ribarsky of the Bureau of Economic Analysis.
[99] King and Fullerton (1984).
[100] Internal Revenue Service (2000).
[101] Treas. Reg. §1.167(a)-2.
[102] Board of Governors of the Federal Reserve System (1995).

c. Intangibles

Intangible assets include goodwill, customer bases, trademarks, copyrights, patents, and workforce quality. Other intangible assets may include motion picture films, sound recordings and computer software. The costs to acquire intangibles after August 10, 1993 are generally recovered on a straight-line basis over 15 years.[103]

Certain intangible assets, most notably patents, copyrights, motion picture films, sound recordings and computer software are excepted from the 15-year amortization period applicable to most acquired intangibles if they are acquired separately. The costs of a separately acquired patent or copyright are recovered on a straight-line basis over the shorter of the legal life or the useful life of the property.[104] Computer software investments are recovered over 36 months on a straight-line basis.[105] Investments in motion picture films and sound recordings can be recovered using the income forecast method. Under this method, taxpayers forecast the anticipated lifetime income from the property, and then each year as income from the property is earned, the proportion of the basis in the property that bears the same relationship to the total basis as that year's income bears to the total anticipated income may be deducted.[106]

The costs to create certain intangibles may be deducted immediately, rather than capitalized and amortized over the life of the intangible asset. Advertising costs, research and experimentation expenditures, the expenses of training programs and other expenses that create future goodwill and know-how essential for profitable future production generally are deductible in the year incurred. On the other hand, the costs to create motion picture films, sound recordings, and books must be capitalized[107] and recovered through depreciation in the same manner as if these properties were purchased.

The level of annual investment in intangibles is difficult to measure, in part because much of this spending is not separately accounted for on tax returns. A partial estimate nonetheless is possible. Advertising is one important source of intangibles, and in 1997 corporations deducted over $188 billion in advertising expenses on their tax returns.[108] According to the Shepherd and Payson, the top 500 U.S. firms spent $111 billion on research and development in 1997.[109]

[103] §197(a).
[104] Treas. Reg. §1.167(a)-14(c)(4).
[105] §167(f)(1). Computer software that is acquired "bundled" with hardware is not eligible for the 36-month amortization rule, but is instead depreciated as part of the hardware.
[106] §167(g). For purposes of §167(g), the anticipated lifetime income is limited to income earned prior to the end of the tenth taxable year ending after the year that income forecast property is placed in service.
[107] Treas. Reg. 1.263A-2(a)(2)(ii).
[108] Internal Revenue Service (2000).
[109] Shepherd and Payson (1999).

CHAPTER 4

EVALUATION OF THE CURRENT COST RECOVERY SYSTEM[110]

A. Introduction

This chapter addresses the issue of how the main features of the current cost recovery system affect the taxation of capital income. It focuses on how closely current law cost recovery allowances reflect allowances based on economic depreciation; how deviations from economic depreciation affect the level and distribution of taxes on capital income; and justifications for any current law deviations from economic depreciation.

Our empirical evaluation of the main features of cost recovery under the regular tax finds that, at current rates of inflation, depreciation allowances under current law generally are accelerated relative to those implied by economic depreciation, but that this relationship would reverse at a high rate of inflation. The relationship between tax depreciation and economic depreciation, however, varies from investment to investment in a way that gives some investments a tax advantage over others. In particular, the cost recovery system provided by current law favors investments in equipment over nonresidential structures, and favors intangibles over depreciable property. Because of this differential tax treatment, the current cost recovery system may distort investment decisions by businesses.

However, countervailing factors may exist that would argue for deviations of the current cost recovery system from the norms provided by economic depreciation and tax uniformity. Such deviations are rationalized as a way to provide tax incentives to save and invest, offset other tax distortions, offset market failures, and ease tax compliance and administration.

B. Income Measurement: General Issues

1. Statutorily Determined Allowances Based on Time

For depreciable assets, the current-law cost recovery allowances assume that assets wear out at a specified rate over time. This rate is independent of the actual or expected economic conditions facing each taxpayer. Thus, the current-law depreciation allowances deviate fundamentally from the concept of economic depreciation. At best, a schedule of statutory allowances could match economic depreciation only on average. However, statutory schedular allowances are much simpler for the taxpayer to comply with and for the IRS to enforce than would be a method that sought to determine appropriate economic depreciation for each asset used by each taxpayer.

MACRS also bases cost recovery allowances on specified time periods. However, many assets may depreciate faster or slower depending on how intensively they are used. Present law

[110] The discussion of several issues relating to the classification of assets under MACRS is considered in Chapter 6 below.

generally does not take intensity of use into account for purposes of determining depreciation.[111] Ignoring intensity of use may mismeasure income to some extent, but it may promote tax simplicity.

2. Activity vs. Asset Type as Basis for Assigning Cost Recovery Allowances[112]

As discussed above, some assets receive the same depreciation treatment regardless of the industry or economic activity in which they are employed. These assets include several types of equipment, as well as commercial, industrial and residential structures. Also, the tax treatment of nondepreciating assets, such as land, inventory, and intangibles, does not vary according to which industry is making the investment. For many types of equipment, however, depreciation allowances depend not on the type of asset, but on the industrial activity in which it is used. Basing cost recovery allowances on the industry using the asset, rather than on the asset itself, has an ambiguous effect on income measurement, tax administration, and tax compliance.

An activity-based system would more accurately measure income to the extent that assets depreciate differently depending on the activity in which they are employed. This is more likely to occur to the extent that individual assets are combined into a larger production process that wears out, becomes obsolete, and is replaced as a unit. On the other hand, an activity-based cost recovery system has the potential to mismeasure income to the extent that assets with the same economic depreciation rates are given different tax treatment depending on the employing industry, and to the extent that assets with different economic depreciation rates are given identical tax deductions within an activity. The aggregate depreciation of an industry's assets may nevertheless provide an accurate income measure, if the activity-based system is accurate on average for the industry.

The current mixed system is appropriate to the extent that it accurately differentiates between assets that should be depreciated on an activity basis and those that should not. To the extent, for example, that assets such as cars, trucks and buildings depreciate at the same rate regardless of where employed, the current system may be correct in depreciating them on an asset basis. To the extent that other assets are combined into more idiosyncratic production processes that differ from industry to industry, then current law may be correct in depreciating those assets on an activity basis.

Neither an asset-based, nor an activity-based, system would seem to have a clear advantage in promoting tax simplicity. An activity-based depreciation system offers the advantage of using the same depreciation rules for all (or most) of a company's investments, rather than depreciating each investment differently. On the other hand, an asset-based system may offer the advantage of requiring only seven or eight different investment categories for purposes of determining cost recovery allowances.[113] It may be easier to assign each asset to one of these limited number of categories, to change that assignment when appropriate, and to

[111] Taxpayers may elect to exclude certain property from the application of the MACRS if the assets are more properly depreciated using a method that is not expressed in a term of years, but this election is rarely used. Indeed, one of the rationales for converting to statutorily determined recovery allowances from prior law facts-and-circumstances depreciation was to reduce controversy.

[112] This topic is revisited in Chapter 6.

[113] See, for example, the depreciation system described in U.S. Treasury (1984).

integrate new assets into an asset-based system than it would be to properly determine and to assign each firm's activities to one of many industrial categories. Current law's class life system, for example, differentiates over 100 separate industrial activities. Of course, a less detailed activity-based classification system is possible, but past experience may suggest that it is unlikely.

3. Land and Inventories

While land and inventories are not depreciable for tax purposes, some land and inventories nonetheless may fall in value as they age.[114] For example, the nutrient content of farmland may diminish over time, or a reduction of the water table eventually may render farmland unsuitable for crops. To the extent that land and inventories fall in value as they age, their treatment under the Code may cause income to be overstated.

There is also the administratively difficult issue of how to separate depreciable land improvements from other expenditures that must be capitalized.[115] Because of the complexity of these issues there is legal uncertainty in this area. For example, whether certain land improvements have a determinable useful life is sometimes unclear. However, when there is a close connection between the grading and clearing of land and other depreciable assets, the costs of grading and clearing have been held to be depreciable.[116] Such a connection apparently exists when the grading and clearing is for the construction of a road that is useful only to the extent that it leads to a (depreciable) building. Uncertainty imposes costs on taxpayers and the IRS in addition to the costs of inefficiencies and inequities that arise from mismeasuring income by denying a deduction for an asset that depreciates.

4. Historically Based Recovery Allowances

Depreciation allowances are not indexed for inflation. This means that, as explained above, their real value falls as the rate of inflation rises. Consequently, depreciation allowances that are appropriate under one inflation rate may become too restrictive or too generous over time as the inflation rate changes. As discussed more completely below, however, many analysts believe that indexing depreciation may be administratively complex and may not necessarily improve income measurement.[117]

5. Alternative Minimum Tax (AMT)

Until recently, depreciation was a major adjustment of the corporate AMT. Depreciation was thus an important determinant of whether a corporation paid AMT.

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[114] Inventory accounting allows the lower of cost or market (LCM) and LIFO, which should ameliorate this concern with respect to inventories. Moreover, land often appreciates.
[115] Maule (1994).
[116] Clearing and grading costs are not assigned a class life and, by default, are assigned a 7-year recovery period. The Administration's FY 2001 Budget contains a proposal to assign clearing and grading costs for public utility property a class life equal to that of the related property.
[117] See Chapter 5 of this report.

The AMT has uncertain effects on investment.[118] For example, while depreciation deductions generally have been less accelerated under AMT rules than under the regular tax rules, the AMT imposes a lower statutory tax rate on income.[119]

The corporate AMT has declined dramatically in importance in recent years. Part of this is due to a natural life cycle caused by depreciation allowances and the AMT credit. Part may be due to the current economic expansion. Part, however, is due to recent statutory changes that have significantly reduced adjustments for depreciation under the AMT and that repealed the AMT for small corporations (as discussed above). Consequently, in the future, the effect of the AMT on depreciable property will be much less important than it has been in the past.

6. Depletion

Under current law, the recovery of the cost of depletable assets is closely related to intensity of use, rather than to the passage of time. Cost depletion and percentage depletion allowances increase with the reduction in the stock of the underlying natural resource. The focus on intensity of use differentiates depletion from time-based depreciation allowances. This difference in focus seems appropriate for two reasons. First, the differences in intensity of use over one year seems likely to be a more important source of differences in declines in value in the case of natural resources than they do in the case of depreciable plant and equipment. Second, intensity of use seems likely to be more easily measured (and monitored by the IRS) in the case of deposits of natural resources than in the case of depreciable plant and equipment.

Cost depletion deductions are determined by allocating cost basis over time according to the pattern in which the estimated mineral reserve is extracted. If the depletion rate is constant and is measured accurately, and if there is no inflation, then cost depletion mimics economic depreciation.[120] In practice, however, income is likely to be mismeasured to some degree because the depletion rate may not be appropriately determined and depletion allowances are not indexed for inflation. In addition, income can be mismeasured to the extent that costs are not properly allocated to the reserve or that the size of the reserve is mismeasured.

The allowance of percentage depletion is a tax subsidy. Percentage depletion grants deductions that are completely unrelated to those implied by a measurement of economic income. Thus, when summed over the life of the reserve, percentage depletion deductions often exceed the cost of the asset. Taking the larger of percentage depletion or cost depletion can greatly understate income earned from qualifying mineral reserves.[121]

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[118] GAO (1995), Lyon (1990), and Gravelle (1994).

[119] However, if the depreciation adjustment is the primary reason a firm is on the AMT, then the AMT will diminish investment incentives. In this case, the AMT, in conjunction with the credit for prior year minimum tax liability, serves only to accelerate tax payments over time without affecting the undiscounted sum of tax payments.

[120] Gravelle (1994).

[121] The excess of percentage depletion over cost depletion is a corporate tax expenditure with an estimated annual corporate revenue loss of about $400 million (U.S. Office of Management and Budget (2000)).

7. Expensing and Tax Credits

Allowing capital costs to be expensed, and granting tax credits, generally are inconsistent with measuring and taxing economic income. Absent offsetting adjustments in other tax rules, expensing and tax credits reduce taxes below the level implied by economic income. Thus, activities that benefit from expensing and tax credits generally receive tax subsidies.

C. Income Measurement: Empirical Evaluation of Current Law's Capital Cost Recovery System

An empirical evaluation of the current cost recovery system requires estimates of economic depreciation. This literature has recently been extensively reviewed,[122] and Appendix 1 discusses this literature in some detail. All of the existing studies have limitations, and results vary somewhat from study to study. Nonetheless, for a wide variety of assets, economic depreciation appears to be fairly well approximated by a constant geometric rate of asset price decline.

The geometric depreciation rates estimated by Hulten and Wykoff, and expanded to include a more detailed list of assets by Jorgenson and Sullivan, are widely used in empirical economic analyses dealing with capital income taxation.[123] Undoubtedly, these estimates have a number of serious weaknesses, not the least of which is that the evolution of the economy over the past 20 years may have rendered them obsolete. Notwithstanding their limitations, the Hulten-Wykoff estimates may be the best available evidence we have on economic depreciation. These rates are presented in Table 4 for 35 types of depreciable assets, including 20 types of equipment, 14 types of nonresidential buildings, and residential buildings.

Investment in certain intangible assets also may depreciate as the investment ages. For example, an advertising campaign may increase profits over several years by cementing brand-loyalty (an intangible asset) and hence allow the firm to charge higher prices. As time passes, the value of the intangible asset may fall, e.g., as customers forget or grow tired of the clever message and jingle used in the ads. This reduction in value is analogous to the economic depreciation of a tangible asset. The degree to which expenditures on advertising and research create long-lived assets that depreciate is uncertain.[124] Nonetheless, Fullerton and Lyon suggest that central estimates for the depreciation rates for the intangible assets created by advertising and R&D are .333 and .15, respectively.[125] Table 4 includes an average of these rates as the depreciation rate for intangibles (asset 36).

[122] See, e.g., Fraumeni (1997), Hulten and Wykoff (1996), Jorgenson (1996) and Gravelle (1999).
[123] Hulten and Wykoff (1981a), Jorgenson and Sullivan (1981), Auerbach (1983a), Fullerton (1987), and Gravelle (1981 and 1996).
[124] U.S. Treasury (1994).
[125] Fullerton and Lyon (1988).

Table 4
A Comparison of Tax Allowances with Economic Depreciation at Various Inflation Rates[a]

Asset	Economic Depreciation Rate	Tax Life	Present Value of Economic Depreciation	Present Value of Tax Depreciation: No Inflation (per dollar)	No Inflation (relative to economic depreciation)	3% Inflation (per dollar)	3% Inflation (relative to economic depreciation)	6% Inflation (per dollar)	6% Inflation (relative to economic depreciation)
1 Furniture and Fixtures	0.110	7	$0.759	$0.914	120.4%	$0.849	111.9%	$0.792	104.3%
2 Fabricated Metal Products	0.092	7	$0.724	$0.914	126.2%	$0.849	117.3%	$0.792	109.4%
3 Engines and Turbines	0.079	15	$0.692	$0.797	115.2%	$0.668	96.5%	$0.569	82.2%
4 Tractors	0.163	5	$0.823	$0.939	114.1%	$0.891	108.3%	$0.847	102.9%
5 Agricultural Machinery	0.097	7	$0.735	$0.898	122.2%	$0.823	112.0%	$0.757	103.0%
6 Construction Machinery	0.172	5	$0.831	$0.939	113.0%	$0.891	107.2%	$0.847	101.9%
7 Mining & Oil Field Machinery	0.165	7	$0.825	$0.914	110.8%	$0.849	102.9%	$0.792	96.0%
8 Metalworking Machinery	0.122	7	$0.778	$0.914	117.5%	$0.849	109.1%	$0.792	101.8%
9 Special Industrial Machinery	0.103	7	$0.747	$0.914	122.4%	$0.849	113.7%	$0.792	106.0%
10 General Industrial Equipment	0.122	7	$0.778	$0.914	117.5%	$0.849	109.1%	$0.792	101.8%
11 Office and Computing Machinery	0.273	5	$0.886	$0.939	106.0%	$0.891	100.6%	$0.847	95.6%
12 Service Industry Machinery	0.165	7	$0.825	$0.914	110.8%	$0.849	102.9%	$0.792	96.0%
13 Electrical Machinery	0.118	7	$0.771	$0.914	118.5%	$0.849	110.1%	$0.792	102.7%
14 Trucks, Buses, and Trailers	0.254	5	$0.879	$0.939	106.8%	$0.891	101.4%	$0.847	96.4%
15 Autos	0.333	5	$0.905	$0.939	103.8%	$0.891	98.5%	$0.847	93.6%
16 Aircraft	0.183	7	$0.840	$0.914	108.8%	$0.849	101.1%	$0.792	94.3%
17 Ships and Boats	0.075	10	$0.682	$0.878	128.7%	$0.792	116.1%	$0.718	105.3%
18 Railroad Equipment	0.066	7	$0.653	$0.914	140.0%	$0.849	130.0%	$0.792	121.3%
19 Instruments	0.150	7	$0.811	$0.914	112.7%	$0.849	104.7%	$0.792	97.7%
20 Other Equipment	0.150	7	$0.811	$0.914	112.7%	$0.849	104.7%	$0.792	97.7%
Average, Equipment b/	0.151		$0.793	$0.916	115.5%	$0.854	107.7%	$0.798	100.6%
21 Industrial Buildings	0.036	39	$0.508	$0.546	107.5%	$0.363	71.5%	$0.263	51.8%
22 Commercial Buildings	0.025	39	$0.414	$0.546	131.9%	$0.363	87.7%	$0.263	63.5%
23 Religious Buildings	0.019	39	$0.349	$0.546	156.4%	$0.363	104.0%	$0.263	75.4%
24 Educational Buildings	0.019	39	$0.349	$0.546	156.4%	$0.363	104.0%	$0.263	75.4%
25 Hospital Buildings	0.023	39	$0.400	$0.546	136.5%	$0.363	90.8%	$0.263	65.8%
26 Other Non-farm Buildings	0.045	39	$0.565	$0.546	96.6%	$0.363	64.2%	$0.263	46.5%
27 Railroads	0.018	20	$0.335	$0.741	221.2%	$0.593	177.0%	$0.487	145.4%
28 Telephone and Telegraph	0.033	15	$0.488	$0.797	163.3%	$0.668	136.9%	$0.569	116.6%
29 Electric Light and Power	0.030	20	$0.462	$0.741	160.4%	$0.593	128.4%	$0.487	105.4%
30 Gas Facilities	0.030	15	$0.462	$0.797	172.5%	$0.668	144.6%	$0.569	123.2%
31 Other Public Utilities	0.045	15	$0.563	$0.797	141.6%	$0.668	118.7%	$0.569	101.1%
32 Farm Structures	0.024	20	$0.404	$0.741	183.4%	$0.593	146.8%	$0.487	120.5%
33 Mining, Shafts, and Wells	0.056	5	$0.617	$0.939	152.2%	$0.891	144.4%	$0.847	137.3%
34 Other Non-Building Facilities	0.029	39	$0.453	$0.546	120.5%	$0.363	80.1%	$0.263	58.1%
Average, Non-Residential Structures [b]	0.030		$0.451	$0.636	141.0%	$0.474	105.1%	$0.377	83.6%
35 Residential Buildings	0.015	27.5	$0.300	$0.642	214.0%	$0.466	155.3%	$0.355	118.3%
36 Intangibles	0.214		$0.860	$1.000	116.3%	$1.000	116.3%	$1.000	116.3%

Source: Department of the Treasury, Office of Tax Analysis

[a] All calculations assume that assets are held forever and use a 3.5% real rate of return. The nominal rate of return is calculated by adding the inflation rate to the real rate of return.

[b] Capital stock weighted average.

Table 4 also classifies each asset[126] under the MACRS system, based largely on that asset's midpoint ADR life as reported in Jorgenson and Sullivan.[127] In order to assess the appropriateness of current law's cost recovery allowances, Table 4 compares the discounted present value of each asset's economic depreciation with its tax depreciation. Because tax depreciation is not indexed for inflation, while economic depreciation is, the comparison between the two is sensitive to the rate of inflation. Table 4 shows the calculation for three different inflation rates: no inflation, 3 percent inflation, and 6 percent inflation.[128]

For most types of equipment, tax depreciation is accelerated relative to economic depreciation at all three inflation rates. For example, assuming a 3 percent inflation rate, on average tax depreciation for equipment has a present value of 107.7 percent of the average present value of economic depreciation.[129] Without inflation, the average present value of tax depreciation for equipment rises to 115.5 percent of the average present value of economic depreciation, while at a 6 percent inflation rate the average present value of tax depreciation falls to 100.6 percent of the weighted average present value of economic depreciation (Table 4, line 20).

Because tax allowances are based on historic cost, while economic depreciation is indexed, the degree by which tax depreciation is accelerated falls as the inflation rate rises. At a sufficiently high rate of inflation the present value of tax allowances would be less than the

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[126] Asset 33, mining, shafts and wells, is given a 5-year recovery period as a compromise. Based on its ADR midpoint life as reported in Jorgenson and Sullivan (1981), this asset would have a 5-year recovery period. Based on a Treasury algorithm, however, Fullerton Gillette, and Mackie (1987) gave this asset a 7-year recovery period. Gravelle (1994) notes that much investment in this asset is expensed or receives other preferential treatment. The 5-year life is intended to give this investment relatively preferential treatment without having to divide it into separate investments, each of which receives different cost recovery allowances.

[127] Jorgenson and Sullivan (1981). This classification may be dated and inaccurate, even if it was accurate twenty years ago. Inaccuracies also may be introduced by the simplification required in mapping a system of tax depreciation that in many cases is industry based into depreciation categories that vary only by asset. The paper by Gillette, Fullerton and Mackie (1987), however, suggests that mapping-related inaccuracies are not necessarily severe.

[128] Present value calculations also are sensitive to the assumed real discount rate, which is assumed to be 3.5 percent in Table 4, as well as in Tables 5, 6, and 7. This rate may appear to be low, and undoubtedly calculations will vary somewhat depending on the assumed real discount rate. For several reasons, a 3.5 percent discount rate may be reasonable, however. For fairly small changes in the discount rate, the overall pattern of results is not likely to change very much. This can be seen by comparing the calculations in Table 5.4 of Gillette, Fullerton and Mackie (1987), which are based on a 4 percent real discount rate and a 4 percent inflation rate, with those in Table 4 above. Furthermore, if interpreted as a risk free real rate of return, 3.5 percent may appear more reasonable. Such an interpretation may be appropriate to the extent that depreciation deductions are risk-free or low risk cash flow streams. There is, however, uncertainty surrounding the appropriate risk level to assume in such calculations. Indeed, present value calculations like those in Table 4, and cost of capital calculation like those in Tables 5, 6, and 7 generally abstract from any explicit consideration of risk and portfolio issues (e.g., Fullerton (1987)). The 3.5 percent real rate of return also is close to the 4 percent real rate of return assumed in similar calculations in Treasury's 1992 study of corporate tax integration (U.S. Department of the Treasury (1992)). Furthermore, a 3.5 percent real discount rate combined with a 3 percent inflation rate and the 22 percent tax rate on interest used in this study yields nominal interest rates that are in line with recent interest rates on high grade corporate debt. For example, calculated using Fisher's Law (as .035/(1-.221) + .03)), the implied nominal interest rate is 7.5 percent, while calculated using modified Fisher's Law (as (.035+.030)/(1-.221), the implied nominal interest rate is 8.3 percent. Corporate Aaa bond yields have ranged between 7 percent and 10 percent during the 1990s (Council of Economic Advisors (2000)).

[129] Average present values are calculated using capital stock weights.

present value of economic depreciation for all assets. Indeed, for some types of equipment (e.g., asset number 3, engines and turbines) the present value of tax depreciation is less than the present value of economic depreciation at a 3-percent inflation rate. At a 6-percent inflation rate, tax depreciation is less generous than economic depreciation for many assets.

Tax depreciation is much less accelerated for many important types of structures than it is for equipment. At a 3-percent inflation rate, the present value of tax depreciation is less than the present value of economic depreciation for 5 of the 14 nonresidential structures, including industrial and commercial buildings (assets 21 and 22, respectively). Nonetheless, some assets (e.g., asset 27, railroads, and asset 28, telephone and telegraph) have tax depreciation allowances that are rather accelerated. On average, at a 3 percent inflation rate, the present value of tax allowances for nonresidential structures (including public utility property) is 105.1 percent of the present value of economic depreciation. Nonresidential structures receive tax depreciation allowances on average that are accelerated relative to economic depreciation. Inflation also reduces the present value of depreciation allowances for structures. At a 6-percent inflation rate, the present value of tax allowances for several long-lived structures can be only about half that required by economic depreciation.

Variation in the degree of acceleration of depreciation across assets is not necessarily an indication of a tax distortion.[130] To give all assets the same tax burden, an incentive depreciation system must give a greater degree of acceleration to longer-lived assets than it does to shorter-lived assets.[131] As will be explained more fully below, current law fails to vary depreciation allowances so as to maintain uniform taxes on all investments. The failure of depreciation to promote uniform taxation of alternative investments is illustrated qualitatively in Table 4 by the generally more accelerated depreciation allowed for equipment than for structures. Uniform taxation calls for the opposite relationship (if depreciation is more accelerated than economic depreciation).

Table 4 also includes an intangible asset (36), which is a combination of research and development and advertising. Tax rules allow new expenditures on these intangibles to be deducted when incurred. Hence, tax recovery allowances have a present value of one dollar for each dollar invested. This exceeds the present value of economic depreciation for these assets.[132]

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[130] We measure acceleration as the ratio of the present value of tax allowances for capital cost recovery to the present value of economic depreciation.

[131] The reason for this effect is that depreciation represents a larger proportion of the pre-tax cash-flow for a short-lived asset than it does for a long-lived asset. See, e.g., Gravelle (1979) and (1994). Neutrality requires that all assets have the same cost of capital, or pre-tax net of depreciation return (see the discussion below). The cost of capital may be expressed as $\rho=(r+\delta)(1-uz)/(1-u)-\delta$, where r is the real discount rate, δ is the rate of economic depreciation, u is the statutory tax rate, and z is the present discounted value of allowable tax depreciation deductions on a one dollar investment (see, e.g., Fullerton (1987)). If tax depreciation matches economic depreciation, $z=\delta/r+\delta$ (see Auerbach (1983b)). Investments of all durabilities (i.e., all values of δ) will have a common cost of capital. Starting from this common cost of capital, a neutral accelerated depreciation incentive would lower the cost of capital by the same amount for all investments, independent of δ. Mathematically, $d\rho$ has to be the same for all assets. But for a change in depreciation $d\rho=\partial\rho/\partial z dz$ and $\partial\rho/\partial z=-u(r+\delta)/(1-u)$. Thus, for $d\rho$ to be the same for all assets (for all values of δ), dz must be larger for assets with low δ than for assets with high δ because $\partial\rho/\partial z$ is larger in magnitude for high δ assets than it is for low δ assets. Assets with low δ are long-lived.

[132] This ignores the taxation of purchased intangibles because in these calculations assets are assumed to be held forever and thus never sold.

The overall picture that emerges from Table 4 is that tax depreciation does not accurately measure economic depreciation, nor does it provide a uniform investment incentive. In general, tax depreciation is more generous than economic depreciation. Capital cost recovery for equipment and for intangibles is relatively more accelerated than it is for structures, when tax uniformity requires the opposite relationship. The importance of these distortions depends on tax rates and how other kinds of income and expense are taxed.

The cost of capital offers a more complete measure of the effects of the tax system, including depreciation and statutory tax rates at the corporate and individual levels, on the decision to invest.[133] The cost of capital is the pre-tax social rate of return required to cover the investment's tax cost while still leaving the investor his required after-tax rate of return.[134] The cost of capital influences the decisions of savers and investors and thus is a useful metric of the efficiency of the tax system.

The information in the cost of capital often is expressed as a marginal effective tax rate.[135] The marginal effective tax rate is the tax rate that, if applied to economic income, would have incentive effects similar to the actual provisions of current law. If the tax system successfully measures and taxes economic income, then the effective tax rate equals the statutory tax rate faced by the investor. To the extent that tax depreciation allowances are accelerated relative to economic depreciation, the effective tax rate falls below the statutory tax rate; to the extent that tax depreciation is slower than economic depreciation, the effective tax rate exceeds the statutory tax rate.

Neutrality refers to the degree to which a tax system imposes a uniform marginal effective tax rate on all investments. A tax system that measures and taxes economic income would be fully neutral, because it would tax the income from all investments at the statutory tax rate. Starting from a nonneutral tax system that imposes different marginal effective tax rates on different investments, a tax change is said to promote neutrality to the extent that it reduces the variation of marginal effective tax rates across investments. Neutrality also can be measured using the cost of capital. If all investments were taxed at the same marginal effective rate, then all would have the same cost of capital. Hence, deviations across investments in the cost of capital reflect differential tax treatment.[136]

If there were no non-tax distortions in the economy, a neutral tax system would yield an efficient, productive, allocation of capital. When all investments face the same marginal effective tax rate, all have the same cost of capital. Hence, it is not possible to increase output by shifting capital from one type of investment to another type of investment. In contrast, if the system of capital income taxation is not neutral, then output can be increased by shifting funds

[133] See e.g., Fullerton (1987).
[134] The cost of capital as defined here excludes economic depreciation. A related concept is the user cost of capital, which is the pre-tax return (cost of capital) plus depreciation.
[135] The marginal effective tax rate, t, is calculated as the difference between the cost of capital (ρ) and the required after-tax return (s), expressed as a proportion of the cost of capital: $t = (\rho - s)/\rho$.
[136] With risky investments, the cost of capital would reflect the risk premium. The calculations in this report exclude risk so that taxes account for all differences in the cost of capital across investments.

from low-tax investments, which have low costs of capital, to high-tax investments, which have high costs of capital.

Table 5, panel A, presents the cost of capital and marginal effective tax rate[137] for a corporate sector investment in each of 37 assets, including 20 types of equipment, 14 types of nonresidential structures,[138] intangibles, land and inventories.[139] The table also includes, in panel B, summary measures, showing the average costs of capital for equipment, structures, land, inventories and intangibles,[140] and for the corporate sector as a whole.[141] Panel B also shows calculations for noncorporate investment, investment in owner-occupied housing, and an economy wide average cost of capital and effective tax rate.

If all corporate investments received economic depreciation, all would have a 37.5 percent marginal effective tax rate.[142] (This is the marginal effective tax rate on inventories and on land, which receive the equivalent of economic depreciation since they are assumed not to

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[137] These calculations assume that investments are held forever and include Federal income taxes only. State and local income and property taxes are ignored. They are based on a 3-percent inflation rate and a 3.5-percent real rate of return. The inflation rate is roughly in line with recent historical experience. The real rate of return may appear low, but may be appropriate for, like that undertaken here, an analysis that does not systematically include risk. See the discussion in note 126 above. While specific numerical results can vary slightly with modest changes in the real discount rate, it seems unlikely that the qualitative nature of the results would be overturned by a modest increase in the real discount rate (see, e.g., Gillette, Fullerton and Mackie (1987)). These calculations also exclude the effects of tax credits and other special rapid amortization provisions. Some of these provisions have very limited availability. Others can be difficult to model or do not apply to marginal investments. For example, these calculations exclude the effect of the 20 percent tax credit available for qualified incremental expenditures on R&D. The credit is left out of the calculations because its incremental nature makes it difficult to parameterize in an aggregate calculation. Including the credit would reduce the cost of capital for R&D, and so would slightly reduce the cost of capital for business investment and for the economy as a whole. Including the R&D credit would have an ambiguous, but small, effect on the neutrality of the tax system, since it would simultaneously increase tax differences within the business sector while reducing tax differences between business investment and owner-occupied housing.

[138] Corporate investment in residential rental property is not allowed in this model. The model assumes that all such investment is undertaken by noncorporate firms.

[139] Land and inventories are assumed not to depreciate. These calculations assume that firms minimize taxes by using LIFO inventory accounting, which is assumed to postpone indefinitely all taxes on inflationary increases in the value of inventories.

[140] In these calculations, we do not consider the taxation of purchased intangibles. This is because all of the cost of capital/effective tax rate calculations assume that the asset is held forever. Gravelle and Taylor (1992), however, analyze the treatment of purchased intangibles in some detail. They conclude: (a) that economic efficiency may not support any amortization of the cost of purchased intangibles, and (b) that if the cost of purchased intangibles is to be amortized, then a common recovery period for all intangibles is appropriate. Both of these conclusions arise because the cost of newly created intangibles is expensed.

[141] Capital stocks are used as weights in constructing these averages.

[142] If the investments were financed with equity, and only corporate level taxes were considered, economic depreciation would imply that the effective tax rate would equal the 35 percent statutory corporate tax rate. The effective tax rate calculation, however, includes taxes on the shareholder and allows for debt finance. Shareholder level taxes on corporate profits push the effective tax rate above 35 percent. The effective tax rate calculation also assumes that about 40 percent of the marginal investment is financed by debt. Because the corporation can deduct interest payments, the share of the investment's income attributable to debt finance avoids the corporation income tax, as well as taxes on shareholders. Instead, interest is taxed only once at the lender's relatively low rate. Under these assumptions, on average, the double taxation of equity is greater than the benefit of the deductible interest and the effective tax rate exceeds 35 percent even with economic depreciation.

Table 5
Cost of Capital and Marginal Effective Tax Rates under Current Law[a]

	Cost of Capital (%)	Marginal Effective Tax Rate (%)
A. Individual Corporate Assets		
1 Furniture and fixtures	4.8	27.8
2 Fabricated metal products	4.7	25.5
3 Engines and turbines	5.7	38.9
4 Tractors	4.8	27.5
5 Agricultural machinery	4.9	29.0
6 Construction Machinery	4.9	28.3
7 Mining & oil field machinery	5.3	34.0
8 Metalworking machinery	5.0	29.3
9 Special industrial machinery	4.8	26.9
10 General industrial equipment	5.0	29.3
11 Office and computing machinery	5.5	36.2
12 Service industry machinery	5.3	34.0
13 Electrical machinery	4.9	28.8
14 Trucks, buses, and trailers	5.4	34.8
15 Autos	5.8	40.1
16 Aircraft	5.5	35.8
17 Ships and boats	4.9	28.7
18 Railroad equipment	4.5	21.9
19 Instruments	5.2	32.4
20 Other equipment	5.2	32.4
21 Industrial buildings	6.1	43.0
22 Commercial buildings	5.8	39.1
23 Religious buildings	5.5	36.9
24 Educational buildings	5.5	36.9
25 Hospital buildings	5.7	38.6
26 Other nonfarm buildings	6.5	45.9
27 Railroads	4.8	27.6
28 Telephone and telegraph	4.9	28.6
29 Electric light and power	5.1	31.5
30 Gas facilities	4.8	27.7
31 Other public utilities	5.1	31.6
32 Farm structures	5.0	29.6
33 Mining, shafts, and wells	4.2	16.5
34 Other nonbuilding facilities	5.9	40.7
35 Residential buildings	N/a	N/a
36 Intangibles	3.6	3.8
37 Inventories	5.6	37.4
38 Land	5.6	37.4
B. Summary Measures		
Corporate sector		
Equipment	5.1	30.9
Structures	5.7	39.0
Public utilities	5.0	29.5
Inventories	5.6	37.5
Land	5.6	37.5
Intangibles	3.6	3.8
Total	5.2	32.2
Noncorporate sector	4.4	20.8
Owner-occupied housing	3.8	8.8
Economy wide average	4.5	21.5

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[a] Include the effects of only Federal income taxes assuming a 3.5% real rate of return and a 3% inflation rate.

depreciate.) If, instead, all corporate investments received the average degree of incentive offered through the current system of accelerated cost recovery allowances, Table 5 shows that all would face a 32.2 percent marginal effective tax rate, equal to the weighted average marginal effective tax rate calculated for the corporate sector as a whole.

Table 5 shows that alternative corporate investments are taxed at widely differing marginal effective rates. These differences reflect differences in cost recovery provisions and imply that the current cost recovery system is not neutral, because neutrality implies a common marginal effective tax rate on all investments.

While effective tax rates vary across types of corporate equipment, the average investment in corporate equipment is tax favored relative to investment in other corporate assets. Because of accelerated depreciation, the average marginal effective tax rate on corporate equipment is 30.9 percent, well below that implied by economic depreciation, and below the average for the corporate sector as a whole. In contrast, corporate nonresidential structures (other than public utility property) are tax penalized. Because of decelerated depreciation, they face a 39.0 percent effective tax rate, well above the average marginal effective tax rate for the corporate sector as a whole and above the marginal effective tax rate implied by economic depreciation. Corporate investment in public utility property receives relatively generous cost recovery allowances, and faces a relatively low 29.5 percent marginal effective tax rate. Corporate investments in land and inventories are assumed not to depreciate, and thus face a 37.5 percent marginal effective tax rate. Because of expensing, corporate investment in intangibles face a very low 3.8 percent effective marginal tax rate.[143]

D. Rationales for General and Selective Investment Incentives[144]

The discussion and calculations above suggest that current depreciation and other cost recovery provisions do not accurately measure economic income. On average, cost recovery seems to be accelerated, in that the average marginal corporate effective tax rate is below that implied by economic depreciation allowances. Furthermore, the tax reductions offered by accelerated depreciation and expensing do not uniformly lower effective tax rates for all assets. In general, cost recovery allowances are accelerated for equipment, public utility property and intangibles, but not for other nonresidential structures, land and inventory. All else equal, this lack of uniformity inefficiently encourages investments in low tax assets at the expense of more productive investments in high-tax assets.

Measuring and taxing economic income, however, may not be the only goal of the current tax system. For example, some economists argue that, by driving a wedge between the pre-tax return generated by an investment and the after-tax return received by the investor, an income tax discourages saving and investing.[145] Accelerated depreciation is one way to reduce the effective tax rate on capital income, and encourage saving and investing. One may

[143] To the extent that intangibles are not expensed, they would face a higher marginal effective tax rate.
[144] Accelerated depreciation also has been justified as a proxy for inflation indexing. This is discussed in the section on inflation indexing in Chapter 6.
[145] See, e.g., Auerbach (1996), Engen and Gale (1996), Feldstein (1981a), Hubbard and Skinner (1996), and Bovenberg (1989).

nonetheless question why the tax reduction generated by accelerated cost recovery is not uniformly available to all investments. The current cost recovery system would seem to be an inefficient way to encourage saving and investment, because the current system concentrates the tax incentive on certain assets, and thereby distorts the allocation of investment among different kinds of assets. Furthermore, not all economists agree that taxes significantly reduce investment and saving.[146]

Accelerated depreciation, even if inconsistent with uniform taxation of all business assets, nonetheless may help reduce certain tax differences arising from other features of the current tax system. As indicated in panel B of Table 5, corporate investment faces a higher marginal effective tax rate under current law than does noncorporate investment. This reflects the double taxation of corporate profits.[147] To the extent that corporate industries are relatively heavy users of tax favored assets, accelerated depreciation helps reduce some of the tax distortions caused by the heavy taxation of corporate, relative to noncorporate, equity income. Not all economists agree, however, on the size of the tax penalty on corporate investment and on the extent to which a relatively high tax on corporate investment income actually discourages investment in the corporate sector.[148]

Table 5 shows that the marginal effective tax rate on income from an investment in owner-occupied housing is lower than the average marginal effective rates on corporate and noncorporate business investment. The low tax on housing reflects the exclusion of implicit rental income from the homeowner's taxable income. Thus, current law favors investment in owner-occupied housing relative to business investment. By lowering the effective tax rate on business investments in plant and equipment, accelerated depreciation ameliorates that relative advantage.[149] These differing effects suggest that accelerated depreciation of business investment does not necessarily lead to a less uniform set of marginal effective tax rates than would result if such investment were granted economic depreciation.[150]

As discussed by Gravelle and Auerbach, inflation can disproportionately increase the marginal effective tax rate on short-lived equipment relative to the marginal effective tax rate on long-lived structures.[151] Accelerating equipment's depreciation allowances, relative to allowances granted to structures, as the current tax system does, could help offset this effect. The calculations reported below in Table 7 in Chapter 5suggest, however, that current law may go too far. Over a wide range of inflation rates, the current law depreciation system gives equipment a marginal effective tax rate below that on structures.

In certain circumstances, a uniform effective tax rate also can be questioned as an appropriate tax policy goal. Some investments may generate benefits to society at large. To the

[146] See, e.g., the papers referenced in footnotes 153 and 154 below for investment and the surveys in Bovenberg (1989), Hubbard and Skinner (1996), and Engen and Gale (1996) for saving.
[147] See, e.g., U.S. Treasury (1992).
[148] See the discussion in Auerbach (1996), Gentry and Hubbard (1997a), and U.S. Treasury (1992).
[149] The tax advantage to owner-occupied housing is widely believed to distort significantly the allocation of capital, even by those who question the size of the distortion in investment behavior caused by other tax differences. See Auerbach (1996) and Summers (1987).
[150] This suggestion is supported by Chapter 5's discussion of a switch to economic depreciation.
[151] Gravelle (1979) and Auerbach (1983b).

extent that the private investor cannot charge for these "positive externalities," such investments will be under-provided by the market. Relatively low taxes on those investments may help to encourage their supply, and help correct this "market failure."[152] Externalities, however, provide only limited support for the tax differences observed under current law. Certain intangibles (e.g., research and development, worker training) may be under-supplied by the private market because the supplier is unable to fully capture the benefits of his investment.[153] For example, a successful inventor who discovers a cheaper way to make widgets may not be able to appropriately charge other firms that adopt or learn from his innovation. An employer considering investing in a worker-training program faces a similar problem, because his employees can take their newfound skills with them to another job. A tax subsidy may help raise the reward to supplying such intangibles, and efficiently stimulate their supply.

Of course, other forms of government intervention also could address many market failures. Changes in patent law, direct subsidies, or an increase in direct research by the government may be more effective in stimulating those types of research and development that offer the greatest benefits to society.[154] Moreover, accelerated depreciation may not always be the best way to reduce the tax cost of investment in business plant and equipment. Accelerated depreciation offers its benefit by distorting the measurement of income. This distortion to the base could be eliminated by using an investment tax credit or allowing partial expensing of the cost of the investment. The use of an investment tax credit or of partial expensing also may make it easier to target and to limit the benefit a taxpayer receives from the investment subsidy. However, both credits and partial expensing tend to concentrate the tax benefit in the first year of an investment, and may offer a greater benefit to established mature firms with substantial taxable income than to newer, perhaps smaller, start-up companies that have yet to earn a profit and thus could not immediately benefit from a higher tax deduction. By spreading its deductions over a number of years, accelerated depreciation ameliorates this problem, relative to the use of a credit or partial expensing.

Subsidies also can be rationalized on the ground that some types of investment may spur general economic growth in a way not captured by the investor. Attention is sometimes focused on equipment, which some studies show to have a very high rate of return.[155] The argument that investment, whether in certain assets or generally, spurs economic growth is controversial.[156] Furthermore, even if true, the argument does not necessarily support the differences in effective tax rates observed across types of equipment. For example, it is unlikely that investment in furniture and fixtures is especially important to achieving a high rate of economic growth, yet furniture and fixtures have an effective tax rate below the average for all corporate equipment. On the other hand, computers, which have been expected to help spur growth by increasing productivity, face a relatively high effective tax rate.

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[152] Other investments may impose "external costs", and so may be over-provided by the market. Investments that generate external costs should face relatively high tax burdens.
[153] See, e.g., Gravelle (1994), and sources cited therein.
[154] See Gravelle (1994), and Gravelle (1985).
[155] See, e.g., DeLong and Summers (1991).
[156] Auerbach (1992), Auerbach, et. al. (1992), Solow (1994).

Perhaps the largest market failure is a severe recession or a depression. Investment incentives such as accelerated depreciation could be used to help stimulate the economy and push it out of a downturn. Using investment incentives as a counter-cyclical device, however, has three important limitations. The first limitation is the uncertain effect tax incentives have on the decision to invest. Investors' responsiveness to changes in the tax cost of investment is an empirical issue, and the research is inconclusive on this subject.[157] Some recent work[158] concluded that tax incentives are important, but that conclusion remains controversial.

Timing causes the second limitation. One problem is that there may be a time lag between when the tax incentive is offered, and when investment actually increases. This lag can make investment tax incentives an ineffective counter-cyclical policy, because the incentive would not offer the stimulus when it is needed, but rather later, after the economy has perhaps recovered on its own. A significant lag is a common empirical finding and many economists have concluded that investment tax incentives are a poor stabilization device.[159] Another timing problem is that it is difficult to know exactly where the economy is located in the business cycle. Even an instantly available incentive may not be appropriate if the economy has already begun to expand. Finally, investment tax incentives, if left in place, do not automatically turn off when no longer needed. They often apply equally in economic booms (such as now) as well as during recessions.

The third limitation is caused by the inability of many firms to benefit currently from the tax incentive because during a recession they may have little or no taxable income. They may not be able to benefit fully from the larger deductions afforded by accelerated depreciation, because negative taxable income does not generate tax refunds. This effect is offset somewhat by the ability to carry back losses to reduce taxes paid up to two years in the past, and to carry forward losses to offset taxes up to twenty years into the future. But the offset is incomplete because interest is not paid on carry forwards and some losses may expire unused. To the extent that firms in a recession have low income and cannot use the extra deductions, accelerated depreciation is unlikely to be an effective macroeconomic stimulus.

Administrative reasons also may support some of the acceleration of cost recovery allowances under current law. Expensing of certain intangibles may be justified on this basis.[160] For example, it may be very difficult for the IRS and for taxpayers to differentiate spending on worker-training programs that create a capital asset from other similar types of labor costs. Accurately separating expenditures for research from other types of spending also may be difficult, as may be dividing research spending between that which creates a useful asset and that which does not. Even if spending on intangible capital can be identified and capitalized, determining an appropriate recovery period and method may be difficult.[161] The current law provision allowing taxpayers with a sufficiently small amount of annual investment to expense

[157] Hall and Jorgenson (1967), Boskin (1988), and Feldstein (1982) argues that investment is quite sensitive to taxes, whereas Chrinko (1986 and 1993) takes the opposite position.
[158] Hasset and Hubbard (1996).
[159] See the papers reviewed in Gravelle (1994).
[160] Gravelle (1994), and Gann (1997).
[161] Newark Morning Ledger, 507 U.S. 546 (1993).

up to $20,000 (in 2000) of investment annually may be justified on the ground that it simplifies tax compliance for small businesses.

CHAPTER 5

COMPREHENSIVE REFORM

A. Introduction

There are a variety of ways to address the issues discussed in Chapter 4. One approach would be to try to improve the current system. An alternative approach would abandon MACRS in favor of a fundamentally different cost recovery system. This chapter deals with the second approach -- fundamental reform.

This chapter discusses a number of approaches to comprehensive overhaul of the depreciation system: switching to the use of depreciation schedules based on estimates of economic depreciation, indexing depreciation for inflation, introducing a system of mark-to-market rules, using book depreciation for tax purposes, and placing depreciation on a taxpayer facts-and-circumstances basis. The first two reforms, economic depreciation and indexing depreciation for inflation, would seem to offer the best possibilities for improved income measurement. Neither approach, however, is without problems. A switch to economic depreciation, for example, is hindered by limited empirical data on economic depreciation rates. Perhaps surprisingly, the analysis below also suggests that a switch to economic depreciation would not improve overall tax neutrality, unless other tax changes are enacted at the same time. Switching to economic depreciation, however, would reduce the importance of taxes in some investment choices. Indexing depreciation allowances for inflation would improve tax neutrality with respect to a wide variety of tax distortions. Indexing has been controversial in the past, however, because, as a stand-alone reform, it does not address other problems in the income tax, and therefore would not necessarily improve income measurement and taxation overall.

The final three reforms discussed in this chapter also have serious problems. A mark-to-market regime generally is infeasible, given the lack of active used asset markets. Conforming tax depreciation to book depreciation is unlikely to improve income measurement or otherwise to improve the functioning of the tax system. A taxpayer facts-and-circumstances system would have significant informational requirements that would lead to serious taxpayer compliance burdens and high administrative costs.

B. Switch to Economic Depreciation

1. Implementation Issues

One approach to fundamental depreciation reform would replace the existing tax depreciation structure with a system more closely related to economic depreciation. Comprehensive depreciation reform based on estimates of economic depreciation has been proposed and, to some extent, implemented in the recent past. For example, Treasury's 1984 tax reform proposal included a depreciation system based on estimates of economic depreciation.[162] This depreciation system, however, was rejected in favor of MACRS, which is less closely linked to economic depreciation and offers accelerated allowances for many assets. Nonetheless, compared to pre-1986 law, MACRS represented a step toward economic depreciation, especially

[162] U.S. Department of the Treasury (1984).

for structures. Moreover, the combination of MACRS and repeal of the investment tax credit (ITC) substantially moved cost recovery allowances (inclusive of the ITC) toward those implied by economic depreciation. These changes in the 1986 Act improved the neutrality of the tax system by reducing differences in the taxation of alternative investments.[163]

While the 1986 Act represented a move toward economic-based cost recovery allowances, it neither mimics economic depreciation, nor offers a uniform tax incentive to each asset. Hence, further comprehensive reform might offer some benefits, both from a pure tax policy perspective, as well as from an efficiency perspective. Nonetheless, several analysts question whether remaining depreciation-induced tax differences across investments within the business sector are large enough to impose significant economic costs.[164] Moreover, comprehensive overhaul of depreciation to reflect more accurately economic depreciation would be difficult and costly.

One viable approach to achieving a system of economic depreciation would be to maintain a schedule of depreciation deductions based on estimates of economic depreciation. This approach would give all assets of a certain type a set schedule of depreciation deductions that would not vary to reflect a taxpayer's circumstances. Because it ignores taxpayer-specific factors, this approach does not offer the possibility of getting depreciation exactly right for any particular individual investment. However, it represents a feasible approach to implementing depreciation deductions that might closely approximate economic depreciation on average. Nonetheless, even this simpler approach to implementing economic depreciation suffers from serious difficulties.

The most significant problem is that we do not know with any degree of certainty what economic depreciation rates should be, even on average, for aggregated classes of investments. While there are many estimates of economic depreciation, these estimates are somewhat inexact and dated. Consider as an example the widely used Hulten-Wykoff depreciation rates.[165] Because they had limited data on the price of used assets, Hulten and Wykoff only directly estimated the depreciation rates for eight assets. They extrapolated from these to calculate depreciation rates for the rest of the twenty-four assets in their study. Such extrapolations may be unreliable, even if the depreciation rates actually estimated from used price data were accurate. Moreover, as suggested above, one may question the accuracy of estimates based on used price data. Any estimate of depreciation is necessarily based on past experience, and may not be relevant for present or future changes in asset values. The Hulten-Wykoff estimates, for example, are nearly twenty years old. Over the past twenty years, entirely new assets and industries have sprung up, while technological changes have substantially modified many other assets. It is not clear how relevant twenty-year old depreciation estimates are to these new types of capital investments.

Because of these problems, comprehensive depreciation reform might require substantial new empirical work. This work, however, is likely to face many of the problems that plague existing estimates of economic depreciation. In the end, it is not clear that new empirical

[163] See Gillette, Mackie and Fullerton (1987).
[164] Summers (1987) and Auerbach (1996).
[165] Hulten and Wykoff (1981a). The Hulten-Wykoff estimates are discussed in some detail in Appendix 1 of this report.

estimates would provide an unassailable foundation for a fundamental reform of the current tax depreciation system.

One way to address our ignorance about economic depreciation would be to use estimates of economic depreciation to group assets into fairly broad recovery classes, rather than try to assign a unique depreciation rate to each specific asset. Such a grouping might place a smaller burden on the scarce information available on economic depreciation, while still using that information to inform tax policy. It also would be simpler and easier to administer such a tax system than one that assigns a unique depreciation rate to each of many individual assets (or industries). A limited grouping of this type was proposed in the Treasury's 1984 Tax Reform Proposals, which used Hulten-Wykoff depreciation rates to aggregate assets into seven cost recovery classes.[166]

Another potential problem arises because switching to economic depreciation may mean switching to an asset-based depreciation system. This would be a major change in U.S. tax depreciation policy. Many estimates of economic depreciation focus on particular assets, and do not differentiate depreciation by the industrial activity in which they are employed. Proposals that advocate moving more closely to economic depreciation often have been asset based, rather than activity based.[167] Because of sparse data, industry differences in depreciation rates for a detailed set of heterogeneous assets may be difficult to support with empirical evidence derived from used asset prices. Activity-based estimates for very aggregated categories of assets (e.g., equipment), however, might be supported by empirical investigations of depreciation based on data other than the price of used assets.[168] It is not clear, however, that good statistical evidence even of an aggregate nature could be obtained for all industries. Nor is it clear that a switch from an activity-based system to an asset-based system would necessarily improve the functioning of the tax system, as discussed in Chapters 4 and 6.

A switch to true economic depreciation would also involve indexing depreciation deductions for inflation. Thus, some of the problems with indexing that are raised in the next section also would apply to economic depreciation. Many of the alleged problems with indexing (e.g., negative effective tax rates), however, arise from indexing a non-neutral and accelerated depreciation system, often in combination with high levels of debt finance with unindexed interest expenses. Such problems would be less troublesome under economic depreciation, because by definition economic depreciation allowances are neutral and are not accelerated.

2. Effect on the Cost of Capital and Effective Tax Rate

Setting aside these difficult implementation issues, cost of capital calculations such as those discussed above can be used to illustrate the effect on investment incentives of a switch to economic depreciation. It is important to bear in mind, however, that these calculations (and the discussion based on them below) assume that the Hulten-Wykoff estimates adequately measure economic depreciation.

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[166] U.S. Department of Treasury (1984).
[167] For example, the 1984 Treasury Proposal was asset based.
[168] Some studies of this type are discussed in Appendix 1.

The results of such calculations are shown in Table 6. The table includes calculations based on current law, a proposal to switch to economic depreciation for depreciable assets, and a proposal to switch to economic depreciation for depreciable assets and intangibles. Because current tax depreciation is accelerated relative to economic depreciation for most assets, switching to economic depreciation would increase the average effective tax rate for business investment. As a result, requiring economic depreciation for all assets, with no other changes in the taxation of capital, would raise the economy-wide average effective tax rate on capital by about 3.5 percentage points. Thus, switching to economic depreciation by itself could reduce the overall incentive to save and invest.

That effect could be offset by using the revenue gained from switching to economic depreciation to reduce other taxes on capital. For example, the revenue could be used to reduce corporate income tax rates or to finance partial expensing for depreciable property. Either of these changes would make the tax system more neutral—the first, by reducing the differential tax burden between corporate and noncorporate capital; the second, by creating a neutral investment incentive (as discussed below).

Without offsetting tax cuts, however, the calculations in Table 6 suggest that providing economic depreciation would make the tax system slightly less neutral with respect to the taxation of alternative investments. The overall change in the uniformity of the tax system can be summarized by a change in the standard deviation of the cost of capital. The standard deviation is a measure of the variability with which alternative investments are taxed.[169] If all investments were taxed alike—i.e., if the tax system were totally neutral—the standard deviation in the cost of capital would be zero. Differences in the taxation of alternative investments raise the standard deviation above zero, with the standard deviation increasing as these tax differences become more important. Under current law, the standard deviation in the economy-wide cost of capital is 0.75 percent. Switching to economic depreciation for business plant and equipment gives a standard deviation of 0.79 percent for the economy-wide cost of capital, and switching to economic depreciation for all assets gives a standard deviation of 0.78 percent. Thus, these calculations suggest that switching to economic depreciation could have a small adverse effect on the overall neutrality of the tax system.

Switching to economic depreciation has a small effect on overall tax neutrality because economic depreciation moves the tax system away from tax neutrality at some margins of choice, while simultaneously promoting tax neutrality at other margins. Economic depreciation moves the tax system away from neutrality at the margin of choice between business assets and owner-occupied housing. Switching to economic depreciation raises effective tax rates on business investment, and thereby increases the relative tax advantage of owner-occupied housing and other lightly taxed assets, such as intangibles. Economic depreciation also moves the tax system away from neutrality at the margin of choice between corporate and noncorporate investment. Switching to economic depreciation slightly increases the difference in the taxation of typical corporate and noncorporate investments, because corporations are relatively heavy users of assets that receive accelerated depreciation under current law. Thus, on two scores, the switch to economic depreciation moves the overall tax system away from tax neutrality. On a third score, however, economic depreciation improves tax neutrality, since it eliminates tax differences among assets within the corporate sector and within the noncorporate sector. Taken

[169] The standard deviation is the square root of the mean squared deviations from the mean.

Table 6
Effect of Economic Depreciation on the Cost of Capital and the Marginal Effective Tax Rate

	Current Law		Economic Depreciation			
			Depreciable Property		All Property	
	Cost of Capital (percent)	Marginal Effective Tax Rate (percent)	Cost of Capital (percent)	Marginal Effective Tax Rate (percent)	Cost of Capital (percent)	Marginal Effective Tax Rate (percent)
Corporate Sector[a]						
Equipment	5.1	30.9	5.6	37.5	5.6	37.5
Structures	5.7	39.0	5.6	37.5	5.6	37.5
Public utilities	5.0	29.5	5.6	37.5	5.6	37.5
Inventories	5.6	37.5	5.6	37.5	5.6	37.5
Land	5.6	37.5	5.6	37.5	5.6	37.5
Intangibles	3.6	3.8	3.6	3.8	5.6	37.5
Total	5.2	32.2	5.4	35.0	5.6	37.5
Noncorporate Sector[a]	4.4	20.8	4.6	23.1	4.6	24.5
Owner-Occupied Housing[a]	3.8	8.8	3.8	8.8	3.8	8.8
Economy Wide Average[a]	4.5	21.5	4.6	23.4	4.7	25.0
Standard Deviation in Cost of Capital	0.75		0.79		0.78	

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[a] Capital stock weighted averages

all together, these three effects roughly cancel, leaving the overall neutrality of the tax system about the same as it is under current law.

Neutrality of the tax system, however, is not equivalent to efficiency, and the standard deviation of the cost of capital is not a substitute for an explicit calculation of the efficiency gains from various tax reforms. Efficiency gains depend on both tax differences and behavioral responses to those differences. Investors may be more responsive to changes in taxation at some margins than at others, so that efficiency gains may depend on which particular tax differences are reduced. For example, reducing the tax differences within the corporate sector could improve efficiency despite the fact that tax differences between sectors are increased. In addition, the standard deviation calculations make no use of an equal revenue yield constraint, and are not necessarily well suited for analyzing overall efficiency. Thus, while changes in the standard deviation of the cost of capital are suggestive of changes in economic efficiency, they are not conclusive proof of changes in efficiency.

These conclusions would change if inflation were higher. The calculations in Table 6 assume a 3-percent inflation rate. Because economic depreciation is indexed for inflation, while current law's tax allowances are not indexed, the comparison between the two can change as the inflation rate changes. In particular, at some higher inflation rates economic depreciation might improve overall incentives to save and invest and might improve neutrality relative to current law. For example, at a 6-percent inflation rate, economic depreciation generates a smaller standard deviation in the cost of capital than does current law. At an 8-percent inflation rate, economic depreciation generates a lower overall average cost of capital and a smaller standard deviation.

3. Economic Depreciation and Partial Expensing

The desire to tax economic income from business investment may conflict with the desire to offer sufficient tax incentives to save and invest. The current system of accelerated depreciation addresses this issue by reducing the tax cost of business investment in general, but it does so in an inefficient way, because accelerated depreciation contributes to effective tax rates that vary within the business sector.

Combining economic depreciation (perhaps along the lines suggested in the Treasury's 1984 proposal) with partial expensing may be a more efficient way to reduce the tax cost of business investment. The reason is that expensing (deducting immediately) a common fraction of the cost of all business investments would reduce all effective tax rates proportionately, and thus would offer a uniform, neutral, investment incentive.[170] Partial expensing also could be

[170] The cost of capital, ρ, is given by $\rho = (r+\delta)(1-uz)/(1-u)-\delta$, where r is the real discount rate, δ is the economic depreciation rate, u is the statutory tax rate, and z is the present discounted value of allowances for tax depreciation on a $1 investment. If all assets received economic depreciation then $z = \delta/(r+\delta)$ and $\rho = r/(1-u)$. Thus, the cost of capital is the same for all assets of all durabilities (it is independent of the asset's depreciation rate), so taxes do not distort the allocation of capital between longer-lived and shorter-lived assets. If all assets received economic depreciation plus expensing of x percent of the cost of an investment, all would receive cost recovery allowances with a present value of $(1-x)\delta/(r+\delta) + x$, assuming that depreciable basis is reduced by the expensed portion of the investment's cost. Thus, all investments would have a common cost of capital given by $r(1-xu)/(1-u)$ independent of the investment's durability.

easily tracked, limited and adjusted as the taxpayer's situation or the general economic situation dictates.[171]

A problem with partial expensing, however, is that it concentrates deductions in the first year of the investment's lifetime. This may favor mature companies with substantial taxable income over start-up companies that have insufficient taxable income to use the tax deduction.[172]

4. Simplification Benefits

A switch to economic depreciation also offers the potential for simplification elsewhere in the tax code. With economic depreciation, AMT depreciation adjustments would no longer be needed. Furthermore, the separate depreciation systems for determining corporate earnings and profits and for other purposes could both be dropped. To the extent that the ordinary income recapture rules are motivated by accelerated depreciation, they also might be eliminated.

C. Indexing Depreciation for Inflation

In order to properly measure income, or to ensure that the benefit of accelerated depreciation is invariant to the rate of inflation, depreciation allowances should rise in proportion to the inflation rate. In contrast, the current system of tax depreciation is based on the historic cost of the asset, and is not adjusted for inflation. Adjusting depreciation allowances upward by the rate of inflation is said to "index" depreciation for inflation. While indexing depreciation has some merit from an income measurement perspective, it has not been a uniformly popular tax change. Opponents of indexing depreciation point out that indexing depreciation without indexing interest flows may lead to tax sheltering opportunities.

1. Benefits of Indexing Depreciation

Indexing depreciation offers a number of potential benefits. First, it helps promote tax neutrality at some margins.[173] For example, indexing would help to prevent inflation from increasing the disparity of treatment between business investment and to investment in owner-occupied housing. Second, indexing depreciation would ensure that inflation does not inappropriately increase the overall marginal effective tax rate on capital income. Indexing thus would help keep inflation from reducing the incentive to save and invest.

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[171] In contrast to the simplicity of partial expensing, an investment tax credit must be larger for longer-lived than for shorter-lived assets in order to give a uniform tax incentive to invest. The cost of capital with economic depreciation and an investment tax credit of k percent is $(1-k)r/(1-u) - k\delta$, assuming that depreciable basis is reduced by the credit. This cost of capital is inversely related to the depreciation rate, δ, so that a neutral credit must be larger for long-lived (low δ) assets than for short-lived (high δ) assets. See Auerbach (1983b), Bradford (1980), and Gravelle (1979 and 1994)).

[172] An investment tax credit faces the same problem. In contrast, accelerated depreciation reduces this problem by spreading deductions out over several years.

[173] All else equal, an unindexed tax system favors investment in long-lived over short-lived assets, as explained in Auerbach (1983b) and Gravelle (1979). If not accompanied by other changes in depreciation policy, indexing would not necessarily lead to more uniform taxation of long-lived and short-lived assets, however, because over a wide range of inflation rates the current unindexed depreciation system favors equipment over structures.

In the past, the interaction of high inflation with an unindexed tax system was widely viewed as a serious problem, one that potentially reduced the level of investment and distorted investment choices.[174] Nonetheless, at today's low rates of inflation,[175] indexing depreciation (and perhaps the rest of the tax system) may not seem particularly urgent. Yet, there is no guarantee that inflation will remain low, or that a low inflation rate does not create problems for the taxation of capital income.[176] Moreover, during a low inflation period, depreciation indexing should have a relatively small short-run revenue cost, making it easier to enact.

2. Indexing Methods

Indexing depreciation allowances requires that the unindexed allowances be multiplied by a factor representing the cumulative change in the general price level since the time the asset was placed in service by the taxpayer. The present value of the indexed allowances, and therefore the incentive value of the deductions, becomes independent of general expected inflation under indexing.[177]

An equivalent method of indexing depreciation allowances is to compute the indexed asset's basis in each accounting period and multiply the indexed basis by the appropriate depreciation rate.[178] The indexed adjusted basis can be calculated by computing the unindexed adjusted basis, using depreciation adjustments based on unindexed allowances, and by multiplying the result by the cumulative inflation factor. Alternatively, the prior period's indexed adjusted basis can be updated using the most recent indexed depreciation allowance. If gains and losses on depreciable assets are to be indexed for inflation as well, then the indexed adjusted basis may be used to compute gain or loss. However, if a policy decision were made to continue to tax purely inflationary gains and losses, even while depreciation allowances are sheltered from inflation, then the unindexed adjusted basis must be used to calculate gain or loss.

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[174] See, e.g., Henderson (1985), Feldstein and Summers (1979), and Feldstein (1982). Not all studies, however, showed that inflation necessarily raised the effective tax rate or increased the variability with which alternative investments were taxed (Fullerton (1987), Fullerton and Henderson (1984), Henderson (1985)). Results about the effects of inflation on effective tax rates depend on the specifics of the tax law as well as on particular modeling and parameter assumptions.

[175] Based on the consumer price index, inflation was 2.3 percent in 1997 and at 1.6 percent in 1998.

[176] Cohen, et. al. (1997) and Feldstein (1996).

[177] Algebraically, if π_i represents the rate of inflation in the i^{th} year after the asset was placed in service, then the unindexed depreciation allowance for the t^{th} year is multiplied by a factor equal to $(1+\pi_1)(1+\pi_2)\ldots(1+\pi_t)$. The unindexed allowance would be calculated as under current law. Indexing preserves the present value of the depreciation deductions in the face of a general expected inflation. In determining the present value of allowances, the t^{th} discount factor can be expressed as $1/(1+\pi_1)(1+\pi_2)\ldots(1+\pi_t)(1+r)^t$, where r is the t-period real after-tax discount rate and the π_i's are expected future one-period rates of inflation. After multiplying the t^{th} indexed depreciation allowance by this discount factor to calculate the present value of the deductions, the inflation terms cancel out.

[178] If using the declining balance method, the adjusted basis is indexed. If using the straight-line method, either the unadjusted basis is indexed (if a constant depreciation rate is used), or a depreciation rate representing the remaining recovery period is calculated each year, and applied to an indexed adjusted basis.

3. Effect of Indexing Depreciation on the Cost of Capital

Table 7 shows the effect of indexing depreciation on the cost of capital and marginal effective tax rate at three inflation rates. These results use the same assumptions as in Table 5 and 6, and do not assume any change in the taxation of inflationary capital gains. At a zero rate of inflation, indexing depreciation has no effect on the cost of capital. However, at a 3-percent rate of inflation, indexing depreciation reduces the cost of capital and effective tax rate for depreciable assets. Indexing depreciation decreases the weighted-average cost of capital for corporate equipment from 5.1 percent to 4.5 percent and the economy-wide cost of capital from 4.5 percent to 4.2 percent. The effect on the economy-wide cost of capital is muted because indexing depreciation does not reduce the tax cost of investment in nondepreciable business assets or in owner-occupied housing. At a higher 6-percent rate of inflation, indexing depreciation generates a larger relative reduction in the tax cost of investment and in the cost of capital, as shown in Table 7.

Indexing depreciation also improves neutrality over the range of inflation rates considered in Table 7. For example, at 3-percent inflation, indexing depreciation reduces the standard deviation in the cost of capital from 0.75 percent to 0.59 percent. The improvement in neutrality arises because indexing depreciation reduces several relative tax disadvantages: the tax disadvantage of investing in business capital compared to owner-occupied housing, the tax disadvantage of investing in tangible business assets compared to intangibles, and the tax disadvantage of investing in corporate depreciable assets compared to similar investments in the noncoprorate business sector.

4. Problems with Indexing Depreciation

Indexing depreciation allowances would cost the government significant revenue. Indexing can be an expensive, open-ended, tax reduction. Indeed, revenue cost was an important reason why (comprehensive) indexing in the Treasury's 1984 tax proposal was rejected by Congress.[179]

Indexing also complicates the tax system by requiring annual adjustments in a number of accounts.[180] In addition, if gains and losses on depreciable assets are not indexed against inflation, then separate accounting for indexed and unindexed asset basis is required. Nevertheless, it is easy to overstate the additional complexity. While there are complicating considerations concerning the exact timing of the adjustments, including partial year considerations, all indexing adjustments depend on only a single rate of general inflation for each period. There is not a separate index for each asset; relative price effects can be ignored. An example may clarify why this is the case.

[179] Perlis (1988).
[180] Halperin and Steuerle (1988) and Feldstein (1981b).

Table 7
Effect of Indexing Depreciation on the Cost of Capital at Selected Inflation Rates

	Cost of Capital					
	No Inflation		3% Inflation		6% Inflation	
	Current Law	Indexed Depreciation	Current Law	Indexed Depreciation	Current Law	Indexed Depreciation
Corporate Sector[a]						
Equipment	4.4	4.4	5.1	4.5	5.7	4.5
Structures	5.1	5.1	5.7	5.2	6.2	5.3
Public Utility	4.4	4.4	5.0	4.5	5.4	4.6
Inventories	5.5	5.5	5.6	5.6	5.7	5.7
Land	5.5	5.5	5.6	5.6	5.7	5.7
Intangibles	3.6	3.6	3.6	3.6	3.7	3.7
Total	4.7	4.7	5.2	4.7	5.6	4.8
Noncorporate Sector[a]	4.3	4.3	4.4	4.2	4.4	4.0
Owner-Occupied Housing	3.7	3.7	3.8	3.8	4.0	4.0
Economy Wide Average[a]	4.2	4.2	4.5	4.2	4.7	4.3
Standard Deviation in the Cost of Capital	.61	.61	.75	.59	.88	.59

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[a] Capital stock weighted averages.

> Suppose that a taxpayer buys a widget for $100, and the widget depreciates by 20 percent each year. Assume that prices are generally flat, but that the relative price of widgets increases by 10 percent. Thus, at end-of-year prices, a new widget would be worth $110, while a year-old widget would be worth $88. The taxpayer's capital investment has declined by $12 in real terms (the initial price of $100 less the end of period value of $88). Accordingly, the taxpayer's proper net deduction to measure economic income is $12. This contribution to net income can be decomposed into a depreciation deduction of $20 (unindexed because general inflation is zero) and an $8 real capital gain on the depreciated widget.[181]
>
> If the widget depreciation were indexed using the relative price of widgets, the taxpayer would take an inappropriate $22 depreciation deduction (1.1x($100-$80)), which exceeds the loss of general purchasing power due to depreciation. If gains and losses were indexed for the relative price change as well, the taxpayer's indexed adjusted basis in the used widget would equal its value ($88). In this case, the taxpayer would not only receive a $22 depreciation deduction, but would have no capital gain for tax purposes. Income would be mismeasured.

Another concern is that indexing depreciation might lead to more general indexing of the tax system and private contracts, which could contribute to macroeconomic instability.[182] Some have also argued that indexing the tax system might reduce public pressure for low inflation policies, and lead to policies that produce higher rates of inflation, with possible negative effects on national economic welfare.[183] However, it is unlikely that the envisioned destabilization and hyperinflation would result from indexing depreciation.

Indexing depreciation without addressing other taxable income measurement issues also has been criticized.[184] The main concern is that, with unindexed interest and a nonneutral and accelerated depreciation system, indexing depreciation would not necessarily improve the measurement and taxation of income. Given that several choices are distorted under the current tax system, the removal of one distortion would not necessarily improve the overall efficiency and equity of the tax system.

The calculations presented in Table 7 suggest that indexing can improve tax neutrality with respect to several margins of choice. The explanation for the differing perspectives lies in the set of investment choices considered in the analysis and in the parameters that underlie the analysis. For example, Gravelle expresses the concern that indexing depreciation can increase tax distortions by increasing the tax advantage afforded business equipment over nonresidential structures.[185] Indexing is likely to cause a proportionately larger marginal effective tax reduction for equipment than for structures, and equipment already is tax favored over structures.[186] This result is reflected in the calculations of Table 7, which show that indexing depreciation

[181] With a realization-based tax system, the taxpayer would receive a depreciation deduction of $20, but tax on the $8 of real capital gain would be deferred if the asset were not sold.
[182] Feldstein (1981b).
[183] Feldstein (1996).
[184] Tideman and Tucker (1976), Halperin and Steuerle (1988), Perlis (1988), and Gravelle (1979).
[185] Gravelle (1979).
[186] Auerbach (1983b), Gravelle (1979).

allowances for inflation increases the difference in the cost of capital between corporate equipment and corporate nonresidential structures.

The calculations in Table 7 do not reflect changes in certain key parameters, such as the ratio of debt finance to equity finance. The variation of these parameters, and the consideration of other tax distortions not reflected in the table, account for some of the other concerns expressed about indexing depreciation.

One important set of issues arises from the choice of whether to finance investment with debt or with new equity issues. The calculations in Table 7 assume that investment is financed with roughly two-fifths debt and three-fifths equity, based on historical financing shares. But increasing the debt/equity ratio can lower the tax cost of corporate investment, and can potentially affect conclusions about the desirability of indexing depreciation for inflation. For example, negative marginal effective tax rates for corporate investments are more likely as the ratio of debt to equity rises.

Debt-financed corporate investment enjoys a general tax advantage over equity-financed corporate investment.[187] This tax advantage is heightened because interest flows are not indexed for inflation. During times of inflation, part of the nominal interest rate represents a return of principal on the loan, rather than income. For the proper measurement of economic income, the return of principal, represented by the real reduction in the borrower's debt due to inflation, should neither be deducted from income by the borrower nor included in income by the lender. But the current unindexed tax system allows the borrower to deduct both the real interest expense and the implied return of principal represented by the real reduction in the borrower's outstanding debt. This results in a tax subsidy that increases with the inflation rate, to the extent that inflation causes an increase in the market rate of interest.[188]

Inflation generally increases the corporate cost of capital for equipment. At generally experienced parameter values for inflation, tax, and depreciation rates, the effect on the cost of capital through depreciation outweighs any reduction achieved from leveraging. For longer lived assets, however, the leveraging effect can outweigh the depreciation effect, so that inflation can actually reduce the cost of capital.

An additional concern is that indexing depreciation might encourage tax shelters.[189] This view notes that the combination of accelerated depreciation and debt finance can lead to very

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[187] Interest deductibility gives debt-financed corporate investment a tax advantage over equity-financed corporate investment. Because interest is deductible by the corporation, after-tax corporate interest costs reflect the savings of both the corporate income tax and shareholder-level tax on corporate earnings. However, shareholder discount rates reflect the after-tax yield on credit instruments net only of shareholder taxes. Consequently, the required yield on a leveraged investment need earn only enough to pay the shareholder-level tax. In contrast, because the normal return to equity is not deductible by the corporation, income from an equity-financed corporate investment is taxed twice, once under the corporate income tax and again under the individual income tax as dividends or capital gains earned by the shareholder. The equity-financed investment must earn a return sufficient to cover both tax burdens. Because noncorporate taxpayers incur only a single level of tax, no similar advantage is derived from leveraged investments in that sector.

[188] Gravelle (1994). See also the discussion in the preceding footnote.

[189] Halperin and Steuerle (1988), Perlis (1988), and Gravelle (1979).

low or negative effective tax rates, which often are considered a hallmark of tax shelters. Indexing depreciation that already is accelerated might be viewed as similar to further accelerating depreciation allowances, and might lead to low or negative effective tax rates, especially when combined with high levels of debt finance. Even without accelerated depreciation, however, indexing depreciation prevents inflation from increasing the corporate cost of capital, leaving only the leverage effect. A combination of high levels of debt finance and a high inflation rate could lead to negative effective tax rates for both equipment and structures.

At modest rates of inflation, however, indexing depreciation is unlikely to generate negative marginal effective tax rates. For example, at 3-percent inflation, indexing depreciation does not generate negative marginal effective tax rates for depreciable assets.[190] At 6-percent inflation, indexing depreciation leaves marginal effective tax rates positive on all corporate investments in depreciable property and on all but two noncorporate investments in depreciable property.[191] High rates of inflation would be needed to generate significant negative marginal effective tax rates at the average levels of debt assumed in these calculations.[192]

Indexing depreciation plays no direct role in generating negative effective tax rates for corporate investments. Even without inflation, the combination of accelerated depreciation and high leverage may be sufficient to generate a low or negative marginal effective tax rate.[193] With inflation, the lack of indexing of interest expense may be sufficient alone to generate a low or negative marginal effective tax rate. The lack of indexing depreciation allowances for inflation serves only to counteract the tax reducing effects of accelerated depreciation and corporate interest deductions. Indexing depreciation eliminates this countervailing effect, and thus only indirectly contributes to the possibility of generating negative marginal effective tax rates on debt-financed investments.

Indexing or accelerating depreciation sometimes is held to increase tax incentives to leverage depreciable investments because of the interaction of debt with investment incentives discussed above.[194] This argument is questionable.[195] A firm's incentive to finance with debt rather than with equity generally is viewed as depending on the difference between the after-tax returns to debt and equity. This difference, in turn, depends on statutory tax rates at the firm and individual levels, and on whether interest flows are indexed for inflation.[196] The impact of depreciation and other investment incentives on the cost of capital is independent of this tax difference, and hence is irrelevant to the firm's debt/equity choice.[197] Debt may be a low tax

[190] The results of these detailed calculations are not reported in Table 7.
[191] These two asset types (railroad equipment and mining shafts and wells) involve situations in which the cost recovery allowances are estimated to be highly accelerated relative to economic depreciation.
[192] This may not have been true under the accelerated cost recovery systems available during the 1980's. Gravelle (1979), Fullerton and Henderson (1985), Fullerton (1987).
[193] Ballentine (1988).
[194] Halperin and Steuerle (1988) and Perlis (1988).
[195] Ballentine (1988), Auerbach (1988), Mundstock (1985).
[196] See, e.g., Gordon and Malkiel (1981), Fullerton and Gordon (1983), and Gentry and Hubbard (1997a).
[197] Gravelle (1994) .

source of financing, but accelerating or indexing depreciation does not make debt more advantageous.[198]

5. Accelerated Depreciation as a Proxy for Indexing

In the past, accelerated depreciation has been justified in part as a way to index implicitly for inflation.[199] Acceleration is said to have an administrative benefit over indexing, since acceleration may be simpler for taxpayers and the IRS. Yet accelerated depreciation may be a poor proxy for explicit indexation. Even when the accelerated allowances grant the right amount of depreciation at a particular inflation rate, they will not do so at other inflation rates. Only explicitly indexing depreciation allowances for inflation ensures that depreciation allowances are adequate to recover the economic costs of investment, or to offer the appropriate level of investment incentive, at all inflation rates and for all assets.[200]

6. First Year Allowances as a Proxy for Indexing

Auerbach and Jorgenson have proposed a depreciation plan that would index depreciation by allowing an immediate write-off equal to the present discounted value of depreciation allowances.[201] Their initial plan envisioned economic depreciation, but an investment incentive could be offered by increasing the first year deduction. The Auerbach-Jorgenson plan would be inflation-proof because the entire deduction would occur in the first year; its value would be independent of the inflation rate that prevails over the investment's lifetime.[202]

Allowing the entire deduction for depreciation in the first year nonetheless raises certain issues. One problem is that the value of depreciation depends on the real discount rate, which cannot be known with certainty. In addition, firms without sufficient tax liability would be unable to benefit fully. Thus, this proposal would be biased in favor of established firms, and may encourage mergers. Granting the full value of the deduction in the first year may place pressure on recapture provisions if the asset is sold prematurely or converted to nonbusiness use. It also may put pressure on the distinction between business use and personal use property and possibly on other margins relevant to enforcement and administration.

The Auerbach-Jorgenson plan also may raise revenue concerns because in periods of high inflation indexing will reduce government revenue.[203] Nevertheless, over a short budget window, the Auerbach-Jorgenson plan appears to have a large revenue cost because it allows all

[198] Ballentine (1988). Nonetheless, debt may increase the benefits associated with tax incentives by allowing tax-favored assets to migrate more completely to the portfolios of high bracket investors (Auerbach (1988)).
[199] Feldstein (1981b), Gravelle (1980), and Aaron (1976).
[200] This does not mean, however, that at any given inflation rate, all accelerated depreciation proposals would produce less uniform effective tax rates than would indexing all possible depreciation systems for inflation. For example, Feldstein (1981b) concludes that the 10-5-3 plan is essentially equivalent to indexing the then current system of depreciation over a fairly wide range of inflation rates. Gravelle (1980) concludes that the 10-5-3 depreciation plan produces more uniform effective tax rates than would indexing the then current depreciation system.
[201] Auerbach and Jorgenson (1980).
[202] A first year deduction also eliminates the need to track basis and depreciation over time and on this score may promote tax simplicity.
[203] Gravelle (1979) and (1980).

depreciation to be taken in an investment's first year. However, depreciation deductions are smaller over the remaining life of the investment. The associated tax increases in the out-years must be taken into account in evaluating the long-run revenue cost of the Auerbach-Jorgenson plan.

D. Introduce a Mark-to-Market Regime

In principle, a mark-to-market approach to depreciation offers the possibility of measuring income correctly. Under this approach, each asset basis is equated with the asset's market value at the end of each taxable year, the prior-year asset basis is adjusted to account for general inflation, and the resulting inflation-indexed change in basis is taken as a gain or loss. The result is a measure of economic income associated with the change in asset value.

As a practical matter, mark-to-market presents two difficulties as a means of implementing the goal of economic depreciation.[204] First, few active markets exist for used productive assets. Only a few such assets, such as automobiles and other transport assets, are traded with sufficient frequency and in sufficient numbers that reasonably good estimates of market value may be obtained at low cost. Even then, there are transaction costs, informational asymmetries, and firm-specific characteristics that may dictate differences between market value and value-in-use. For example, installation costs may be important. Or, a "lemons" problem may exist if buyers are less informed than sellers concerning the condition of the assets being sold.[205] Specific firm characteristics may lead to significant bid-ask spreads on the prices of used assets. A particular taxpayer may use assets more or less intensively than average, so that the depreciation experienced by the taxpayer differs from the average depreciation observed in the market. Even for assets with significant resale markets, it is not clear how well changes in the prices of marketed assets reflect either changes in the values of the entire stock of assets, most of which are not traded, or changes in the values of particular assets.

A mark-to-market type regime might allow other methods of valuing assets. For example, appraisals based on the value of similar assets, measures of intensity of use, expenditures on repairs and other relevant factors might be used to construct or adjust depreciation estimates. Such methods are likely to have limitations, however. Appraisals, for example, are likely to be costly for the taxpayer to undertake, may be inaccurate, and may be contested frequently by the IRS. Thus, these problems cast doubt on the practicality of a mark-to-market regime.

The second problem with a mark-to-market approach is that it would measure the total change in the asset's real value, including both depreciation (i.e., age-related declines in value) and revaluation. Mark-to-market would thus represent a big step toward full accrual taxation of (net) real capital gains, and thus would represent much more than depreciation reform. It may be

[204] Mark-to-market also faces a conceptual problem. If implemented in an *ex post* sense, marking-to-market may mismeasure depreciation, to the extent that depreciation is to reflect anticipated reductions in asset values. To measure anticipated depreciation, firms would have to use forecasts, perhaps based in part on past price history, to calculate estimates of future changes in value. These forecasts would be costly for the firm to produce, and would place heavy verification burdens on the IRS. They also would face many of the same problems encountered by academic studies of economic depreciation.

[205] See the discussion in Appendix 1.

difficult to use a mark-to-market technique to measure only depreciation, while continuing to tax revaluations (capital gains) on a realization basis.

E. Conform Tax Depreciation to Financial (Book) Depreciation

Many firms measure income for financial reporting purposes as well as for tax purposes. Thus, they have to keep two sets of accounts. Allowing (or requiring) firms to conform tax depreciation to financial, or book, depreciation would help reduce administrative cost. It also could result in improved income measurement to the extent that book depreciation gives a more accurate measurement of income than does tax depreciation. In addition, it might reduce disputes between taxpayers and the IRS.

These benefits, however, may be overstated. In addition to depreciation, there are many other differences between financial and tax accounting.[206] Consequently, even if tax and book depreciation were conformed, companies would still have to keep two sets of financial records. Conforming tax to book depreciation uniformly involves more than conforming recovery periods and depreciation methods. It would also involve capitalizing the same costs for book and tax purposes and having consistent placed-in-service and retirement rules. Smaller companies, moreover, may currently use tax depreciation rules for keeping their nontax accounts, or may not keep nontax accounts. These companies would not benefit from switching to financial accounting.

Disputes between the taxpayer and the IRS would be eliminated only if the IRS always accepted the taxpayer's depreciation lives and methods. This seems unlikely. Under any system, the IRS would still have to ensure that firms follow appropriate financial reporting guidelines and do indeed conform tax to book depreciation. In addition, it is likely that any serious conformity proposal would place some limits on firms' ability to adopt shorter lives and accelerated methods of depreciation. Such limits may lead to costly disputes between taxpayers and the IRS. Limits also may create biases that benefit some industries at the expense of others. For example, to the extent that limits are based on a firm's historic method of book depreciation, firms that have traditionally used more accelerated book methods may benefit relative to other firms that used slower depreciation for financial reporting purposes.

Verifying depreciation methods for firms that are not publicly traded and are not required to prepare audited financial statements could be difficult. Possibly loan and other documents could be used to determine depreciation for such firms, but the standards to which these records conform may be questioned. As an alternative, the IRS could create a set of industry depreciable lives and methods based on the depreciable lives chosen by publicly traded firms. However, this solution raises the question of whether the two sets of firms are comparable in terms of their asset mixes or use of assets over time.[207] It may also tend to establish two different, yet related, depreciation systems. One system would apply for publicly traded firms; such taxpayers would have significant liberty in choosing depreciation lives and methods. The second system would apply to other taxpayers that do not file financial reports; such taxpayers would have prescribed

[206] Ferres, et. al. (1992).

[207] The same issue arises, however, under current law, where asset class lives, if reviewable, would be determined as representing industry averages. The averages may not be representative of specific industry segments.

lives and methods from which they could not deviate. This could give publicly traded firms a competitive advantage over privately held firms to the extent that publicly held firms are able to shift more easily to accelerated depreciation.

Further, it is not clear that adopting financial accounting for depreciation would necessarily improve income measurement. This is an empirical question that is difficult to answer for several reasons. First, there are no systematic estimates of book depreciation and the financial accounting rules governing depreciation allow firms broad discretion in choosing their depreciation methods. Thus, there is no well-defined set of financial depreciation rules against which tax depreciation rules may be compared. Second, even if, as often contended, book depreciation generally is less accelerated than is tax depreciation, and even if tax depreciation on average is accelerated relative to economic depreciation, it does not follow that a switch to book depreciation would improve income measurement. Book depreciation may be even slower than economic depreciation. Third, to the extent that book depreciation is slower than tax depreciation, book depreciation could overstate economic income during periods of significant inflation more severely than would tax depreciation even if book depreciation were close to economic depreciation at a low inflation rate. Fourth, if tax depreciation were conformed to book depreciation, firms may face pressure to misstate their financial income. For example, firms may elect to adopt more accelerated book depreciation methods. This could reduce or eliminate any gains to income measurement that otherwise would result from slowing depreciation deductions.[208]

An important disadvantage of determining tax depreciation by reference to book depreciation is that it would transfer authority to determine tax rules from the Congress and the Treasury to the FASB and the accounting profession. Thus, the Federal government would no longer have a direct role in setting tax depreciation policy.

F. Allow Depreciation Based on Taxpayer Facts and Circumstances

Pre-ACRS law allowed individual taxpayers to establish depreciation deductions based on the particular facts and circumstances applicable to each taxpayer. However, pre-ACRS rules were only partially oriented toward achieving a system of economic depreciation. Rather, those rules, as developed to their maturity, were focused heavily on establishing a useful life standard, under which capital costs could be spread according to a few allowable depreciation methods (i.e., the straight-line, declining balance, and sum-of-years digits methods). While this system may have achieved a good approximation to economic depreciation in some cases, the infrequency of useful life adjustments and the restrictions to particular depreciation methods were likely to have resulted in gross errors in other cases.

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[208] While the benefits in terms of reduced taxes point to an obvious incentive for ever accelerating depreciation, two considerations may place some limits on this effect. First, accelerating book depreciation may reduce book income, and managers may be disinclined to report smaller profits to stockholders. Second, financial accounting standards may be expected to place some limit on the adoption of accelerated depreciation methods. How effective these limiting pressures would be, however, is open to question. For example, if stockholders see through arbitrary accounting conventions, reductions in book earnings that are associated with higher real after-tax profits may not offer much of a deterrent to ever accelerating depreciation. In addition, financial accounting standards are inherently conservative, in that they tend to be biased towards smaller reported earnings. Thus, there may be little reason to expect financial depreciation to resist moderate acceleration of depreciation.

If implemented appropriately to achieve an economic depreciation standard, a facts and circumstances system of depreciation places a high premium on information about the future price behavior of depreciable property. It requires a reasonably good notion of not only the asset's average useful life, but also the pattern of depreciation over that life and the amount of salvage value at the end of the useful life. A fully implemented system would not specify particular depreciation methods such as straight-line or declining balance methods. It would allow taxpayers to choose their methods to match expected reductions in value.

Such a system would impose a heavy burden on taxpayers to obtain the necessary data and to use those data to justify to the IRS their depreciation deductions. It would impose a large burden on IRS agents as well, requiring significant expertise in order to evaluate the data provided by taxpayers. Such a system would require taxpayers to invest in systems to track productive assets so that their depreciation could be carefully monitored. This would be costly, and in many cases the needed data may be difficult to obtain. The future is unknowable, and even obtaining a reasonable expected value as to the future value of assets may be difficult.[209] This system would be likely to generate a great deal of controversy and litigation because of the informational gaps, future uncertainties, and unsubstantiated claims and beliefs in this area. It is primarily for this latter reason that the Treasury developed the Asset Depreciation Range (ADR) method (which provided acceptable ranges for depreciable lives for classes of assets) and eventually led to the repeal of facts-and-circumstances depreciation.

G. Expensing of Business Investments

An alternative approach to depreciation reform would allow businesses to expense the cost of investment by granting an immediate deduction of the investment's full cost in the year of purchase. Expensing business investment would push the U.S. tax system away from a tax based largely on income[210] toward a tax based largely on consumption.[211] An evaluation of expensing, and of consumption taxes, however, is beyond the scope of this report.[212] Nonetheless, some of the relevant issues are discussed briefly in the interest of completeness.

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[209] As the discussion of depreciation versus revaluation pointed out, taxpayers would not need to take all future possibilities into account, but would need to consider the effects of time (i.e., wear and tear) and obsolescence.

[210] The current US tax is not a pure income tax. A number of assets enjoy at least partial consumption tax treatment. For example, owner-occupied housing is untaxed, depreciation is somewhat accelerated, much retirement saving benefits from deferral of tax on principal and earnings, capital gains taxes can be deferred, possibly forever if the asset is held until death, and are taxed at lower rates for individuals.

[211] The equivalence of expensing and consumption taxation follows from the identity that income (Y) equals the sum of savings (S) plus consumption (C). Hence, C = Y-S, from which it is apparent that the tax base of a consumption tax is identical to the base of a consumed income tax that allows a deduction (i.e., expensing) for savings. It is important to note, however, that the shift to expensing may be economically different from a shift to a pure consumption tax in the short run. This difference stems from transition relief for owners of existing assets. A shift to a consumption tax generally would not allow taxpayers to continue to depreciate existing assets. In contrast, a switch to expensing may provide transition relief for existing capital by allowing taxpayers to continue to depreciate existing assets. Transition relief for existing capital has important implications for evaluating the revenue, efficiency and equity effects of consumption tax reforms. See, e.g., Auerbach (1996)

[212] Recent analyses of consumption taxes include Aaron and Gale (1996), Gentry and Hubbard (1997a and b), Gravelle (1995), Kotlikoff (1995a and b), and Jorgenson (1995).

Expensing would offer the potential for both benefits and costs compared to the current tax system. A benefit of expensing is that it would lower marginal effective tax rates, thereby improving incentives to save and invest. It also would reduce differences in taxes on alternative investments, thereby improving the productivity of our nation's capital stock. Expensing would effectively index cost recovery (and capital gains) on qualified investments for inflation, because all of the investment's cost would be recovered immediately and would have a present value independent of the future rate of inflation. It may simplify the tax system by eliminating the compliance and other administrative costs associated with determining proper tax allowances for depreciation. The size of any of these potential benefits, however, is a matter of some dispute. Estimates can vary, depending, e.g., on the specifics of the policy option and on assumptions about how responsive savers and investors are to changes in taxes on capital income.

Expensing also would impose some costs. Expensing would reduce the progressivity of the tax system, because most capital income is earned by high-income taxpayers. Thus, expensing would give the wealthiest taxpayers a large tax cut. Expensing is likely to have a large revenue cost, which must be offset by raising other taxes, reducing government spending, or increasing government borrowing. In some cases, expensing may create undesirable incentives or inappropriately favor certain taxpayers. For example, expensing combined with debt finance may create negative effective tax rates, a hallmark of tax shelters. If not universally applied, expensing may offer a tax benefit to investment in qualifying business assets (e.g., plant and equipment) relative to investment in non-qualifying business assets (e.g., inventory). By concentrating all of the deductions in one year, expensing may favor established companies over smaller start-up firms without substantial taxable income. Expensing may promote mergers and acquisitions as firms seek to maximize the value of the tax deduction. Finally, expensing may shift the intergenerational distribution of the tax burden to older generations, largely by reducing the value of existing assets.[213]

[213] Existing assets would not be eligible for expensing. Rather, they would continue to be depreciated or, perhaps, would lose their remaining depreciation deductions. In contrast, new assets would be expensed. Thus, a new investment would have tax deductions with a larger present value than would an equivalent amount of existing capital. Competition that equates the rate of return earned on all assets is thus likely to reduce the value of existing assets relative to new assets and relative to consumption goods. This fall in the value of the existing stock of capital is equivalent to a one-time tax on that stock. To the extent that older generations own a disproportionately large share of the existing capital stock, they would bear a disproportionately large share of the burden of this tax. Of course, to the extent that existing assets would not lose their remaining depreciation deductions, the fall in their value would be mitigated. See Gravelle (1995).

CHAPTER 6

CURRENT ISSUES IN TAX DEPRECIATION

A. Introduction

In response to a public notice issued in 1999, taxpayers and their representatives provided a number of written submissions to the Treasury Department. While generally couched in terms of their own particular situations, these comments nonetheless highlighted a number of important issues pertaining to the depreciation system under current law. This chapter summarizes these issues.

Many comments reflected dissatisfaction with the design and administration of the current classification system, as well as beliefs that many class lives do not reflect economic realities. Accordingly, this chapter first reviews principles and issues related to the classification of depreciable assets. It also describes difficulties with keeping a system of class lives current, and presents options for addressing this issue. The final section discusses miscellaneous issues involving depreciation recovery periods and methods.

B. The Classification of Depreciable Assets

Tangible depreciable property is placed in one of ten MACRS categories. Each category is assigned a recovery period over which historical costs are recovered, a method that provides how the depreciation deductions are spread over the recovery period, and a timing convention that describes when assets are treated as being placed in service during the taxable year. Thus, assignment of property to a MACRS category determines completely the depreciation deductions allowed to a taxpayer with respect to that property.[214]

The class life system is the primary mechanism by which eligible property is assigned to MACRS categories. The first subsection reviews the origins and historical development of this system. A secondary classification mechanism also exists in which certain assets are placed into specified MACRS categories directly by statute. These property assignments are reviewed at the end of the first subsection subsection. The next subsection describes the advantages and disadvantages of using a class life system for assigning depreciation recovery periods and methods, and outlines certain principles and issues that need to be considered in the design of an asset classification system. The third subsection discusses current asset classification issues and controversies, including problems introduced by the assignment of MACRS recovery periods. Current issues involving the classification of real property are treated in some detail in the final subsection.

[214] Taxpayers may elect to choose a less accelerated method than that specified for a category of property, provided that the election applies to all property in that category placed in service during the taxable year. See §168(b)(5).

1. Origins and Development of the Asset Classification System

The class life system was initially formulated in 1962 as a guideline tool to assist taxpayers and the IRS in agreeing upon acceptable useful lives to be used in the context of a taxpayer facts-and-circumstances depreciation system. This guideline classification system was transformed in 1971 into an elective system that allowed taxpayers to choose a useful life from a range of lives specified by the IRS for each defined class of property. The range of lives was centered on a "class life" and was intended to reflect in some measure the asset retirement practices for the property defined in the asset class over all users. In 1981, class lives ceased being used as midpoints of acceptable useful life ranges, but served a limited role in assigning property to a handful of ACRS cost recovery categories. The depreciation deductions assigned to these categories no longer attempted to mirror economic depreciation. Effective in 1987, the MACRS expanded the use of the class life system as an asset classification mechanism. This subsection describes the historical development of the current system in greater detail.

a. Facts and Circumstances

Until the introduction of the ACRS in 1981, a taxpayer's depreciation deductions were calculated based on taxpayer-specified useful lives and salvage values, and on IRS-prescribed depreciation methods. Such deductions were intended to be a "reasonable allowance for the exhaustion, wear and tear," and obsolescence of depreciable property.[215] A minimal requirement was that the aggregate deductions with respect to a unit of property should fully recover the asset's original historical cost, less any salvage value. Additional restrictions on the allowable rates of depreciation also were imposed on the calculation of depreciation allowances.[216]

In the early years of the income tax, taxpayers' depreciation deductions were generally not challenged unless they were shown to be unreasonable in the face of clear and convincing evidence. Deductions determined on a consistent basis and in accordance with accepted accounting practices were generally allowed. In 1934, however, the Treasury Department undertook a number of administrative changes designed to reduce significantly the value of the deductions. In particular, taxpayers were required to provide evidence to justify useful life and salvage value estimates.[217] With these administrative changes, the listing of lives in Bulletin F became increasingly important.[218] A taxpayer wishing to establish a useful life shorter than that

[215] §167(a).

[216] For example, prior to 1946, taxpayers were required to use the straight-line depreciation method to distribute cost (less salvage) over time. Thereafter, the 150-percent declining balance method was allowed, and the 1954 Internal Revenue Code permitted more accelerated deductions for most property, including the 200-percent declining balance and the sum-of-years digits methods. The sum-of-the-years-digits method involves multiplying the asset's original capitalized value (less any salvage value) by changing a fraction. The numerator of the fraction corresponds to the remaining number of years in the applicable recovery period (including the current year for which the allowance is being calculated), and the constant denominator equals the sum of all the numerators thus calculated over the recovery period. For example, a 5-year recovery period yields fractions 5/15, 4/15, 3/15, 2/15, and 1/15, where 15 is the sum of the remaining life digits 5+4+3+2+1. See Reg. §1.167(b)-3.

[217] These administrative actions were implemented, in part, as a response to Congressional proposals to reduce depreciation deductions by 25 percent for the years 1934, 1935 and 1936. U.S. Department of the Treasury (1971) 9, footnote 10.

[218] The IRS had produced a compendium of useful lives, called "Bulletin F," in 1931 This document listed useful lives for about 2,700 assets, organized by industry, to be used as a guide for taxpayers and revenue agents.

published in Bulletin F, if audited, generally needed to demonstrate the validity of that shorter life.[219]

Bulletin F was reissued in 1942. It was substantially enlarged, nearly doubling the number of lives to reflect over 5,000 assets used in 57 different industries or activities.[220] The 1942 Bulletin F also provided, for the first time, composite lives for several industry and general asset groupings. For example, a ten-year life was provided for use in depreciating all equipment used in the buildings construction trade. This represented an attempt by the IRS to promote the use of group accounts, organized by broad classes of economic activity.

b. The Guideline System

The current class life system was originally promulgated in 1962.[221] The Treasury established an elective system designed "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."[222] The system provided a list of "guideline" lives that reflected useful lives used by businesses for tax purposes. A guideline life for an industry was established generally at the 30th percentile of the useful lives of assets reported for the industry in a 1960 Treasury survey.[223] Consequently, the guideline lives were generally shorter than the composite lives contained in Bulletin F, which was withdrawn as an audit guide. The guideline lives were specified for broadly defined asset classes, and were organized into four groups. Group One included assets used by business in general (e.g., office equipment, transportation equipment, land improvements, and buildings). Group Two contained asset classes for non-manufacturing activities other than those organized as Group Four. Group Three consisted of asset classes for manufacturing activities. Group Four contained asset classes for transportation, communications and public utilities.

The guideline lives served as temporary "safe-harbor" depreciation lives that taxpayers could rely on for a limited period. A taxpayer computed a "class life" under this system as a weighted average of the useful lives of the taxpayer's assets defined within a single asset class.[224]

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[219] A survey of IRS revenue agents and engineers, undertaken in 1971, indicated that Bulletin F lives had tended to be regarded as safe-harbor useful lives. Over 80 percent of the survey respondents said that, prior to 1962, they had accepted useful lives for machinery and equipment that were longer than the Bulletin F lives without regard to actual retirement practices. In addition, while 71 percent of the respondents reported that taxpayers claimed lives that were shorter than the Bulletin F lives, only 38 percent said that they accepted lives that were shorter than the Bulletin F lives, and about 57 percent indicated that they accepted lives equal to Bulletin F lives. U.S. Department of the Treasury (1971), 46.

[220] The revision also tended to lengthen the listed lives. One study found that, of the 2,700 lives that had been listed in the 1931 edition of the Bulletin, 1,038 were increased in the 1942 edition, while only 54 were decreased. The study was conducted by the Machinery and Allied Products Institute. Grant and Norton (1955), 222.

[221] Rev. Proc. 62-21, reprinted in U.S. Department of the Treasury (1964).

[222] U.S. Department of the Treasury (1964)..

[223] Pollack (1968), 6. According to Pollack, the guideline lives were not based exclusively on the 30th percentile lives of the 1960 Treasury survey, but were also determined on the basis of studies of tax returns and on engineering studies of particular industries. Officially, the lives were "based on analyses of statistical data and engineering studies and assessments of current and prospective technological advances, for each industry in the United States." U.S. Department of the Treasury (1964), 51.

[224] Use of the term "class life" under the guideline system is different from the use of the same term under the Asset Depreciation Range (ADR) system introduced in 1971. A "guideline life" under the former system is equivalent to a "class life" under the latter. A guideline system "class life" represented an average of the taxpayer's useful lives

The class life was compared to the relevant guideline life, and, if no shorter than the guideline life, it was deemed acceptable as long as the "reserve ratio test" was met. The reserve ratio test was intended as an objective measure by which the government and the taxpayer could judge whether the taxpayer's actual retirement and replacement practices were consistent with the taxpayer's chosen useful lives.[225] These automatic adjustments were intended to impart greater objectivity and standardization in the setting of depreciation useful lives.

The new system was voluntary for taxpayers. They could continue to use all facts and circumstances to justify their chosen useful lives.[226] Indeed, in a 1971 survey of IRS revenue agents and engineers, 54 percent of respondents indicated that "few" taxpayers had adopted the guideline system, while only 22 percent felt that "most" taxpayers had adopted the system. The remaining 24 percent of respondents indicated that "some" taxpayers used the guidelines. Only 41 percent of revenue agents and engineers felt that the guideline system was favorable to "most" taxpayers, while 24 percent felt it was favorable to only a "few" taxpayers.[227]

The Treasury had hoped the guideline system of lives would achieve several goals:[228]

> By classifying taxpayers into broad "industry" groups, the system would foster the adoption of more uniform lives among competing taxpayers, yet continue to allow flexibility according to individual facts and circumstances.

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used to compute depreciation allowances. It was determined by computing a straight-line deduction amount for all assets within a guideline class, irrespective of whether an accelerated method was actually used, and dividing the total unadjusted basis of the relevant assets by the resultant depreciation amount. See U.S. Department of the Treasury (1964), 20.

[225] The reserve ratio test provided a mechanical method of checking whether the taxpayer's actual retirement practices conformed to the recovery period used for tax purposes and adjusting tax recovery periods to bring tax depreciation into line with actual retirement experience. The reserve ratio test was based on the idea that the average tax recovery period for assets in multiple asset accounts can be compared with the average actual period of use by comparing the ratio of the amount of accumulated tax depreciation with the total investment value in the account. The taxpayer's reserve ratio was computed by dividing the total accumulated depreciation for all the assets in a guideline class by the total original capitalized basis of those assets. The reserve ratio was compared with a published test ratio range. The test ratio range depended upon the test life for the class (generally equal 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).

As long as the taxpayer's reserve ratio was within the test ratio range, his depreciation tax deductions were considered to reflect actual experience. If the taxpayer's reserve ratio exceeded the upper bound of the test ratio, however, there was a presumption that the tax lives used to calculate depreciation for those assets were too short because the accumulated depreciation represented too large a fraction of original basis. A life that was too short would be lengthened by 25 percent. If the taxpayer's reserve ratio fell below the lower bound of the test ratio range, however, the tax lives were considered to be too long and would be adjusted downward by approximately 15 percent.

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 addition, 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 to bring a 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. See Brazell et al. (1989) and U.S. Department of the Treasury (1964).

[226] A taxpayer could not elect to use the guideline system for only some assets within a class. U.S. Department of the Treasury (1964), 54.

[227] U.S. Department of the Treasury (1971), 47-48.

[228] U.S. Department of the Treasury (1964), Appendix 2.

The guideline lives would allow the adoption of shorter useful lives. It was felt that industry asset studies could account more readily for obsolescence, and that, individually, taxpayers could not adequately show the effects of technological change on the useful lives of individual assets.

The guidelines would be easier to keep up to date than Bulletin F useful lives because of the fewer number of lives. It was anticipated that the guideline lives would be reviewed periodically to insure that they kept pace with technological developments.

The reserve ratio test and useful life adjustment tables would establish more uniform revenue agent practices in the areas of challenging taxpayer useful lives and adjusting those lives, if required.

The guideline system would encourage the use of broader multiple-asset accounts in order to simplify compliance and enforcement.

The guideline system established 25 guideline classes for property used by business generally, including 13 different types of buildings. The system also included 37 classes or subclasses for manufacturing activities, 26 classes or subclasses for transportation, communications, and public utilities, and 17 guideline classes or subclasses for other non-manufacturing activities. Special purpose structures were classified with their associated equipment.[229] Guideline lives were specified for 99 of the 105 defined classes. For the remaining classes and for unclassified property, the taxpayer's own facts and circumstances governed the determination of useful lives.

Many guideline class descriptions contained only an asset or activity title. Others had short definitions, often with a brief listing of included and excluded assets. Presumably taxpayers would be able to rationally sort themselves on the basis of the given activity titles and definitions and by reference to the government's Standard Industrial Classification (SIC) system, upon which the guideline asset classes were seemingly based. Assets that failed to fit conveniently into a described asset class were viewed as simply not having a guideline life, in which case the taxpayer was to rely solely on relevant facts and circumstances for justifying useful lives.

The guideline system addressed a number of classification issues. Consolidated groups were to apply the guidelines and the reserve ratio test to each corporation separately.[230] Except for Group One assets, property was classified according to the productive activity in which it was used. Where a taxpayer was engaged in more than one industrial or commercial activity, the assets engaged in each activity were to be classified separately to that activity, as long as the activity was not insubstantial.[231] A taxpayer did not need to be in the trade or business of selling

[229] Special purpose structures were defined as structures designed as "an integral part of the production process and which, under normal practice, are replaced contemporaneously with the equipment which they house, support or serve." A building whose usefulness was restricted by the manner in which it was constructed would not in itself make the building a special purpose structure. U.S. Department of the Treasury (1964), 4, 66.
[230] U.S. Department of the Treasury (1964), 64.
[231] An activity was considered insubstantial if less than three percent of the total basis of assets used in all activities (not including property classified as assets used by business in general) were used in that activity. Assets used in an

the output of an activity in order for assets to be classified to that activity.[232] If an item of equipment were used in the manufacture of products or provision of services connected with two or more guideline classes, then the asset was to be classified according to its primary use.[233] Similarly, a building used for various purposes, such as offices, retail stores, and a warehouse was to be classified according to its primary use.[234]

Specifying exactly the correct guideline life was of secondary importance in 1962. The guideline lives were intended only as an initial point on the search to find appropriate useful lives. A misclassification that led to a measurably different useful life would be rectified in time because the reserve ratio test was intended to adjust tax lives to reflect actual retirement practices. The major concern at the time was whether the reserve ratio test could be made to operate accurately and efficiently.

Unfortunately, the reserve ratio test did not function as intended. The initial form of the test assumed constant growth rates for assets over time, and therefore discriminated against taxpayers whose investments were concentrated in the early years of a test period. An alternative form of the test was introduced in 1965 to correct for this bias, but it was more complex. Over 87 percent of revenue agents and engineers surveyed in 1971 felt that the reserve ratio test was unworkable and impractical, and a similar percentage of survey respondents favored abandonment of the guideline system.[235]

From a theoretical perspective, the test's major flaw was that it required at least a full guideline life cycle of investment to have transpired before yielding a valid conclusion. It tended to discriminate in favor of those taxpayers with limited historical investment experience who could rely on a presumably shorter guideline life. The reserve ratio test also tended to penalize taxpayers that wished to retain fully depreciated property for use in a stand-by production mode, or kept in storage on the chance that an unknown future productive opportunity might arise.

c. The Asset Depreciation Range System

The guideline system was replaced in 1971 by the Asset Depreciation Range (ADR) system. The ADR system represented a further step away from a system of depreciation based on facts and circumstances. It offered an annual election to taxpayers to depreciate property defined in an asset class by using a useful life selected from a range of lives specified for the asset class. The range for any particular asset class was centered on a midpoint class life, and contained lower and upper limits, specified in half-year increments, that were approximately twenty percent below and twenty percent above the midpoint class life. Unlike the guideline system, there was no attempt to reconcile any differences between actual useful lives and the

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insubstantial activity were to be classified in the guideline class for the activity that the insubstantial activity primarily served or with which it was most closely associated. U.S. Department of the Treasury (1964), 64, 76.

[232] U.S. Department of the Treasury (1964), 64.

[233] Primary use could be determined in any reasonable manner. U.S. Department of the Treasury (1964), 65, 78.

[234] U.S. Department of the Treasury (1964), 78.

[235] Over 40 percent of the 1971 survey respondents who felt the reserve ratio test to be unworkable believed the test to be ineffective because of its numerous tolerances and adjustment limits. Another 37 percent thought it was simply too complex, while 15 percent felt that taxpayers did not adequately understand the test. U.S. Treasury (1971), 48.

depreciation life chosen from the asset class life range. Nevertheless, the link between economically meaningful useful lives and tax depreciation lives was not severed completely. By law, the ADR midpoint class lives were to reflect in a reasonable way the anticipated useful life of the class of property to the industry or other group.[236]

The ADR system continued the classification system originally established under the guideline system. The midpoints of the new ADR guideline ranges were identical to the guideline lives that had been published in 1962.[237] The ADR system, however, imposed some further restrictions on its use. The scope of an election was broadened; an ADR election generally applied to all eligible property placed in service during the specified taxable year of the electing taxpayer whereas a taxpayer under the guidelines could elect on an asset class by asset class basis.[238] The electing taxpayer also was required to establish "vintage" accounts, in which only property placed in service during a single taxable year could be grouped together. Certain assets had to be accounted for separately. For example, used assets could not be combined with new assets and section 1245 property could not be placed in the same account as section 1250 property.[239]

The rules governing the ADR system continue to regulate the classification of assets under current law. Property is classified according to its primary use, even if that primary use is insubstantial in relation to all of a taxpayer's activities. Property subject to a lease is generally classified in accordance with the activity in which the lessee uses the property. However, property defined in an asset-specific guideline class, such as automobiles or office furniture, is classified without regard to the activity of the lessee.[240]

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[236] §167(m)(1), before its repeal in 1990. This definition of a class life may be contrasted with the definition of the taxpayer-specific useful life contained in the regulations, which refers to "the period over which the asset may reasonably be expected to be useful to the taxpayer in his trade or business or in the production of his income." Reg. §1.167(a)-1(b). The distinction is particularly relevant with respect to assets that are normally sold after a period of time and placed into service by multiple taxpayers during their productive lives.

[237] The one exception was due to the fact that Revenue Procedure 62-21 had not established a guideline life for telephone communications, whereas the initial ADR regulations established four separate classes for telephone communications property.

[238] There were many exceptions to this rule. Used assets could be excluded from an election if such assets comprised more than 10 percent of all assets purchased during the taxable year. Property eligible for the investment tax credit could also be excluded, in whole or in part. Under temporary statutory provisions, taxpayers could choose to exclude buildings (and their structural components), land improvements, and subsidiary assets (generally short-lived assets such as jigs, dies, and patterns) from an ADR election. The subsidiary asset exception applied only if such assets comprised more than three percent of a taxpayer's annual investment. These special rules applied through 1973, or until the IRS promulgated a specific asset class for the property in question. Separate asset classes were established for a number of subsidiary asset classes in 1974. In 1995, P.L. 93-625 made section 1250 property (generally buildings and land improvements) ineligible for the ADR system unless the IRS were to promulgate specific asset classes for such property. For land improvements, this was accomplished in a 1977 revenue procedure, retroactive at taxpayer option to 1974. Buildings, however, were not included in the revenue procedure, so that their lives after 1974 were to be determined either by using the guideline lives and procedures or through facts and circumstances.

[239] In part, these restrictions were designed to facilitate the collection of useful data concerning actual taxpayer asset retirement practices.

[240] Reg. §1.167-11(e)(3)(iii).

d. Changes to the ADR System under the Office of Industrial Economics

The Treasury's Office of Industrial Economics (OIE) was established to conduct asset depreciation studies on an ongoing basis under the ADR system.[241] Several revenue procedures ensued from these studies throughout the 1970's. The revenue procedures established new asset classes, refined definitions of existing classes, moved particular assets from one class to another, and revised useful lives and annual repair allowances.[242] These changes increased the number of asset classes from 103 in 1971 to 125 by 1981. The thirteen former guideline building classes were eliminated by 1974. Of the 90 original non-building asset classes, 70 class lives remained unchanged by 1981, sixteen were shortened, while four were lengthened. About 25 asset classes that covered previously unclassified assets were created during this period.[243] Fourteen new classes that included assets taken from previously existing classes were also eventually created. Ten of these split-off classes gave rise to shorter lives for the included assets. Three resulted in longer lives, while one class life was unchanged. The class life applicable to property remaining in the old asset class usually remained unchanged as a result of the removal of assets into a new class. Consolidations caused a reduction of four asset classes.

e. The Accelerated Cost Recovery System

The introduction of the ACRS in 1981 completed the divorce of tax depreciation deductions from allowances based on taxpayer-specific facts and circumstances. Except for certain limited exceptions, taxpayers were required to use the ACRS-specified allowances for newly acquired assets. The new system defined a small number of asset categories, each of which included assets with a wide range of actual useful lives. A cost recovery schedule of depreciation rates was assigned to each property category.

The ADR class life system played a minor role in terms of classifying property to ACRS categories. Section 1245 property with a class life of four years or less was assigned a three-year cost recovery period, while remaining section 1245 property (other than public utility property) was generally assigned to a 5-year cost recovery category.[244] Thus, assets with class lives as

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[241] OIE effectively passed out of existence in 1981 when the Accelerated Cost Recovery System was adopted (Brazell et al. (1989)).

[242] Annual repair allowances were established under the ADR system to ease disputes between taxpayers and the IRS regarding whether certain expenditures were considered expensed repairs or capitalized costs. The annual repair allowance for each asset class was expressed as a percentage of original asset basis. Expenditures that were not "excluded additions" (i.e., expenditures clearly of a capital nature) could be expensed as maintenance and repairs up to the amount of the annual repair allowance. See subsection B.4 in Chapter 3 for a discussion of the treatment of repairs under current law.

[243] The IRS initially created fourteen classes for subsidiary assets in response to the Revenue Act of 1971. These classes generally covered special tools with relatively short useful lives. However, as industry class definitions were revised in the latter 1970s, six of these subsidiary asset classes were subsumed into the general asset class definitions for the industries involved. In addition, seventeen new classes were formed to include assets in previously undefined industries; fourteen of these were comprised of assets in two industries: telegraph, ocean cable, and satellite communications (TOCSC) and cable television (CATV).

[244] The ACRS assigned section 1245 property used by public utilities to categories with recovery periods of 3, 5, 10, and 15 years on the basis of class life splits at 4, 18, and 25 years. In addition, a few assets were assigned to recovery categories by statute. For example, railroad tank cars, which otherwise would have been assigned 5-year

short as 4.5 years and as long as 50 years could be depreciated over five years. Section 1250 property was assigned to a 10-year ACRS category if it had a class life of 12.5 years or less. Section 1250 property with a longer class life, or such property without a class life (mainly buildings and their structural components) was assigned a 15-year cost recovery period.

Section 1250 property assigned to the 15-year ACRS category was depreciated using the 175-percent declining balance method, except that low-income housing could be written off using the 200-percent declining balance method. With the exception of 5-year property,[245] other ACRS categories were written off using schedules that reflected the 150-percent declining balance method.[246]

As the class life system existed after 1973, building assets were not assigned class lives. This fact allowed taxpayers to develop the practice of assigning different useful lives to building "structural components." Thus, a building's roof, or its heating system, could be defined as a separate asset, and a separate useful life could be assigned to each component. This practice, which led to more accelerated depreciation deductions for buildings, was prohibited with the introduction of the ACRS in 1981. As mentioned above, buildings and their structural components were placed in a single asset category with a relatively short 15-year cost recovery period. The ACRS also disallowed the recognition of any loss from the abandonment or replacement of any structural component, and applied section 1245 full recapture rules to nonresidential buildings.[247] The 15-year recovery period for section 1250 assets was lengthened to 18 years in 1984 and to 19 years in 1985.

f. Assigned Property and Other Changes Under the MACRS

The Tax Reform Act of 1986 continued the approach of the ACRS by ignoring taxpayer facts and circumstances. It attempted to assign property to asset categories that reflected, in a general way, the differences in class lives. Thus, the ADR class life system gained renewed importance in determining depreciation deductions.

The differences between the ACRS and the MACRS were most pronounced for real property. The ACRS 19-year real property category was redefined by excluding section 1250 assets with class lives of less than 27.5 years, moving a number of assets to a newly created 15-year category. "Residential rental property" was distinguished from "nonresidential real property" and these two categories were assigned lengthened recovery periods of 27.5 and 31.5 years, respectively. Furthermore, only the straight-line depreciation method could be used for these two categories, and the section 1250 recapture rules were again made applicable to nonresidential real property (i.e., no recapture was required). These changes reflected a belief

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recovery period, were statutorily assigned a 10-year recovery period. Assets used in connection with research and experimentation were assigned a three-year cost recovery period, regardless of their class life.

[245] The schedule for 5-year property was 15 percent, 22 percent, 21 percent, 21 percent, and 21 percent.

[246] The slower rate of depreciation for the ACRS categories containing mainly section 1245 property was justified by the fact that these assets were generally eligible for the investment tax credit. Under the 1981 statute, the depreciation schedules were to become more accelerated over time, achieving the 200 percent declining balance method by 1986. However, these more accelerated schedules were repealed in 1982.

[247] No depreciation recapture was required with respect to nonresidential real property if a taxpayer elected to depreciate the property using the straight-line method.

that depreciation of buildings had been too accelerated under ACRS relative to most personal property.[248] The prohibition against building component depreciation was maintained.[249]

The classification of section 1245 property was altered in 1986 to reflect better the class lives of the property. Using class life breaks at 4, 10, 16, 20, and 25 years, section 1245 property (and section 1250 property with a class life of less than 27.5 years) was classified into categories with assigned recovery periods of 3, 5, 7, 10, 15, and 20 years, respectively. Section 1245 property without a class life was assigned to the 7-year property category. These changes lengthened the recovery periods of property with class lives of ten years or more. In addition, the 1986 Act repealed the investment tax credit. To offset these changes somewhat, the depreciation method applicable to property with recovery periods of ten years or less was accelerated to the 200-percent declining balance method.[250]

In addition to altering the assignment of property by means of the class life system, the 1986 Act assigned the following property to MACRS property categories, regardless of their class lives:

- 3-year recovery property: certain horses;
- 5-year recovery property: automobiles and light trucks, semi-conductor manufacturing equipment, computer-based telephone central office switching equipment, qualified technological equipment,[251] section 1245 property used in connection with research and experimentation, and certain alternative energy production equipment;
- 7-year recovery property: railroad track, single purpose agricultural or horticultural structures;
- 15-year recovery property: municipal wastewater treatment plant and certain telephone distribution plant;
- 20-year recovery property: municipal sewers and
- 50-year recovery property: railroad grading or tunnel bores (straight-line method only).

[248] U.S. Congress (1987), 98.
[249] U.S. Congress (1987), 109.
[250] U.S. Congress (1987), 98.
[251] Qualified technological equipment includes (1) any computer and related peripheral equipment, (2) high technology telephone station equipment installed on the customer's premises, and (3) high technology medical equipment. The term computer means "a programmable electronically activated device which – (i) is capable of accepting information, applying prescribed processes to the information, and supplying the results of these processes with or without human intervention, and (ii) consists of a central processing unit containing extensive storage, logic, arithmetic and control capabilities. Peripheral equipment means any "auxiliary machine (whether on-line or off-line) which is designed to be placed under the control of the central processing unit of a computer." Both terms exclude "(i) any equipment which is an integral part of other property which is not a computer, (ii) typewriters, calculators, adding and account machines, copiers, duplicating equipment, and similar equipment, and (iii) equipment of a kind used primarily for amusement or entertainment of the user." Qualified technology medical equipment means "any electronic, electromechanical, or computer-abased high technology equipment used in the screening, monitoring, observation, diagnosis, or treatment of patients in a laboratory, medical, or hospital environment."§168(i)(2).

A few changes have been made to this list in the years following enactment of the MACRS:

- The Technical and Miscellaneous Revenue Act of 1988 replaced the 7-year recovery period for single purpose agricultural or horticultural structures with a 10-year recovery period, and assigned a 10-year recovery period to any tree or vine bearing fruit or nuts. This Act also limited the method used to depreciate property used in a farming business to the 150-percent declining balance method (3, 5, 7 and 10-year property) and allowed only straight-line depreciation for trees and vines bearing fruit or nuts.[252]
- The Omnibus Budget Reconciliation Act of 1993 extended the recovery period for nonresidential real property from 31.5 years to 39 years. In a 10-year temporary provision, this Act also reduced recovery periods for qualified property on Indian reservations by about 40 percent.
- The Small Business Job Protection Act of 1996 established a separate recovery classification for "water utility property," extending the recovery period from 20 years to 25 years for water utility assets and municipal sewers, and permitted only the straight-line method for this property. The same Act assigned a 15-year recovery period to section 1250 property that qualifies as a retail motor fuels outlet. It also allowed lessors that dispose of leasehold improvements at the termination of a lease to compute a loss on any remaining adjusted basis, even though the improvements may consist of building structural components.
- The Taxpayer Relief Act of 1997 designated certain qualified "rent-to-own" property as 3-year property.

Few of the changes introduced since 1986 were enacted in response to an empirical demonstration that the recovery period assigned to an asset was inappropriate from either a useful life or economic depreciation perspective. These changes nonetheless may have promoted other tax policy objectives. The 1988 changes to farm property were essentially revenue offsets to pay for changes in the uniform capitalization rules affecting farmers. The legislative history of the 1993 change in the recovery period for nonresidential real property referred to a longer actual useful life, but did not cite supporting evidence.[253] The change also was viewed at the time as compensation for a relaxation of the passive loss rules. The 1996 change to water utility property was described as appropriate primarily in view of the exception being granted for contributions-in-aid-of-construction to water utility companies, although it also was justified on the basis of "the long useful lives generally exhibited by such property."[254] No evidence on the useful life of water utility property was offered, however. The assignment of a 15-year life to retail motor fuels outlet stores was intended to resolve an ongoing classification issue as to whether such stores qualified as belonging to the class describing assets used in petroleum marketing.[255] The 1997 assignment of a 3-year life to consumer durables subject to rent-to-own contracts was intended "to avoid future controversies with respect to the proper treatment of such property."[256]

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[252] Taxpayers in farming that elect certain exemptions from the uniform capitalization rules must use straight-line depreciation under the Alternative Depreciation System.
[253] U.S. Congress (1993).
[254] U.S. Congress (1996), 242.
[255] U.S. Congress (1996), 78.
[256] U.S. Congress (1997), 285.

2. Principles for Classifying Assets

a. Accuracy in Measuring Economic Depreciation

An asset classification system represents a balancing of separate objectives. One goal is the accurate measurement of taxable income, with the idea that increased accuracy in measuring depreciation implies a more accurate measurement of taxable income across different taxpayers and more equal effective marginal tax rates on investments in depreciable property. This can improve the efficiency of the income tax.[257] With accurate income measurement, one group of investments is not favored over another, so that real costs, not tax depreciation policies, guide the allocation of scarce economic resources. The costs of mismeasuring income include the lost output resulting from a tax-induced inefficient allocation of resources.

The benefits derived from measuring taxable income more accurately, however, must be weighed against the costs of increased administrative complexity. Efforts to improve the accuracy of measuring depreciation are likely to increase the costs of complying with and administering the tax system.

Administering a system with a limited number of class lives is simpler than enforcing a system based on taxpayer facts and circumstances. Enforcement of the latter inevitably requires revenue agents to rely on a set of asset or activity lives in order to judge the appropriateness of taxpayer recovery periods. A class life system standardizes these recovery periods for all taxpayers, and eliminates the need for taxpayers to justify departures from the standardized set. The economic benefits of greater simplicity are measured by the decreased amount of legislative, regulatory and judicial resources employed by both the government and taxpayers in compliance activities.

While established taxpayers have a historical basis for estimating useful lives and salvage values, newly organized businesses do not. The latter must therefore rely on average industry asset retirement practices. A class life system formalizes this procedure by providing new participants with a valid and verifiable means to obtain useful life estimates. Care must be taken in this regard, however, to ensure that new firms and existing firms are treated equally.[258]

While a class life system might be thought to create errors in measuring depreciation relative to a taxpayer-specific facts-and-circumstances system, this is not necessarily true. One justification for establishing a class life system is that individual taxpayers may not be the best evaluators of future asset obsolescence. The Treasury pointed this out in 1971, as a partial justification for establishing its ADR class life system.

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[257] As discussed in Chapters 4 and 5, however, improved accuracy in the measurement of depreciation need not improve the overall neutrality of the tax system when there are tax preferences and other forms of income mismeasurement.

[258] Under a voluntary class life system, if the established class lives are too long relative to actual industry practice, then new establishments would be placed at a competitive disadvantage relative to established firms that may rely on their own experience. No similar advantage is given to new firms if class lives are shorter than those dictated by industry experience, however, provided existing firms can also avail themselves of the listed class lives.

> "The past experience of the particular taxpayer is not a better guide to the future period of productivity of assets newly being acquired than the experience in the taxpayer's industry as a whole. The taxpayer's own past experience may well have been affected by a variety of abnormalities—difficulties in obtaining financing, labor difficulties, a period of depression in the taxpayer's business, or other factors."[259]

Consequently, rates of depreciation, and especially depreciation due to obsolescence, might be estimated better by looking at the experience of an industry as a whole, where transient factors wash out across firms and over time.

A class life system may be more adaptable, and therefore more useful and realistic, than one based on taxpayer-established lives. Arguably, lives established for groups of taxpayers, or groups of asset types, may be reviewed relatively frequently, providing reasonably up-to-date guidance for both taxpayers and revenue agents. This prediction has been rarely fulfilled, however. For example, by 1962, the 1942 Bulletin F lives had remained unchanged for twenty years. It was hoped at that time that the 1962 guideline lives (which numbered less than 100, as opposed to the more than 5,000 Bulletin F lives) could be reviewed periodically to ensure they kept pace with technological and other developments.[260] By 1971, none of the 1962 guideline lives had been revised, and they were simply incorporated as midpoint class lives under the ADR system. Indeed, about 70 of the original 1962 guideline lives are still being used today to classify assets. No new asset class lives were established or revised under the MACRS provisions of the 1986 Tax Reform Act that authorized the Secretary to alter or establish class lives. This authority was revoked in 1988.[261]

b. <u>The Grouping of Assets</u>

Businesses will rarely set up accounts with only a single asset or single asset type. Even under a facts and circumstances system, group (or composite) asset accounts are common. These accounts contain a variety of assets used in a taxpayer's activity, and usually are depreciated using an average useful life. This procedure reduces the number of depreciation accounts that the business must track, and simplifies accounting. However, it also is likely to increase the variance of useful lives within a depreciation account, and therefore, possibly distort investment decisions. Using an average life implies that most assets will be depreciated at rates that are different from economic depreciation. Roughly half of the assets will be retired before they are fully depreciated, while the other half will still have value when fully written off at the end of the average useful life. If assets with different useful lives are placed in the same group, then those assets with the longer lives will incur a lower tax cost relative to assets with the shorter lives. If these assets are highly substitutable for each other, then the relative tax subsidy for the longer lived assets will lead to a distortion in investment. In addition, if certain assets are tax disfavored, then taxpayers may choose uneconomic levels of repair or maintenance expenditures as a substitute for making new investments in those assets. These considerations suggest that assets with widely different useful lives should not be grouped together, since large useful-life variance within an asset class implies a greater relative subsidy for long-lived assets.

[259] U.S. Department of the Treasury (1971), 27.
[260] U.S. Department of the Treasury (1964), 2.
[261] Section 6253, P.L. 100-647, the Technical and Miscellaneous Revenue Act of 1988.

This discussion also has implications for the issue of whether and how losses should be recognized upon asset retirements. If recognition of losses is allowed, then short-lived assets within the group account are effectively written off over a period shorter than the recovery period assigned to the account, while longer-lived assets are depreciated over the recovery period. This implies an average effective recovery period that is shorter than the stated period and may contribute to mismeasurement of income.[262] However, recognition of losses upon asset retirements from a group account could be consistent with the stated recovery period. For example, consider three assets with useful lives of 3, 5 and 7 years and weights of 20 percent, 40 percent, and 40 percent, respectively, that are all assigned a 5-year recovery period. Without recognition of losses, these assets would be written off over 5 years, consistent with the stated recovery period. With loss recognition, the assets would be written off over 3, 5, and 5 years, respectively, implying an average recovery period of about 4.5 years. If, however, the asset class were lengthened to 6 years with loss recognition, the investment costs could be recovered over 3, 5 and 6 years, which average to a 5-year recovery period.[263]

c. Broad versus Narrow Definitions of Asset Classes

Asset classes may be defined broadly or narrowly. A narrowly defined class would contain only assets with similar useful lives and similar rates of depreciation over their useful lives. This would permit the establishment of a class life and method associated with each asset class that could yield tax depreciation deductions equal to the included property's anticipated decline in economic value.

In practice, virtually any class of assets, even if narrowly defined, will be quite heterogeneous. Individual assets are used at different rates of intensity, and are subject to different practices regarding repairs and maintenance. Retirement practices of different taxpayers may also differ. Assets may tend to be converted to different uses by some taxpayers, put on stand-by use by others, and disposed of entirely by others. Similar property used in different activities might also be subjected to different rates of depreciation, so that "best-practice" machinery in one use may differ markedly over time from "best-practice" machinery in another use.

Defining asset classes narrowly would increase the number of asset classes in the depreciation system and would increase the number of classification controversies that would need to be resolved. Individual taxpayers, producing similar outputs by similar methods, and subject to comparable competitive pressures to keep costs at a minimum, may adopt similar methods of production. They might be expected to adopt similar operating rates for machinery, subject assets to the same sorts of environmental forces, adopt nearly identical repair and maintenance schedules, and retire like assets for nearly the same reason. The forces for obsolescence could operate equally on all taxpayers within the activity. As a result, it might be

[262] Under pre-ACRS facts-and-circumstances system, losses were not recognized on normal asset retirements from multiple asset accounts, if the asset was not sold or abandoned. Under ACRS losses were recognized upon retirement for most assets, the structural components of buildings being an exception.

[263] In this example, patterns of deductions are dissimilar from those that would be obtained if the assets were depreciated separately, using these same recovery periods. In practice, the present value of the tax deduction generated should be equated, not the average write-off period.

reasonable to expect that taxpayers within a given activity would have similar useful lives and rates of economic depreciation over time for the same types of assets.

Broader asset classes may require less detailed information in assigning depreciation allowances to assets than would be required under a system with a larger number of more narrowly defined asset classes. Broad asset class distinctions may reduce the number of asset classification controversies and reduce the cost of complying with and administering the tax system. However, to the extent that depreciation allowances vary greatly from class to class, controversies are likely to remain. Broader asset class definitions may also tend to mismeasure income by giving the same depreciation allowances to economically dissimilar assets. If so, they would increase the deviations of adjusted tax bases of assets from their economic values, creating built-in gains and losses that may distort taxpayer decisions. They may encourage unproductive tax shelter activity, for example. In the past, broad categories have contributed to the need for complicated loss recognition and gain recapture rules for depreciable property.

d. Activity Versus Asset Basis for Classifying Property

Should property be classified according to the activity of use, the type of asset (as defined by the output of the capital goods-producing industries), or some mixture of the two? In many cases, this distinction is not important. Certain assets are used only in particular activities. In these cases, defining an asset class on the basis of an activity is equivalent to defining it on the basis of the type of assets used. For example, "telephone distribution equipment" as an asset class is likely to define equally an activity described as "assets used to distribute telephonic services." Nevertheless, there are circumstances where this correlation of assets and activities is not as high.

The ADR classification system used under current law generally groups together assets used by taxpayers in a given economic activity. Activities, in the case of the ADR system, tend to correspond to two-digit industries, or groupings of two-digit industries, defined under the Standard Industrial Classification (SIC) system. In addition, the ADR system groups together certain types of assets that tend to be used in many different activities, (e.g., automobiles, trucks, office furniture, general land improvements such as fences and landscaping, and assets used to produce energy for use in industrial processes). It also defines certain classes by the type of asset within a given activity (e.g., distribution and transmission assets used in telephone communications). However, these cases might be viewed as simply narrowing the scope of the defined economic activity (i.e., the activity of transmitting and distributing telephone service, as distinct from the activity of switching telephone calls). What constitutes a reasonable definition of an activity depends on the degree of asset heterogeneity within a class.

Classifying assets according to the activity in which they are used offers the advantages of simplicity and administrability. A taxpayer under an activity-based classification system is likely to have to deal with fewer asset classes. If the activity classes are defined broadly, a taxpayer may be limited to tracking only one or two such accounts. Definitional controversies are likely to be minimized as well. New productive assets are developed continuously, and definitional boundaries based on types of assets are likely to become blurred over time. While

the same is true for defining economic activities, activity distinctions may change less frequently.[264]

Under some circumstances, an activity-based classification system may be more accurate than an asset-based system. Seemingly similar assets may be employed differently in different industries, or wear out at different rates when employed in different activities. In addition, an activity's assets may tend to fall in value together. Taxpayers may retire or replace all assets that are used together to produce a particular product or service, particularly when obsolescence, rather than wear and tear, is the primary determinant of anticipated asset retirements. Taxpayers producing similar products and operating under comparable competitive pressures may use similar equipment, adopt like retirement practices, and be subject to the same forces of obsolescence. Consequently, depreciation may be more closely linked with forces operating on the market for an industry's output and with changes in the technology for producing that output than with different equipment types, particularly if those types are broadly defined. Using the same depreciation rate for many assets within an industry may therefore reflect income more accurately. Under this view, changes in rates of obsolescence are likely to be reflected as changes in activity-based depreciation, and could be more easily handled by adjusting activity-based class lives than by adjusting class lives of several equipment types or by redefining equipment-specific asset classes.

Under other circumstances, however, an asset-based classification system may be more accurate. If wear and tear is a more important determinant of depreciation, and assets of a particular type are used in similar ways in different activities, then these assets may depreciate at the same rate regardless of where employed. If such assets are easily identified, so that separate classification of these assets by taxpayers may be relatively easy, it may be more efficient to assign these assets their own separate class lives. This would minimize differences between tax and economic depreciation, minimize the importance of recapture issues, and minimize concerns regarding the proper weighting of assets for establishing an average class life.

Asset classes defined by type of property may be reasonable when the specific assets are used in a similar way in more than one economic activity. The use of such assets is not dominated by a particular activity, so that technological developments in that area are unlikely to affect market prices for used assets. Under these conditions, depreciation is likely to be more closely associated with technological changes in the assets themselves rather than with specific developments in the methods of production within various economic activities.

The Bureau of Economic Analysis in the Department of Commerce defines several tangible asset types for the purpose of producing National Income and Product Account estimates of "capital consumption."[265] A system of asset classes based primarily on BEA asset types was adopted in the recommendations for tax reform published by the Treasury Department in 1984.[266] The Treasury had commissioned research that had estimated typical depreciation

[264] Of course, any test of this proposition will depend on how narrow or broad are the definitions of assets and activities.
[265] Fraumeni (1997).
[266] U.S. Department of the Treasury (1984).

rates for a number of BEA-defined asset types.[267] Following that empirical research, the Treasury proposed a system of eight broad asset categories, each with a separate constant rate of depreciation. The highest depreciation rate was assigned to ACRS 3-year property, while other personal property was assigned to the next four classes on the basis of belonging to various BEA asset categories.[268]

Whether such a classification system would have been easier to administer, or easier for taxpayers to implement, or whether it would have produced depreciation allowances that would have been closer to economic depreciation is unknown. The system was criticized for introducing greater complexity, and for substituting an unfamiliar classification system for a known one. Taxpayers have developed a certain level of comfort with the class life system developed under the guidelines and ADR. That system has existed for nearly 40 years. Under the current system, if an asset class easily encompasses the taxpayer's relevant economic activity, then a taxpayer need account for only a single class life, abstracting from the asset-specific classes. With a system based on asset types, taxpayers could have to account for numerous asset classes. Nevertheless, the proposed system may not have been difficult to implement. Except for the default class 4, most of the specified asset types were assets already defined by type under the ADR class life system. Distinctions between, say, "general industrial machinery" and "other electrical equipment" would not have been necessary. These asset types tended to be grouped together in the proposed class 4.

The equipment classes under the Treasury proposal were quite broadly defined, and could have encompassed greater useful life heterogeneity than under the ADR system. As discussed above, this could be particularly telling if asset depreciation depends more on obsolescence and less on wear and tear.

3. Evaluation of the Current Classification System

a. Classification Controversies

A common complaint of taxpayers is that they have assets which they know do not last as long as the assigned recovery period. Sometimes these complaints may be traced to the nature of the classification system. A sub-industry, whose assets have shorter lives than the assets of other sub-industries within a given asset class, may feel it is being treated unfairly. The heterogeneity of buildings serves as another example. Certain taxpayers claim that their buildings do not last 39 years because of their need for frequent remodeling improvements. They believe that the 39-year recovery period for nonresidential real property is too long to fit their particular circumstances. For example, retail shopping space in a mall (which undergoes frequent change

[267] Hulten and Wykoff (1997). The asset categories studied were tractors, construction machinery, metalworking machinery, general industrial equipment, trucks, autos, industrial buildings, and commercial buildings. See Fraumeni (1997) and Appendix 1 of this report.

[268] "Trucks, buses, and trailers" and "Office, computing, and accounting equipment" were assigned to class 2. Class 3 contained "construction machinery," "tractors," "aircraft," "mining and oil field machinery," "service industry machinery," and "instruments." Class 5 included "railroad equipment," "ships and boats," and "engines and turbines." Class 4 was the default category for other assets that had been five-year property under ACRS. While the proposal was not specific as to how these asset types were to be defined, their correspondence with the BEA asset categories indicates that the definitions used by BEA would have been authoritative for most cases.

with change of tenants) has the same recovery period as a warehouse (which may not undergo any change for long periods of time).

Assuming the facts as presented are valid, these cases illustrate problems with having broadly defined asset classes. However, defining more narrow classes may not be administratively feasible. For example, distinguishing a narrower class of buildings from all other buildings may be very difficult, if not impossible to administer, and may create greater controversy as other taxpayers attempt to classify their building investments into the asset class with a shorter recovery period. Creating more asset classes would also make the system more cumbersome over time as the sheer number of classes would tend to grow.

Taxpayers sometimes have difficulty classifying assets if they conduct several activities that span more than one asset class. Identifying an activity is difficult, because there is no clear definition of what constitutes an activity. For example, the refining industry has argued that the production of chemicals for use in its refining activities should be treated as a separate activity for the purpose of classifying assets for depreciation purposes. The IRS, however, has ruled that such chemical production is not a separate activity because the taxpayer does not sell any chemicals. This approach would reduce the number of asset classes that taxpayers and the IRS must track and reduce disputes between taxpayers and the IRS. However, this approach would make the depreciation system sensitive to the degree of vertical integration. An integrated firm would have fewer asset classes, and could be given either an unwarranted advantage or disadvantage compared with a less integrated firm.

In another case, the IRS has attempted to reclassify certain property because the identified activity of the owner has changed. Natural gas gathering lines have historically been owned by natural gas producers and have been classified with natural gas production assets, which currently have a 7-year recovery period. Recently, however, companies in the business of natural gas transportation have acquired natural gas gathering lines. As a matter of law, the IRS has adopted the position that gathering lines not used by petroleum and natural gas producers should be classified as assets used in the carrying of gas by pipeline, which is 15-year property under current law. The industry disputes this recharacterization of gathering lines.

Dual use property creates additional issues. In general, the primary or predominant use of an asset determines its classification to an activity class. The application of this provision can be controversial, however, as illustrated by the controversy regarding retail motor fuel outlet stores. Such stores, belonging to asset class 57.1, have a class life of 20 years. However, many of these stores are also used to sell items other than petroleum products, including food, drinks and other convenience items. When does the petroleum marketer become a common retailer (whose building is depreciated over 39 years)? An IRS issue paper designed to ensure uniformity in treatment highlighted this issue, resulting in a statutory amendment in 1996 that assigned a 20-year recovery period to such property.[269]

These issues are common. They can sometimes be resolved by broadening or narrowing asset class definitions, or by refining existing asset class definitions. But these fixes require

[269] *Coordinated Issue, Petroleum and Retail Industries, Convenience Stores*, revised April 2, 1997, reproduced in 97 TNT 64-4 (April 3, 1997). §168(e)(3)(E)(iii), as added by P.L. 104-188, Sec. 1120(a).

legislative changes and may create additional classification issues. Broadening asset classes is likely to reduce the number of issues concerned with where an asset should be placed, but it is also likely to increase the number of complaints that asset class lives are "too long" for certain affected industries. Narrowing asset classes increases the number of definitional boundaries over which there may be disputes.

New activities are difficult to classify because they often do not fit neatly into existing asset classes. Without regulatory authority to define or redefine asset classes, the Treasury currently can do little but assign the property to an existing class, or declare that no class exists that covers the activity. Normally, the IRS will attempt to identify those characteristics of the new activity that most nearly match the characteristics of existing asset classes. However, this practice may eventually become questionable in a system where asset classes are seldom, if ever, reviewed and revised. The cellular phone industry, which did not exist when the current asset classes were defined, is a case in point. This industry's assets differ in many respects from those used by wired telephone service, and may not fit well into the existing definitions for telephony-related classes. Nevertheless, present law does not contain a separate asset class for the cellular telephone activity.

b. Cliffs and Plateaus

In mapping class lives into MACRS recovery classes, the current depreciation system creates "cliffs" that give very different depreciation allowances to assets with similar class lives. For example, a cliff exists between a class life of 9.5 years and one of 10.0 years. Property assigned a class life of 9.5 years (e.g., assets used in the manufacture of chemicals, or computer-based telephone switching equipment) receives a 5-year recovery period and a 200-percent declining balance method, while property assigned a class life of 10.0 years (e.g., furniture, agricultural equipment, mining assets, assets used to manufacture paper, wood products, nonwoven fabrics, aerospace equipment, and non-electronic equipment) is depreciated using a 7-year recovery period and a 200-percent declining balance method. The 6-month difference in class life causes a two-year difference in the cost recovery period. Another cliff occurs between the 15- and 16-year class lives. For example, tobacco manufacturing assets, with a class life of 15 years, are assigned a 7-year recovery period, while petroleum refining assets, with a class life of 16 years, are depreciated using a 10-year recovery period. Because of these cliffs, assets with class lives slightly less than the upper end of a recovery class may be tax advantaged, relative to assets with a class life slightly greater than the upper end of that cost recovery class.[270]

The current classification system also leads to "plateaus" in which assets with vastly different estimated useful lives are treated equally. For example, tobacco manufacturing assets, with a class life of 15 years, are given the same depreciation deductions as assets, such as furniture or agricultural equipment, with a 10-year class life. To the extent that class lives are correlated with economic lives, this implies a tax advantage for assets that lie on the far end of the recovery period, relative to assets that lie in the near end of the recovery period.

What quantitative difference does a cliff or a plateau make? Consider the following table, which shows the present values of depreciation allowances for property depreciated using

[270] This assumes a correlation between economic life and class life.

MACRS recovery periods, methods and a half-year convention for the taxable year in which the property is placed in service. The present values are expressed as a percentage of original basis and computed using a 6-percent discount rate.

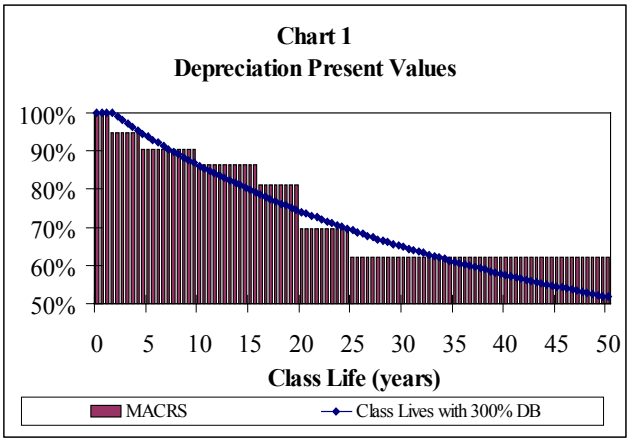
Table 8

Present Values of MACRS Depreciation Allowances[a]
(Percentage of Original Basis)

Property Classification and Method	Present Value of Depreciation Allowances
3-year property, 200 percent declining balance	94.7%
5-year property, 200 percent declining balance	90.4%
7-year property, 200 percent declining balance	86.4%
10-year property, 200 percent declining balance	81.1%
15-year property, 150 percent declining balance	69.4%
20-year property, 150 percent declining balance	62.2%

Department of the Treasury
Office of Tax Analysis
[a] Computed using a 6 percent discount rate.

These results are also shown in Chart 1, as the MACRS present values. Chart 1 also shows the present value of an alternative set of results in which depreciation allowances are computed using a 300-percent declining balance method using the class lives. The declining balance depreciation rate was chosen only for illustrative purposes, as it loosely approximates the present values of MACRS depreciation deductions.[271] This method, however, does not contain the MACRS cliffs and plateaus; the present values decline smoothly and continuously as the class life increases. The differences between this method and the MACRS method are shown in Table 9. That table computes the change in the present values of depreciation under the two systems at those changes in class life where the MACRS cliffs occur.[272] The results show that the MACRS cliffs cause changes in the value of depreciation that are larger than that using 300-percent declining balance over the class life. These cliffs provide taxpayers an incentive to seek an additional half-year or year reduction in class lives and place an arbiter of class lives (whether Congress, the Treasury, or the courts) under pressure to assign shorter class lives.



[271] This exercise could also be conducted using, say, the 200-percent declining balance method, along with partial expensing.
[272] Since there are no asset classes with class lives of 15.5, 19.5, or 24.5, the change in the present value of depreciation is shown over whole year increments at those points.

Table 9

Change in Present Values of Depreciation Allowances at MACRS "Cliffs" (Percentage of Original Basis)[a]

Change in Class Life	Change in Present Value of Depreciation Allowances Under MACRS	Using 300% Declining Balance Over Class Life	Column (1)/ Column (2)
	(1)	(2)	(3)
4.5 years to 4 years	4.3%	0.8%	5.6
10 years to 9.5 years	3.9%	0.6%	6.1
16 years to 15 years	5.4%	1.1%	5.0
20 years to 19 years	11.7%	1.0%	11.9
25 years to 24 years	7.2%	0.9%	8.3

Department of the Treasury
Office of Tax Analysis
[a] Computed using a 6-percent discount rate.

The cliffs and plateaus under MACRS presumably are a by-product of a desire to simplify the depreciation system by providing a limited number of recovery classes. The supposed simplification, however, may be more apparent that real. Most of the costs of administering and complying with the current system are in identifying and properly classifying property. The computation of the depreciation allowances is relatively simple once the property's class life has been determined.

These cliffs and plateaus may be unnecessary. Depreciation recovery periods could be established directly based on class lives and a more accelerated method or methods could be used to obtain, on average, the same pattern of depreciation present values as is achieved under the current system. This would raise the value of depreciation deductions for some investments and for some taxpayers, and lower that value for others, thereby creating winners and losers. But the revised depreciation rules would eliminate preferences and penalties available to some assets and taxpayers under current law, and would offer the potential for a more neutral tax system.

A reform that could eliminate the MACRS categories and base cost recovery on the basis of class lives possibly would result in a much larger number of listed recovery periods.[273] There are now 38 distinct class lives (as compared to 125 asset classes), and the system outlined here would have a similar number of recovery periods. This is potentially a disadvantage relative to the current system. However, excluding the largest corporations, most taxpayers would likely have a small increase in the number of recovery periods.

[273] Fewer class lives could be provided, but possibly at the expense of accuracy in income measurement.

c. Issues Concerning Buildings

Section 1245 versus Section 1250 Property

Classification criteria under MACRS depend not only on an asset's class life, but also on whether the asset is section 1245 property or section 1250 property.[274] With regard to computing depreciation allowances, this distinction is important in determining whether certain real property is considered to have a class life. It therefore has become particularly important in the area of building depreciation. Buildings and their structural components do not have a class life. Section 1250 property without a class life is depreciated over 39 years using the straight-line method. Section 1245 property, if assigned a 7-year recovery period, for example, is depreciated using the 200-percent declining balance method. With a 6-percent discount rate, the distinction means a present value difference in the value of deductions of nearly 47 percent of original cost. As a result, some taxpayers have conducted "cost segregation" studies, which itemize the hundreds or thousands of individual elements used in constructing a building and distinguish which elements may be considered to be section 1245 property and which elements are section 1250 property.

In deciding whether an item of property is section 1245 or section 1250 property, taxpayers must refer to nearly 40 years of regulations, rulings, and court decisions. Knowledge of these documents is necessary in order to decipher the correct meaning of terms such as "personal property," "real property," "an integral part of production," "facilities," "buildings," "structural components," and "research." In general, local law definitions are not controlling. For example, certain building fixtures may be considered real property under local law, but unless these same fixtures are considered structural components under the Federal tax law, they may be section 1245 property. A complicating factor is that most legal decisions in this area

[274] The distinction between section 1245 property and section 1250 property related originally to different sets of rules dealing with the treatment of gains upon the disposition of property. The portion of gain recognized on the sale or exchange of section 1245 property that is attributable to any previously deducted depreciation allowance is taxed as ordinary gain. For section 1250 property, the recapture of depreciation as ordinary income is generally limited to the portion of previously deducted depreciation allowances that are in excess of deductions that would have been taken if they were computed using the straight-line method.

In general, section 1245 property is defined in the Code as either personal (tangible or intangible) property, or other tangible property (not including a building or its structural components) that is depreciable and that is (1) used as an integral part of certain specified activities (manufacturing, production, extraction, or furnishing transportation, communications, electrical energy, gas, water, or sewage disposal services), or (2) constitutes a facility used in connection with the activities referred to in (1) for (a) research or (b) the bulk storage of fungible commodities. Section 1245 property also includes single purpose agricultural or horticultural structures, petroleum and petroleum product storage facilities (which are not buildings), railroad grading or tunnel bores, and property subject to certain rapid amortization sections of the Code.

Section 1250 property is depreciable real property that is not section 1245 property. Thus, all personal property is section 1245, while real property is either section 1245 property or section 1250 property, depending on its use by the taxpayer. In general, section 1250 property consists of buildings (including their structural components), other inherently permanent structures, and land improvements of general use and purpose. The original justification for distinguishing section 1250 property from section 1245 property was that section 1250 property was long-lived, often sold before the end of its useful life, that gains on such property contained a significant inflationary component, and that such gains should therefore be granted capital gains treatment. The straight-line recapture baseline was enacted in 1964, at a time when all new buildings could be depreciated using the 200-percent declining balance method.

were made in the context of determining eligibility for the investment tax credit, and not directly for deciding depreciation classification or recapture issues. In addition, in response to certain court decisions, the tests which the IRS has used to decide whether property is section 1245 or section 1250 property have evolved over time, sometimes overturning earlier rulings and decisions. These considerations suggest that the use of the section 1245/1250 distinction for classifying depreciable property adds complexity to the tax system.

Building Definitions

The regulations define a "building" as "any structure or edifice enclosing a space within its walls, and usually covered by a roof, the purpose of which is, for example, to provide shelter or housing, or to provide working, office, parking, display, or sales space."[275] The IRS and the courts have applied a "functional use" test to identify buildings, by which a structure is a building if its function is to provide a controlled environment and space for the performance of indoor work, and if it is equally important to provide work space and a controlled environment.[276] A related test is the "functional" test, whereby a structure is a building if it provides shelter, housing, or space for working, office, parking, displays, or sales, unless it is a specialized structure the principal and primary utility of which is a significant factor in the manufacturing or production process. A third test is the "appearance" test: if it looks like a building, it is a building.[277] The IRS has also employed a "permanent attachment" test, by looking at whether property is "inherently permanent." The fact that property is movable, however, does not necessarily mean that it is not a building.[278]

Structural components of a building are identified specifically by regulation, and are treated as part of the building itself (i.e., section 1250 property). The IRS has used certain tests over time to determine whether property constitutes a structural component. Courts have focused on the "permanence" of the property.[279] Consequently, the IRS has focused on the manner of attachment to the land or the structure, and on how permanently the property is designed to remain in place.[280]

The somewhat ambiguous nature of these tests illustrates the problem facing taxpayers and the IRS. There may be a growing problem with the depreciation of modular buildings, which may be moved, and are moved, but which "look" like buildings. Whether such buildings have a useful life similar to that of "more permanent" structures should be the question at issue, not the degree of difficulty in moving the structure. A shorter life would be appropriate to the extent that a relatively easily moved modular structure actually wears out faster than does a more permanent, traditionally constructed building.

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[275] Reg. §1.48-1(e)(1), as referenced by Reg. §1.1245-3(c)(2), which is referenced by §1.1250-1(e)(3)(i).
[276] Rev. Rul. 77-363, 1977-2 C.B. 10, modified by Rev. Rul 79-343, 1979-2 C.B. 18.
[277] *Sunnyside Nurseries v. Comm.* 59 T.C. 113 (1972), and *Endres Floral Co. v. U.S.* 450 F. Supp. 16 (N.D. Ohio 1977).
[278] Rev. Rul. 77-291, 1977-2 C.B. 7.
[279] *Morgan Est. v. Comr.*, 448 F.2d 1397 (9th Cir. 1971) *aff'd per curiam,* 52 T.C. 478 (1969), *Minot Federal Savings & Loan Ass'n. v. U.S.*, 435 F.2d 1368 (8th Cir. 1970), and *King Radio Corp., Inc. v. U.S.*, 486 F.2d 1091 (10th Cir. 1973).
[280] Rev. Rul. 75-178, 1975-1 C.B. 9.

Composite Depreciation

MACRS depreciates the entire building, including its structural components, as a single asset, i.e., a building is a composite asset.[281] Composite (or grouped asset) depreciation methods do not differentiate between walls, roofs, shingles, wiring, pipes, sinks, electrical switches, etc. In contrast, component (or item) depreciation would account separately for each individual component of a building.

The composite approach offers the potential to simplify compliance with, and administration of, the tax laws. The taxpayer is not required to account separately for each part of the building, and the IRS is not required to examine this separate accounting. Composite depreciation also may reduce disputes between the taxpayer and the IRS over the allocation of costs among different building components. Nonetheless, composite depreciation can have disadvantages. It may mismeasure income to the extent that a particular building is constructed of a mix of components that have lives that differ from the lives of the components used in the typical building, and a recovery period is established for the typical building.[282]

Cost Segregation Studies

In recent years, more sophisticated taxpayers have hired firms to conduct what are called cost segregation studies. These studies make detailed inventories of individual assets, in order to distinguish items of section 1245 property from items of section 1250 property. Following a selection of recent court decisions, these studies have been aggressive in designating property as section 1245 property.[283] Upon being so designated, such property is not treated as a structural component of a building, but is depreciated as property belonging to the taxpayer's general activity class. Thus, rather than being depreciated straight-line over 39 years, this property is depreciated over, say, 7 years using the 200-percent declining balance method.

Resource constraints may limit the ability of the IRS to monitor and judge the appropriateness of these section 1245 designations. The sheer volume of individual items is staggering and the IRS may not be able to review adequately each cost segregation study. Furthermore, as discussed above, the distinction between section 1245 property and section 1250 property is not always clear, making taxpayer/IRS disputes more likely. This situation is both a potential for abuse and a possible source for excessive litigation. It also can create inequities between aggressive taxpayers and others.

There is no easy way to resolve the building classification problems. Proper income measurement requires that depreciation allowances vary across assets with different economic

[281] Presumably all assets could be broken down into smaller components. Thus composite vs. component depreciation is an issue that applies to all assets. It has been a more serious concern, however, for buildings.

[282] This issue exists in all systems, including the ADR system and the MACRS, in which assets are grouped and given a "typical" life.

[283] For example, the proper depreciation of such items as electrical wiring and junction boxes used to power equipment and plumbing for specialized equipment appears to be ambiguous. Arguments can be advanced that such items are section 1245 property and are therefore not considered to be a component of the building. In addition, some courts have maintained that a portion of the general purpose wiring in a building may be allocated to the specialized equipment, so that such allocated general wiring should also be considered to be section 1245 property.

lives, which requires in turn that particular expenditures be categorized for purposes of determining depreciation allowances. Frictions, disputes and manipulation are unavoidable under any such system. One strategy would address the problem by reducing the controversies associated with the section 1245/1250 distinction by redefining a building to include only the shell, roof, walls, and certain easily identified major structural components. An alternative would eliminate the section 1245/1250 distinction altogether and depreciate buildings according to the taxpayer's general activity class, with an appropriate upward adjustment to the affected class lives. This would increase the variance in economic lives with the asset classes, however, and could lead to additional investment inefficiencies. A third strategy would move in the opposite direction, and strictly limit the taxpayer's ability to segregate selective elements of a building's cost. All elements included within a "building" would be depreciated in a single composite account. However, where and how to draw any new line would be contentious and probably necessarily arbitrary. These solutions all may involve revisiting class lives and recovery periods. While all might reduce taxpayer/IRS disputes, it is unclear whether any would improve income measurement.

Treatment of Real Property Improvements and Structural Components

Following the logic of composite depreciation, additions or improvements to any property are depreciated under current law using the same recovery period as would apply to the underlying property. This rule applies to all property subject to the MACRS, and applies regardless of whether the improvement lasts as long as the property.

Concern has been expressed as to the appropriateness of this rule, especially with respect to real property improvements. Building expenditures are recovered over a 27.5-year or 39-year recovery period. Improvements (specifically, improvements that are section 1250 property) are depreciated using this same recovery period. Furthermore, unlike for other property, the proposed ACRS regulations did not recognize the retirement of a structural component of a building as a disposition of property.[284] Thus, no loss may be recognized when a structural component is retired. For example, the replacement of a roof results in a new asset being depreciated over either 27.5 or 39 years, while depreciation of the initial roof (and any subsequent roof replacement) is continued. Consequently, there can be a "cascading" effect, where several roofs are being depreciated at the same time, even though only one is physically present.

This treatment of improvements will mismeasure income on average to the extent that a pattern of improvements differs from that which may be implicit in the 39-year life applied to the entire investment.[285] It is an empirical question, however, whether the depreciation of the entire flow of costs over the investment's life is too fast or too slow. In answering this question, one must account both for costs that may be deducted too early as well as for costs that may be deducted too late, relative to the proper treatment under a component-based system.

[284] While many apparently apply the ACRS regulations to current law, similar regulations for the MACRS have not been issued. Consequently, loss recognition upon retirement of a structural component is somewhat of an unsettled issue.

[285] This discussion accepts that a 39-year life is appropriate for a typical building.

Other rules apply when real property improvements take the form of leasehold improvements (made by the lessor for the benefit of the lessee). In this case, if a leasehold improvement made by a lessor is abandoned upon termination of the lease, and the property is irrevocably disposed of or abandoned by the lessor at that time, then a disposition is deemed to have occurred. The lessor is allowed a loss write-off of any remaining basis.[286] Thus, current law may treat leased real property more beneficially than owner-occupied real property.[287] Note that this relative tax difference cannot be removed by simply adjusting the recovery period assigned to buildings in order to account for the particular loss recognition rule.

Some observers have argued that special rules should apply to real property improvements. Among the proposals are (1) establishing separate asset classes for building improvements, (2) granting explicit authority to take loss deductions for abandoned improvements, whether they are leasehold improvements or not, and (3) modifying recovery periods to account for improvements. These proposals all assume that existing class lives do not adequately account for improvements, an assumption that is not necessarily valid. A building is depreciated as a composite asset for which the recovery period represents an average depreciation period. Using an average life implicitly recognizes that some components depreciate faster than the average, while other components depreciate over a longer period.

Objections may be made to each of these proposals. Establishing a separate asset class for building improvements would require that such improvements be easily identifiable and that a reasonable average class life could be found for building improvements. Such a scheme creates new administrative complexities. If improvements were given a shorter tax life, taxpayers would be tempted to shift greater amounts of investment from the original investment to the subsequent "improvements," and the IRS would need to seek constraints on the taxpayer's ability to accelerate deductions in this manner. Such controversies might be reduced by including any expenditures made within, say, three years of placing a building in service as part of the original cost, and/or by specifying that improvements may not exceed, say, 15 percent of the building's unadjusted basis.

Allowing separate write-offs for improvement abandonments would seem to be a reasonable policy. It is the general rule for all other depreciable property. Nevertheless, its implementation would involve additional administrative complexity. For example, what would be the proper unit for defining an improvement? If only half of a roof is replaced, would the current roof be considered as abandoned? What if 80 percent of the roof is replaced? What about an electrical apparatus, which may no longer be used, but which remains within the walls of a building?

Establishing a recovery period that takes into account the fact that a portion of a building is replaced before the end of the building's useful life may be the simplest alternative to administer. It is not inconsistent with the proposal to recognize loss upon abandonment, but the ability of taxpayers to recognize such losses would need to be taken into account in establishing an appropriate class life. The major question is whether such a life could be established on the

[286] §168(i)(8).

[287] §168(i)(8)(B). In this regard, a lessor who places a leasehold improvement in service is treated similarly to a lessee who placed such property in service and abandons it.

basis of available statistical data. Analysts would require information on typical building improvements in order to compute the life appropriately. Such data are not easily obtainable. The exercise also would require sufficient uniformity of improvement investments to create a reasonable average.[288] If retail establishments undergo improvements more often than do office buildings, then the implied useful life for buildings used primarily for retail would be lower than that for buildings used primarily for office space. But if buildings are to be distinguished by use, how would dual use buildings be treated? Should an allocation rule, or a predominant use rule be adopted? Again, administrative complexity must be balanced against the desire to achieve an appropriate policy outcome.

39-year Recovery Period for Nonresidential Real Estate

Even setting aside problems related to improvements, taxpayers frequently object that the recovery period for real estate is too long. Some empirical evidence supports this view.[289] The present value calculations in Table 4 (above), for example, suggest that for many nonresidential structures, including industrial and commercial real estate, tax depreciation is slower than economic depreciation. Consequently, nonresidential structures may face a marginal effective tax rate that exceeds that associated with economic depreciation, as shown in Table 6 (above).[290] Assuming straight-line depreciation, a 30-year recovery period would give nonresidential structures about the same marginal effective tax rate as implied by estimates of economic depreciation.[291] Straight-line depreciation over 20 years[292] would give nonresidential structures about the same marginal effective tax rate as currently faced by equipment.[293]

Some factors, however, may argue against shortening real estate's recovery period. One is that buildings may appreciate in value over time. Giving more generous depreciation deductions, while continuing to allow gain on the building and associated land to benefit from deferral and from a reduced rate of tax, may strike some as inappropriate. Another is that the empirical evidence cited above may be dated and possibly inaccurate; current tax depreciation may reflect economic depreciation. The Committee Report on the 1993 bill that lengthened the life of structures to 39 years justified the increase as a way to match tax depreciation more closely to economic depreciation, although no supporting data or studies were cited.[294] Finally, buildings might enjoy a tax benefit from an ability to support relatively high leverage ratios.[295] The increased tax benefit of debt finance might counteract to some degree the tax cost of decelerated depreciation. The tax benefit of high leverage would seem to be fairly small for noncorporate investors, however, and some evidence suggests that buildings may not be more

[288] This observation would also be relevant to the proposal for establishing a separate class for building improvements

[289] These calculations rely on the Hulten-Wykoff measures of economic depreciation.

[290] These calculations assume that assets are held forever. Thus, they ignore asset sales that potentially affect conclusions about the taxation of real estate and other investments.

[291] The exact straight-line recovery period depends on the particular assets being compared and on whether the investment is made in the corporate or the noncorporate sector. The calculation also is sensitive to the assumed (3 percent) inflation rate because economic depreciation is indexed while current tax depreciation is not indexed and to the assumed real discount rate, which can affect present value comparisons.

[292] See the previous footnote.

[293] Gravelle (1999) obtains a similar result.

[294] U.S. Congress (1993).

[295] Hines (1987).

heavily debt-financed than other investments.[296] Finally, buildings are affected less by the lack of indexing depreciation allowances for inflation. An increase in inflation tends to raise the depreciation cost of equipment more than that of structures.

C. Keeping the System Current

1. The Asset Class System Is Dated

The current system of asset classes and class lives is dated. As noted above, well over half the current class lives date back at least to 1962, and most of these have not been revised since published in Revenue Procedure 62-21. Current class lives for many other assets (about 54) were established under the ADR system, which was in place between 1971 and 1980.

In addition to being dated, class lives do not appear to be based on a consistent concept of useful life. As discussed above, class lives under Revenue Procedure 62-21 generally were established based on estimates of the useful lives taxpayers claimed for tax purposes in the late 1950's. These useful life estimates were supposed to reflect "the period over which the asset may reasonably be expected to be useful to the taxpayer in his trade or business or in the production of his income."[297] But it is not clear that useful lives reflected a careful calculation of the period of economic service. Nor is it clear that the calculations were done in a consistent way by all taxpayers. Instead, the useful lives claimed by taxpayers on their returns probably would have reflected many influences, including taxpayer estimates of useful life based on their own concepts and methodologies, Bulletin F lives (which date back at least to 1942), the opinions of revenue agents, and useful life agreements with the IRS. It would be unlikely that these useful lives represented a clear and consistent concept of an average useful life even in the 1950's. The extent to which they reflect an appropriate estimate of the useful life for an asset placed in service today, forty years later, is even less certain.

Class lives established under ADR were intended to reflect the anticipated useful life of that class of property to the industry or other group. The ADR concept of a class life differs from the 1962 concept when an asset is sold or exchanged.[298] While ADR lives benefited from the systematic studies done by Treasury's Office of Industrial Economics, [299] and perhaps represented an improvement in quality over the lives established under the 1962 rules, new class lives for all assets were not established under the ADR system. Even today many assets have class lives that pre-date the ADR system. Thus, ADR's modification to the concept of a class life has not been implemented fully and consistently in determining class lives under current law.[300] Current class lives are not based on a single well-defined concept of a useful life, consistently implemented in a standardized calculation for each type of asset. Instead, they are

[296] Gravelle (1985).
[297] Reg. § 1.167(a)-1(b).
[298] The ADR concept of class life concept generally would be theoretically longer than the 1962 concept of useful life, although class lives tended to be established at levels that were below median useful life estimates.
[299] See the discussion in section B for a brief review of OIE's studies.
[300] Furniture and office equipment, transportation assets, residential rental properties, nonresidential real properties, and computers and computer peripheral equipment are among the types of assets that might be used by several taxpayers over their useful lives.

an amalgamation of lives calculated in potentially inconsistent ways based on data that can be over forty years old.

The 1986 Act emphasized the "anticipated decline in value over time" in establishing new class lives. The legislative history of the Act made this change in definition of a class life more concrete by stating that new class lives should be established so as to equate the present value of tax depreciation, computed using the straight-line method over the class life, with the present value of real economic depreciation. The Treasury's Depreciation Analysis Division (DAD)[301] extended this notion, by observing that differences between straight-line tax depreciation and economic depreciation should also involve gains and/or losses upon dispositions of assets. These gain inclusions and loss deductions should be taken into account in the present value comparison as well. However, because no new class lives were established under the authority of the 1986 Act, these concepts were never implemented. Consequently, no existing class life expressly incorporates the decline-in-value criterion.[302]

Public comments received by the Treasury Department in response to its notice requesting taxpayer comments on depreciation as part of the background for this report revealed that many taxpayers believe that their current MACRS recovery periods were "too long."[303] Whether these comments referred to a belief that class lives should be shortened, or that the MACRS mapping from class lives to recovery periods was not adequate, or both, was not always evident.

2. Need For Systematic Review of Class Lives

a. Legislative Adjustment of Class Lives

Technology is never constant. There exists an ever-present need in classifying assets for depreciation purposes to accommodate changes in business activities and technologies. This may require either periodic changes in asset class definitions or changes in class lives, or both.

Normal legislative action represents one method of adjusting the depreciation system on an ongoing basis to reflect new technological and economic realities. This approach has both advantages and disadvantages. The legislative process may be an effective tool for gathering the information required to make deliberate changes in depreciation policy. The legislative process also may evaluate effectively the relative benefits of depreciation reform in the context of broader tax and spending policy concerns. On the other hand, the normal legislative process may face some challenges in implementing what are essentially technical changes. Legislative action on technical depreciation provisions, for example, may be delayed by other more pressing legislative business. Well-warranted changes in depreciation may face substantial implementation delays.

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[301] DAD was established under the provision of the 1986 Act to monitor actual depreciation and to recommend modifications to class lives.

[302] This definition of class life was deleted from the Code in 1988, along with the Secretary's authority to revise class lives.

[303] The Treasury did not expect to receive, nor did it receive, comments from taxpayers that indicated their recovery periods were too short.

b. Alternative Mechanisms for Adjusting Class Lives

There are a number of alternatives to normal legislative action. First, authority and funding to modify depreciation could be returned to the Treasury along the lines established in the 1986 Act. Throughout the 1970's, and for a brief period after the enactment of the Tax Reform Act of 1986, the authority to set class lives rested with the Secretary of the Treasury. This approach has the advantage of allowing a technical staff to make technical changes in tax provisions. However, Congress may not want to transfer this sort of policy authority from the legislative branch of government to the executive branch of government.

A second option would provide Treasury with the needed authority and budget resources to conduct asset studies and to implement appropriate changes, but to require that such changes occur in a pre-specified process. The process might be modeled on the current process by which Treasury issues regulations. Under such a process, Treasury would announce a proposed rulemaking and subject the proposed changes to public comment and discussion for a period of time before allowing proposed changes to become final. This process would ensure that Treasury's policy changes reflected the concern of affected parties by allowing these parties to review the Treasury work, and to present additional or alternative evidence that Treasury could consider before issuing a final regulation.

A variant of this option would have Treasury submit prospective changes in class lives and asset class definitions to Congressional review and veto. This process would delay the effective date of a depreciation change to, say, six months after issuance, in order to allow Congress a chance to review and, if desired, to overrule or modify the change. This process would provide Congressional oversight while allowing tax experts the ability to make technical changes in depreciation in a timely manner.

c. Technical Difficulties in Estimating Class Lives

The primary difficulties in updating class lives are technical in nature. The process involves a review of class lives, the definition of appropriate asset classes, and the establishment of new class lives. While there are statistical issues, obtaining the data needed to estimate class lives is a major impediment; it is a costly and difficult process in many cases.

Some assets are traded frequently. For these assets, obtaining price and age data generally is not a serious problem. Asset ages can usually be identified, market prices may be obtained, and average rates of depreciation can be estimated. For example, judgments must be made regarding the severity of any "lemons problem,"[304] or whether asset retirements have been taken into account appropriately, but they probably do not create insurmountable barriers. Most assets, however, are not traded frequently. Furthermore, even when there is a second-hand market for used machinery, it is usually the case that only older machines are sold; price data relating to the earlier years of an asset's life are often not available. Thus, it is frequently not possible to infer the pattern of asset price decline in the crucial early years of a machine's life.

[304] See the discussion in Appendix 1.

An example may illustrate this point. Suppose a typical piece of machinery lasts ten years, but is generally sold only after six years. There will be no price data for years two through five. Suppose available data show that machines of this type sell for 10 percent of their initial cost at the end of year six and decline in a straight-line fashion through year ten. In this case, there are no data on which to estimate a class life, based on the straight-line present value equivalency criterion postulated under the 1986 Act.

Consider the data in Table 10. Three alternative value patterns (designated A, B, and C) are shown for years one through six: a straight-line pattern (A), a more accelerated pattern (B), and a less accelerated pattern (C), all of which might be considered plausible based on the information in this example. The present values for economic depreciation (with a discount rate of 6 percent) are 0.80, 0.85, and 0.77, respectively. Using the straight-line present value equivalency test yields estimated useful lives of 7.0, 4.5 and 8.5 years, respectively. Alternative present value rules have similar problems. For example, setting a useful life so that depreciation calculated using a double-declining balance method yields a present value of depreciation equivalent to that of economic depreciation, yields estimated useful lives of 9.5, 6.5, and 10.5, respectively.

Table 10

Example of Inferring Economic Depreciation with Missing Data

Year	Value			Depreciation		
	A	B	C	A	B	C
0	1.000	1.000	1.000			
1	0.850	0.700	0.960	0.150	0.300	0.040
2	0.700	0.450	0.840	0.150	0.250	0.120
3	0.550	0.250	0.700	0.150	0.200	0.140
4	0.400	0.150	0.540	0.150	0.100	0.160
5	0.250	0.125	0.340	0.150	0.025	0.200
6	0.100	0.100	0.100	0.150	0.025	0.240
7	0.075	0.075	0.075	0.025	0.025	0.025
8	0.050	0.050	0.050	0.025	0.025	0.025
9	0.025	0.025	0.025	0.025	0.025	0.025
10	-	-	-	0.025	0.025	0.025
Present Value of Depreciation:				0.799	0.850	0.769
Equivalent Straight-Line Life:				7.0	4.5	8.5
Equivalent Double Declining Balance Life:				9.5	6.5	10.5

Department of the Treasury
Office of Tax Analysis

In the absence of significant resale markets, Treasury (or another appropriate agency) would need to collect data on lives, retirements, repair records, productive capacity measures, etc., from taxpayers. This may be difficult and costly. Taxpayers may be required to collect, maintain and provide the necessary data to the appropriate government agency. These data would have to be collected in a consistent manner over several years. Furthermore, to be effective, these requirements would have to be accompanied by appropriate penalties for noncompliance. This may place a heavy burden on taxpayers.

An alternative may be to rely on industry-financed studies. This approach suffers from an obvious bias in the selection of assets to be studied; unless mandated for all industries, only those industries hoping to benefit from a study will be willing to provide data. In addition, most estimation biases seem to arise during the data collection phase of a study. Without supervision of this phase, it would be difficult for Treasury to review a private industry's study.

A third issue is the need to extrapolate past experience into the future. While appropriate in some cases, past experience may be a poor indicator of future depreciation in other cases. Rapid technological changes, such as computerization of a production process, may result in a significant changes in depreciation patterns and useful lives. In these cases, the estimates obtained from past experience ideally would be adjusted to take the rapidly changing technology into account. This is also the reason why relatively frequent reviews of class lives are needed.

It is important to note that changing technology does not necessarily translate into shorter depreciable lives. Indeed, a constant rate of obsolescence generally implies a constant depreciation rate. A move to shorter lives generally requires an acceleration of the rate of obsolescence. Thus, a rate of obsolescence of three percent per year is likely to lead to a stable useful life for equipment. A rate of obsolescence of six percent per annum is likely to lead to a stable, but shorter, useful life. However, a single jump to a higher obsolescence rate does not necessarily imply an ever-shorter useful life. This distinction between rates of obsolescence and useful lives is often obscured in discussions of depreciation and useful lives.

The question often arises regarding the treatment of new technologies for which no existing useful life exists. If a class life for similar assets exists that could be applied, that life would not take into account the new technology, because the life predates the new technology. Some commentators suggested the need for a process by which a class life could be assigned to assets based on new technology before the assets are placed in general use. The need for immediate clarification is obvious, especially if there are questions as to the correct classification of such property. This may require that the IRS act swiftly on requests for rulings in this area, which in turn requires that taxpayers identify new technologies and provide as much data as is feasible that will provide an indicator of future useful lives. Perhaps temporary asset classes could be established for nascent technologies. These temporary asset classes would provide certainty to taxpayers for an initial development period, without disturbing the class lives for existing technologies. They would also provide a signal that this asset class will be studied before the expiration date of the temporary asset class. This may be preferable to current law, because it would avoid placing new assets in an existing asset class, where they may not belong, and would avoid placing new assets permanently in a "default" class with an arbitrary class life. This procedure, of course, is not possible under current law, where all changes in class lives must be established by statute.

D. Other Issues

1. Used Assets

Under economic accounting, depreciation allowances would be unaffected by the sale of an asset. For example, consider a widget that costs $100 when new that has straight-line economic depreciation over a 10-year life. If tax depreciation mirrored economic depreciation, annual depreciation deductions would be $10 for each of ten years. The annual depreciation deduction would remain $10 regardless of how many times (if ever) the widget was sold over its 10-year economic lifetime.

Current law deviates from this treatment. Used assets are depreciated over the same lifetime and use the same method as a comparable new asset. Thus, depreciation begins anew each time an asset is sold. This would appear to create a tax bias against used assets, but it need not do so in all cases.

In some cases, depreciating used assets using the same rules applied to new assets can mismeasure income from the used asset and can create a tax bias against investment in a used asset. Continuing the example above, suppose that, following current law's approach, both new widgets and used widgets are depreciated over ten years using the straight-line method. If an investor bought a seven-year-old widget for $30, then (absent other relief) he would recover the cost of his investment at the rate of $3 per year over each of the next ten years. This offers inadequate tax deductions, compared to economic depreciation of $10 per year for each of the asset's three remaining years of productive service. Because of the deceleration of tax depreciation, the investor would have unrecovered basis at the end of the asset's useful economic life. Furthermore, the investor would be better off buying $30 worth of a new widget, whose cost is recovered fully and at the economic rate over its 10-year economic life. In this example, currently applicable tax depreciation rules appear to discourage investment in used assets, relative to investment in new assets.

The overstatement of income from investment in a used asset, however, can be tempered by current law's provision allowing recovery of remaining basis when an asset is retired from service. If the investor in the seven-year-old widget retired his widget at the end of its useful life, he would recover $3 of his cost in the first year of his investment, $3 in the second year, and $24 in the third year. He would not necessarily be left with unrecovered basis at the end of the asset's useful economic lifetime. Nonetheless, his tax depreciation (including basis recovery upon retirement) still would be slow relative to economic depreciation and slow relative to depreciation allowed on an investment in a new widget.

In other cases, depreciation rules could be changed in ways that might avoid creating a tax bias against investment in used assets. For example, suppose that economic depreciation occurs at a constant geometric rate δ. If tax depreciation mirrored economic depreciation by establishing open-ended accounts, then tax allowances would equal δ times remaining basis. If new and used assets were governed by the same tax depreciation rules, tax allowances would

equal economic depreciation for both types of assets. Depreciation would not affect the decision of whether to invest in a new asset or in a used asset.[305]

This discussion suggests that current tax rules may not seriously mismeasure income from used assets. Modifying current depreciation rules in an attempt to relieve a perceived bias against investment in used assets may offer only small benefit in the form of improved income measurement and improved tax neutrality, but would add complexity to the tax code.

2. Computerization of Technology

The rapid development of computers and the rapid integration of computers into the production process raise difficult issues. Industry representatives argue that depreciation is too slow for computers and for production equipment that increasingly relies on computer technology.

Current law creates a distinction between stand-alone computers and computers used as an integral part of technology. Stand-alone computers are identified as qualified technological equipment and are given a five-year recovery period. Computers used as an integral part of other equipment are depreciated on a composite basis as part of the underlying asset. Consequently, their costs generally are recovered over 5, 7, 10 or more years.

Certain commentators have pointed out that, at least in their initial applications, computers do not generally last for five years. For example, Moore's Law implies that computers double in speed every two years. This suggests rapid obsolescence and some commentators consequently argue that the five-year recovery period for computers is too long.[306]

Some industry representatives also argue that computerized equipment may be depreciated over too long a recovery period. Most class lives for equipment pre-date the computer revolution. Thus, the class lives may fail to reflect the relatively large cost share currently accounted for by relatively short-lived computer components.

One solution to the depreciation issues raised by the computer revolution would be to undertake new empirical studies designed to accurately estimate the useful life of stand-alone computers and of computers used as an integral part of other types of equipment. Recovery periods could be modified to reflect these studies. In order to keep up with what promises to be fairly rapid future technological growth, studies of computer-related equipment might need to be revisited periodically, to ensure that existing depreciation rules reflect the best available data. This approach is likely to be costly.

In addition, it would be possible to modify current depreciation rules by allowing taxpayers to separate the computer components from the other components of integrated equipment, and to depreciate the computer components separately. This, however, may prove

[305] This assumes that the asset has no finite useful life. If the asset has a finite useful life, then the tax code can bias the investor's choice in favor of new over used assets, as discussed above.

[306] Because old generations of computers still may be productive in their current application and also may have significant scrap value, Moore's Law does not necessarily imply that a five-year recovery period is too short.

difficult to accomplish in an easily administrable way. In many cases it is likely to be difficult to allocate costs between computers and production equipment. As equipment and computers become increasingly integrated, this difficulty will increase.

3. Changes in the Regulatory Environment

Another aspect of updating the class life system relates to property of publicly regulated utilities. Electric, gas, water, and telephone utilities were all generally regulated at the time the current class lives were established. Today, however, long distance telephone service has been largely deregulated, and the deregulation of gas and electric generation activities is underway. Under rate of return regulation, utilities were not theoretically concerned with depreciation and tax expense, because rate structures were based on cost-plus pricing.[307] A utility's rate of return on equity was largely independent of its tax or depreciation expenses. Consequently, for public utilities, it is unclear that existing class lives truly represent the actual useful lives of the property involved.

Class lives may be expected to be different in the current more competitive environment. Producers must maintain state-of-the-art equipment, which might mean shorter lives and more rapid depreciation. For example, new generations of combined cycle gas turbine generators are more efficient today than previously, leading to a more rapid retirement of such equipment than would have occurred under regulation. Furthermore, it is possible that new types of equipment, particularly distributed power equipment, could cause more rapid retirement of transmission and distribution equipment.

Another area of concern is the current distinction between assets used for self-generated electricity and assets used for electricity generated and sold to others. Electrical and steam producing equipment is given a 15-year recovery period if the energy is not generally sold, but is used in a manufacturer's production process. However, equipment used to generate electricity for use in a residential or commercial setting is likely to be treated as building structural components and depreciated over 27.5 or 39 years, respectively. Furthermore, the proper classification of distributed power assets used by non-utility taxpayers to generate electricity is unclear when some of the electricity is regularly sold to others.[308] Generation equipment, when owned and operated by a public utility, has a recovery period of 20 years. As the electric utility sector becomes deregulated, these discrepancies may create biases against specific power production technologies and may be inconsistent with a desire to achieve the most efficient technology.

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[307] In addition, in order to receive the benefits of accelerated tax depreciation, ACRS and MACRS required the use of a normalization method of accounting. Normalization generally required that the tax benefits represented by accelerated depreciation were to be returned to the utility's ratepayers through regulated rates over the regulatory life of the property. See, §§168(f)(2) and (i)(10).

[308] The FY 2001 Budget contains a proposal to clarify the treatment of distributed power equipment used in residential, commercial, or industrial settings. The proposal would assign a 15-year recovery period to all such property, would allow the property to cogenerate limited amounts of usable thermal energy, and would allow a portion of the generated electricity to be sold to others.

4. Compliance and Administration Issues

Much of the complexity of the current system of depreciation is in attempting to assign the relevant property to an appropriate asset class. Once this determination is made, the calculation of annual depreciation allowances is relatively straight forward – current law generally applies prescribed recovery periods, depreciation methods and deemed placed-in-service dates to the amount of capitalized cost.[309]

Much of the administrative burden of current law also relates to record-keeping requirements. Taxpayers may be required to keep depreciation records for multiple purposes. Different lives and methods may be used for financial accounting or regulatory purposes, for regular tax purposes, for AMT purposes, for purposes of determining earnings and profits, and, potentially, for state and local tax purposes. In addition, current law generally contemplates that sufficient records be kept on an asset-by-asset basis in order to determine the amount of gain or loss to be recognized if an asset is disposed of prior to the end of its recovery period.

The MACRS allows taxpayers to save on administrative costs by maintaining one or more general asset accounts for their depreciable property.[310] In a general asset account, all items of property with identical recovery periods that are placed in service in the same year lose their identity and may be depreciated as a single asset. Current law requires that all proceeds from the disposition of property in the account be included in income as ordinary income. This treatment discourages the use of general asset accounts by not allowing an immediate offset for the remaining adjusted basis of the specific item of disposed property. It also converts potential capital gain into ordinary income.

General asset accounts simplify depreciation recordkeeping for taxpayers with multiple properties. Current law could be modified to encourage general asset accounts by providing that only a portion of the proceeds from dispositions be recognized currently; the remaining portion would reduce the depreciable balance in the account. Because MACRS has a switch from the declining balance method to the straight-line method during the recovery period of property, general asset accounts currently must be maintained by vintage. Further simplification could be obtained by eliminating this switch and maintaining a single account for all similar property. Annual depreciation would be determined by multiplying the account balance by a fixed percentage every year (e.g., the 200-percent or the 150-percent declining balance percentage). Account balances would be increased by the amount of property placed in service during the year and decreased by depreciation claimed (and a designated portion of disposition proceeds, if so desired).[311] Finally, consideration could be given to making general asset accounting for depreciation mandatory rather than elective, at least for taxpayers with a sufficient amount of

[309] This is not to suggest that there are not other issues of potential controversy under current law. For example, as discussed above, a taxpayer must determine which costs must be capitalized and which may be expensed, or whether property is used in a trade or business and thus is depreciable. Most of these issues exist under most cost recovery systems and are not unique to current U.S. tax law.

[310] §168(i)(4).

[311] To replicate the half-year placed-in-service convention, one-half of the basis of an addition would be added to the account in the year the property is placed in service and the remaining half added in the succeeding year. Alternatively, the average adjusted basis calculated from beginning-of-year and end-of-year values (before accounting for current year depreciation) could be used.

similar assets. General asset accounting, however, does not provide the backstop that current law provides, where assets with useful lives shorter than the assigned recovery period are allowed an immediate write-off of remaining undepreciated basis at the time of their disposal.

CHAPTER 7

SUMMARY OF ISSUES IN TAX DEPRECIATION

A. Introduction

This chapter summarizes the major issues that are involved in the possible reform of the depreciation system that were discussed in detail in the previous chapters. Each issue is stated as a question. Arguments in favor of an affirmative answer are presented as "pros" and arguments supporting a negative answer are listed as "cons." The issues are grouped by major category. These categories include issues with respect to the type of depreciation system, the design of a revised asset classification system, the process for updating class lives, the recovery periods and depreciation methods used under the revised system, and the treatment of asset retirements.

B. Economic Depreciation and Alternatives

1. Should the system of depreciation lives and methods be reformed so that depreciation allowances reflect estimates of economic depreciation?

Pros

- This option would improve tax neutrality by eliminating the tax differences among depreciable assets within the corporate sector and within the noncorporate sector.
- It would allow some simplification of the tax code by eliminating the need for (1) AMT depreciation adjustments, (2) a separate system of depreciation for determining corporate earnings and profits, (3) the alternative depreciation system, and (4) a system of ordinary income recapture (sections 1245 and 1250).

Cons

- Without an investment incentive, it would raise effective tax rates on business investment and the relative taxation of corporate and noncorporate investment.
- It could increase the variance in effective tax rates across different asset types by increasing the discrepancy between tangible property used in a trade or business (which would become subject to economic depreciation) and intangible property or owner-occupied residential property (which might maintain current preferences).
- Economic depreciation would require indexing allowances for inflation. Indexing depreciation is likely to add complexity to the tax code. In addition, indexing depreciation, without indexing capital gains, interest flows and other aspects of the tax code may create arbitrage opportunities, and may fail to improve the operation of the tax system.
- A system of schedular allowances can only approximate economic depreciation for groups of assets. In reality, there would be numerous situations in which allowed depreciation would be too rapid or too slow; the goal of achieving a system of economic depreciation may prove illusory.

- Estimates of economic depreciation require data on used asset prices, which are not readily available for many, if not most, depreciable assets. The markets in such assets are often too "thin" to yield useful market values for this purpose. Used property values that are available only for the later years of an asset's life are inadequate, because they fail to reflect the pattern of economic decay in the earlier years.

2. Should tax depreciation be mandated to conform with depreciation used for financial reporting purposes?

Pro

- Book and tax conformity would simplify recordkeeping for many firms.

Cons

- Accounting simplification is overstated, because other differences between tax and financial accounting would continue to necessitate (at least) two sets of books.
- It may not improve income measurement. Some taxpayers may misstate their financial income to avoid tax. Discrepancies in depreciation are likely to arise between firms required to prepare audited financial statements and those that are not so required. It would be difficult for the IRS to monitor practices of unaudited firms.
- It may represent an inappropriate abdication of Congressional and Administration authority to provide tax rules.

3. Should a facts-and-circumstances depreciation system be reinstituted?

Pros

- This system can eliminate gross discrepancies from economic depreciation, by requiring taxpayers to justify their allowances on that basis.
- This system can be flexible enough to handle a number of specific situations that cannot be accounted for under a schedular depreciation system.

Cons

- The system places a heavy burden on taxpayers to obtain the necessary data to support their depreciation deductions and an equally heavy burden on the IRS to be able to evaluate those data properly. Past history shows that such a system is likely to generate a great deal of controversy and costly litigation between taxpayers and the IRS.
- Because such a system may not be administered consistently, the hoped for efficiency gains may not materialize.

4. Should depreciation allowances be indexed for inflation?

Pros

- Inflation indexing of depreciation allowances would promote tax neutrality by helping to ensure that inflation does not inappropriately increase the overall marginal effective tax rate on capital income.
- To achieve economic depreciation, depreciation allowances must be indexed for inflation.

Cons

- Measuring economic depreciation is only one step toward measuring economic income. Other deviations from economic income abound in the tax code.
- Indexing depreciation for inflation, while allowing capital gains and interest flows to remain unindexed would not necessarily improve the measurement and taxation of income and may create opportunities for tax arbitrage and lead to tax shelters.
- Indexing is likely to add complexity to the tax system.

5. Can depreciation calculations and recordkeeping be simplified by greater utilization of general asset accounts rather than asset-specific calculations?

Pros

- Asset-specific depreciation requires voluminous records, especially for taxpayers with multiple, similar assets, that could be eliminated through the use of general asset accounts.
- Current-law depreciation is based on several simplifying conventions that may depart from economic income. The additional use of general assets accounts should not create significantly greater distortions.
- The use of general asset accounts is consistent with the use of industry-based classifications of ADR and MACRS.

Cons

- General asset accounts create a legal fiction that assets that have been disposed of, or are fully depreciated economically, will continue to be depreciated ad infinitum for tax purposes.
- In order to make general asset accounts operate efficiently, assumptions must be made regarding the treatment of proceeds from asset dispositions. The extent to which the disposition policies of taxpayers differ, such assumptions may create winners and losers. Special rules may be required for extraordinary dispositions.
- General asset accounts provide the most simplification for taxpayers with the most assets. These firms tend to be larger, more sophisticated taxpayers for whom depreciation accounting may not present a significant challenge.

C. A Revised Asset Classification System

1. Should assets be classified by broad asset types rather than economic activities?

Pros

- Assets of similar type likely depreciate at similar rates, especially if wear and tear is an important determinant of depreciation, or if obsolescence generally affects the productivity of a broad category of assets.
- An asset-based approach might be simpler than an activity-based approach if taxpayers have few asset types but engage in many activities.
- An asset-based approach does not face the problems of multiple lines of business and vertically integrated firms.

Cons

- If taxpayers tend to retire assets used in a particular activity together, then an activity based classification system may be a better approach.
- An activity-based approach is simpler for many taxpayers; taxpayers need account for only one asset class for each activity in which they participate; under an asset-type approach, taxpayers may generally need to identify several asset types and account for them separately, even if engaged in a single economic activity.

2. Should an activity be required to be operated as a separate business before assets are classified to that activity?

Pros

- Separate activities may be difficult to identify unless they are operated as a separate business, i.e., where sales are made to unrelated parties.
- Use of this rule would reduce the number of asset classes that a taxpayer must track.
- This rule could reduce the number of disputes between the IRS and taxpayers.

Con

- Adoption of this rule would make the depreciation system sensitive to the degree of vertical integration. An integrated firm would have fewer asset classes, and could be given either an unwarranted advantage or disadvantage vis-à-vis less integrated firms.

3. Should the legal distinction between section 1245 property and section 1250 property no longer be used to classify assets for depreciation purposes?

Pros

- The distinction between section 1245 property and section 1250 property is not well articulated in law for many assets, and has led to the need for numerous IRS rulings and court decisions.
- It has not been shown that section 1245 property has a different pattern of depreciation than does section 1250 property. Therefore, the distinction may be meaningless.
- The main usefulness of using this distinction under MACRS is to define nonresidential real property. It is probable that such property could be defined more directly and simply by choosing a usable definition of a building.
- The current distinction has led to the proliferation of taxpayer cost segregation studies. Such studies have effectively reintroduced component depreciation for buildings owned by certain taxpayers.

Cons

- Little simplification may be achieved by eliminating the distinction between section 1245 property and section 1250 property only for depreciation classification purposes. These two classes of property are distinguished elsewhere in the code, e.g., in determining ordinary income recapture rules that differentiate between personal and real property.
- Eliminating the section 1245/section 1250 distinction by itself would not eliminate the need that some similar distinction be made (e.g., real vs. personal property, or building vs. non-building property) when classifying property for depreciation purposes. Definitional issues will not simply go away.

4. Should a separate asset category be established for building improvements and/or short-lived structural components?

Pros

- Building improvements may have useful lives that are shorter than the assigned recovery period for buildings.
- The long recovery period for improvements and certain structural components, coupled with an inability to recognize a loss upon retirement, may imply that multiple vintages of retired improvements or structural components may be depreciated simultaneously.
- A separate recovery period for short-lived components would remove a bias against new investments in such components in favor of continual repair.
- Some buildings experience more frequent improvements than others (e.g., retail space vs. warehouse) creating disparities between such structures.

Cons

- Like other asset groupings, a building is depreciated as a composite asset, for which the recovery period represents an average depreciation period. Using an average life for this account implicitly recognizes that some included assets depreciate faster than the average, while other components depreciate over a longer period.
- A separate recovery period for improvements would create administrative problems. It would require the taxpayer and the IRS to properly identify improvements and would create an incentive for taxpayers to attempt to recharacterize any construction costs as improvements.

5. Should used assets be given recovery periods that reflects their shorter remaining life?

Pro

- Used assets have a shorter remaining useful life than new assets.

Cons

- The used asset problem may not be serious. Basis recovery upon retirement helps mitigate the problem. In addition, the extent of the problem will vary depending on the pattern for economic depreciation and the pattern for the type of asset generally.
- Granting a shorter recovery period for used assets would complicate the system by creating a vast multitude of recovery periods. The new owner may not know the ages of some used assets.
- Allowing expensing, or extremely short recovery periods, for some used assets could bias the system toward their use.

6. Should assets that encompass integrated circuits or "computers" as an integral component be treated as stand-alone computers?

Pro

- Computerized equipment is replaced on a more frequent basis than non-computerized equipment. Advancements in computerization determine the rate of obsolescence for such equipment.

Cons

- Integrated circuits appear in virtually every piece of equipment now produced. To treat all such equipment as a computer would be tantamount to restoring ACRS, where virtually all equipment receives the same depreciation write-offs. Such a system would not be neutral; it would favor those industries whose equipment, in fact, lasts longer.
- It may be administratively difficult to disaggregate the cost of the integrated computer from the remainder of the property.

D. Create a New Process to Establish and Amend Class Lives

1. Should Treasury be given the authority to establish class lives?

Pros

- The current system is out-of-date because of the development of new technologies and new products and services.
- The legislative process may move more slowly than desirable in keeping class lives and recovery periods current.
- Congress must currently rely on claims by industry groups concerning the useful lives of their assets.

Cons

- Granting new authority to Treasury to establish class lives may be ineffective without also granting additional authority to require the collection, maintenance, and provision of necessary data by taxpayers in order to allow Treasury to conduct the requisite studies. The data requirements for updating class lives would impose an administrative burden on taxpayers.
- Without special procedures, Congress would be ceding its authority to make important tax policy decisions solely to Treasury.
- The establishment of class lives is a technical question that is best left to be resolved through regulations and rulings.

2. Should class lives be set through a separate review process?

Pro

- Normal tax legislation is a slow process. Needed changes may not occur for many years. Technical changes in class lives could be made in a timely manner either through a pre-specified process modeled on the current process by which Treasury issues regulations or by delaying effective dates to allow Congress the opportunity to review or modify the change.

Cons

- Frequent and rapid changes occur with respect to other tax issues (such as financial products). Singling out depreciation for special procedural rules may be unfair and may detract from other Congressional business.

E. MACRS Recovery Periods and Methods

1. Should the MACRS recovery periods be replaced with recovery periods equal to asset class lives?

Pros

- The current system of assigning recovery periods results in "cliffs," whereby two industries with nearly the same class life are assigned far different recovery periods and perhaps different methods.
- The current system also results in "plateaus," whereby two industries with quite different class lives are assigned the same recovery period and method.
- The presumed simplification resulting from the current system of ten MACRS recovery categories is illusory. There would be little or no additional complexity introduced if taxpayers were to use class lives as their recovery periods.
- Using more accelerated methods, including possibly partial expensing, could achieve a degree of overall investment incentive similar to that provided by the current system.

Con

- Many, if not most, taxpayers find that all their assets fall into one or two MACRS recovery categories. This change would complicate tax computation for many taxpayers because they would have to use additional depreciation methods.

2. Should a regime of partial expensing be substituted for the acceleration of depreciation deductions represented by MACRS recovery periods, either as a proxy for inflation indexing or as an investment incentive measure?

Pros

- Partial expensing permits a simple, yet efficient, method for reducing the effective tax rate on investments.
- While non-indexed depreciation allowances are not affected neutrally by inflation, partial expensing reduces the percentage of the investment cost that is subject to the effect of inflation.

Cons

- A depreciation system cannot be completely indexed for inflation solely through partial expensing. Inflation affects short-lived investments more than long-lived investments, even with partial expensing.
- An incentive based depreciation system created by partial expensing will lower the effective tax rates on depreciable property, but will leave effective tax rates for other types of capital unchanged, thus creating potential distortions.

3. Should the recovery period for nonresidential real property be shortened?

Pros

- Some empirical evidence indicates that 39 years is too long, providing a marginal tax rate for such buildings that is above both the statutory tax rate and the marginal tax rate for equipment.
- A shorter recovery period would lessen the impact of composite depreciation rules for short-lived structural components and property improvements.

Cons

- Currently available studies of real estate are dated and possibly inaccurate. They may also be less valuable due to their reliance on a limited database.
- Buildings enjoy other tax benefits that may not be available to other assets. Examples include lower taxes on capital gains and an ability to support relatively high leverage.

4. Should computers be given a shorter life?

Pro

- Computers are seemingly replaced at a more rapid pace than is reflected in their current 5-year recovery period.

Con

- No empirical study based on the 1986 MACRS methodology for revising class lives has been presented in order to substantiate the claim that computers should be assigned a recovery period of less than 5 years.

F. Treatment of Asset Retirements

1. Should losses be allowed with respect to retirements of structural components of buildings?

Pros

- Buildings are merely collections of structural components. Other than with respect to general asset accounts, current law allows losses to be recognized upon the retirement of an asset. .
- If losses cannot be recognized, and components are sufficiently short-lived, then it is possible, indeed probable, that more than one vintage of a given component will be kept on the books at the same time. Unless adequately reflected in the assigned corporate class life, this treatment likely violates economic depreciation principles, and adds to taxpayer accounting burdens.
- Failure to recognize losses for structural components creates an inefficient tax bias in favor of higher rates of repair expenditures and lower rates of new investment.

Cons

- Buildings are not just composite accounts, but are an integrated productive asset.
- Structural components need not be replaced in their entirety. Partial replacement of such components raises questions as to when a "retirement" has occurred.
- A system that segregates assets into their components is complex, difficult to administer, and invites abuse.

2. Should improvements to owner-occupied nonresidential property receive treatment similar to that accorded leasehold improvements to such property?

Pro

- Leasehold improvements may be written off upon abandonment. Similar loss deductions do not appear to be allowed with respect to components or improvements of owner-occupied structures. This creates an unnecessary and inefficient tax discrepancy, based only on the legal status of the user of the property.

Con

- It is clear that leasehold improvements are abandoned only when the lessee vacates the property. Abandonment is less clear when the owner of a building decides to renovate certain elements of the building. Allowing loss write-offs will increase the burden of ensuring taxpayer compliance.

APPENDIX 1

EVALUATING THE HULTEN-WYKOFF ESTIMATES[312]

A. Introduction

The depreciation rates estimated in a series of papers by Hulten and Wykoff[313] represent the only estimates available for a wide variety of assets in the United States The Hulten-Wykoff estimates have been widely used in studies of the taxation of income from capital.[314] Broadly speaking, the Hulten-Wykoff estimates are consistent with the body of research on economic depreciation. Nonetheless, they are subject to a number of criticisms and qualifications.

B. The Hulten-Wykoff Depreciation Rates

The first column of Table 11 shows the original Hulten-Wykoff estimates. They are geometric, and imply that the value of each asset falls by a constant rate over time, independent of economic conditions. For example, asset number 4, tractors, declines at a constant rate of 16.3 percent each year independently of how intensely the tractor is used, the value of agricultural land, and the price of gasoline.

On average, equipment depreciates at a 15.1 percent rate, although there is variation across assets. Depreciation rates for nonresidential structures are closely clustered about the 3.0 percent average. Nonresidential property in general (equipment and structures) depreciates at an average 7.9 percent rate.[315] The second column of Table 11 shows revised rates for selected assets calculated by Hulten and Wykoff in a later paper.[316] These revised rates generally are somewhat higher than the initial Hulten-Wykoff estimates.

C. The Used-Asset-Price Approach to Measuring Economic Depreciation

Hulten and Wykoff measured economic depreciation using data on the price of used assets. They estimated depreciation as the change in the price of an asset as it ages. For example, their approach would measure the depreciation of a three-year old car in 1999 as the difference in price between a three-year old and a four-year old model in 1999. They use a general functional form (Box-Cox) that imposes no strong constraints on the pattern depreciation must take over time. They conclude, however, that while geometric depreciation is statistically rejected, the observed depreciation pattern was approximately geometric in all cases.

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[312] The discussion in this section draws heavily from Fraumini (1997), Hulten and Wykoff (1981a and 1996) and Gravelle (1999).
[313] Hulten and Wykoff (1979), (1981a and b).
[314] See, e.g., Auerbach (1983a), Fullerton (1987), and Gravelle (1994).
[315] These estimates use capital stock weights from the cost of capital model. They are close to the averages calculated in Hulten and Wykoff (1981a).
[316] Hulten and Wykoff (1996).

Table 11
Hulten-Wykoff Estimates of Economic Depreciation

Asset	Economic Depreciation Rate	
	Original Estimates[a] (percent)	Revised Estimates[b] (percent)
Equipment		
1 Furniture and fixtures	11.0	12.0
2 Fabricated metal products	9.2	
3 Engines and turbines	7.9	
4 Tractors	16.3	18.0
5 Agricultural machinery	9.7	12.0
6 Construction Machinery	17.2	18.0
7 Mining & oil field machinery	16.5	
8 Metalworking machinery	12.2	
9 Special industrial machinery	10.3	
10 General industrial equipment	12.2	12.0
11 Office and computing machinery	27.3	30.0
12 Service industry machinery	16.5	18.0
13 Electrical machinery	11.8	18.0
14 Trucks, buses, and trailers	25.4	30.0
15 Autos	33.3	30.0
16 Aircraft	18.3	18.0
17 Ships and boats	7.5	
18 Railroad equipment	6.6	
19 Instruments	15.0	
20 Other equipment	15.0	
Average for equipment[c]	15.1	
Nonresidential Structures		
21 Industrial buildings	3.6	
22 Commercial buildings	2.5	
23 Religious buildings	1.9	
24 Educational buildings	1.9	
25 Hospital buildings	2.3	
26 Other nonfarm buildings	4.5	
27 Railroads	1.8	
28 Telephone and telegraph	3.3	
29 Electric light and power	3.0	
30 Gas facilities	3.0	
31 Other public utilities	4.5	
32 Farm structures	2.4	
33 Mining, shafts, and wells	5.6	
34 Other nonbuilding facilities	2.9	
Average for nonresidential Structures[c]	3.0	
35 Residential buildings	1.5	

Department of the Treasury — Office of Tax Analysis

[a] Jorgenson and Sullivan (1981)

[b] Hulten and Wykoff (1996)

[c] Weighted average based on the 1996 capital stocks from the cost of capital model.

Hulten and Wykoff did not have used asset data on all the thirty-five assets listed in Table 5. Rather, they had detailed price data on only eight assets (Type A Assets): tractors, construction machinery, metalworking machinery, general industrial equipment, trucks, autos, industrial buildings and commercial buildings. Depreciation estimates for four additional assets (Type B) were constructed based on other empirical research and judgement. Assets in this group include office computing and accounting machinery, ships and boats, hospital and institutional buildings, and other buildings. For 20 remaining categories of assets Hulten and Wykoff had no specific data on depreciation rates. They calculated depreciation rates for these Type C assets using an appropriate average depreciation rate calculated from Type A assets, in combination with the Jorgenson/BEA estimate of the service life for each asset. Jorgenson and Sullivan[317] adopt this technique to expand list to the 35 assets shown in the table.[318]

D. Limitations of the Hulten-Wykoff Study

The original Hulten-Wykoff study is dated. Their papers were published in the early 1980s, and were based on price data largely from the 1970s (and earlier). Since that time, the U.S. economy has changed dramatically, as has the nature of many types of capital. Twenty-year old estimates based on data that is even older may not reflect depreciation of today's capital goods. The age of the estimates, however, is not necessarily a fatal flaw. Some papers suggest that depreciation rates (or age-price profiles) are fairly stable over time.[319]

Another limitation of the Hulten-Wykoff study is that the authors only estimated depreciation rates for eight assets. As the authors readily admit, the expansion to the remaining 27 assets is based more on judgement than it is on econometrics.[320] Nonetheless, for two reasons this criticism can be overstated. First, Type A assets account for a large fraction of total investment. In 1977, the six categories of producers durable equipment included in the Type A group accounted for 55 percent of spending on producer's durable equipment, while the two categories of nonresidential structures accounted for 42 percent of spending on nonresidential structures.[321] Second, the estimates for Types B and C assets are not entirely baseless. Depreciation rates for type B assets are constructed in part from the empirical work of others, while depreciation rates for Type C assets are based on empirical regularities observed for Type A assets.

Geometric depreciation rates themselves are controversial.[322] As Feldstein and Rothschild[323] emphasize, the depreciation process may be too complex to be summarized in a single number. Depreciation may be endogenous, subject to choices about the intensity of utilization and degree of maintenance. Depreciation can take many forms: increased down time,

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[317] Jorgenson and Sullivan (1981).
[318] Hulten and Wykoff (1981a) begin with 22 types of equipment and 10 types of structures. Jorgenson and Sullivan (1981) collapse three types of electrical equipment into a single asset, and so reduce the list of equipment to 20 assets. They also expand public utility structures into five assets and add residential structures, thereby expanding the list of structures to include 15 assets.
[319] Hulten and Wykoff (1981b), Hulten, Robertson and Wykoff (1989**),** Taubman and Rasche (1969).
[320] Hulten and Wykoff (1979) and (1981a).
[321] Hulten and Wykoff (1981a).
[322] Hulten and Wykoff (1996).
[323] Feldstein and Rothschild (1974).

loss of serviceability from wear and tear, wastage of material. There is no a priori reason to think that such a complicated phenomenon should be well summarized by a constant geometric rate. Some also find implausible geometric depreciation's large reduction in asset value during the early years of an investment, and the implication that assets never completely wear out.

Yet, geometric depreciation rates have been estimated in many studies in addition to Hulten and Wykoff's. Recent reviews of the literature have concluded that the evidence supports a geometric rate for a wide variety of assets.[324] In addition, objections to a geometric depreciation rate may reflect the fallacy of composition. Depreciation may be approximately geometric for an entire class of assets even if depreciation is not geometric for any individual asset within that class.[325]

The Hulten-Wykoff study also is subject to a number of generic problems faced by all studies based on used-asset prices:

1. Censored Sample. A sample of prices only represents surviving assets. Assets that have been scrapped will be excluded from the sample. Thus, a depreciation estimate based on prices of surviving assets will under-estimate the true depreciation rate. Hulten and Wykoff correct for this by weighting used asset prices by estimates of the probability of survival.

2. Quality. The prices observed in markets for used assets may not reflect the actual value of the stock of used assets. The used asset market may be dominated by assets that are either above or below the average quality of the population of used assets. Assets may be worth more to buyers than to sellers, or vice versa. Buyers may under or over estimate the value of used assets. Neither the extent nor the direction of the quality bias is certain.[326]

One aspect of the quality bias, Ackerloff's[327] "lemons" problem, has been emphasized in the literature on depreciation.[328] This problem occurs when buyers have difficulty determining the quality of the asset, and sellers bring to market a large proportion of low quality assets. To the extent that the "lemons" problem characterizes the market for used assets, observed asset prices would underestimate the value of the entire population of used assets, and depreciation would be overestimated.

Lemons, however, may not plague markets for used assets. Hulten and Wykoff[329] argue that businesses employ knowledgeable professional agents, so buyers are well informed about the quality of prospective purchases. In addition, dumping lemons may not be the sellers' primary motivation for bringing used assets to market. Sales are likely to be motivated by mergers, by expansions or contractions or changes in lines of business, by cash-flow problems, and a host of other things, in addition to the desire to unload "lemons." Hulten and Wykoff also argue that the similarity between the age-price profile for assets which on a priori grounds are

[324] Fraumeni (1997), Gravelle (1999).
[325] Hulten and Wykoff (1996).
[326] Fraumeni (1997).
[327] Ackerloff (1970).
[328] Hulten and Wykoff (1981a) and (1996).
[329] Hulten and Wykoff (1981a) and (1996).

unlikely to be plagued by a lemons problem and the profile for other assets is inconsistent with a serious lemons problem.[330]

3. Economic Changes. Changes in taxes, changes in interest rates, economic shocks, other sources of obsolescence, and the business cycle all may affect depreciation.[331] There is no reason to expect that depreciation rates would be invariant in the face of such changes even if, under stable economic conditions, depreciation could be characterized by a single geometric rate. Unless controlled for, these factors may bias estimated depreciation rates.

The extent of this bias, and even its overall direction, is not clear a priori, as it may depend on the particular factors changing, and the way that they change. Gravelle,[332] for example, argues that effect of changes in tax depreciation on economic depreciation depends on the relationship between tax rules governing new and those governing used assets. Furthermore, as mentioned above, several papers have found that depreciation rates (or age-price profiles) are fairly stable over time, despite change in underlying factors affecting used asset prices. Others, however, have found that depreciation rates (age-price profiles) may have shifted somewhat over time.[333] After a careful review, Fraumeni[334] concludes that there is no definitive answer to the question of whether depreciation rates (or age-price profiles) are stable over time.

4. Homogeneity. Capital assets differ from each other. All cars are not the same, nor are all buildings. Some assets may have been carefully maintained, while other may have been run down. Buildings often come packaged with land, and it can be difficult to separate the value of land from the value of the building. This problem also has a time dimension, the vintage effect.[335] Assets constructed at different points in time may vary in features that make them more or less desirable. Older buildings may be more sturdily constructed than are new buildings. The whims of fashion may increase the price for buildings of a certain style. Technological advance may make new assets more productive than older assets. It is difficult or impossible to fully control for the effects of these differences on the prices of used assets, and some of them get mixed up with depreciation. The direction of the bias is unclear a priori, as it depends on the particulars of each case.

E. Other Depreciation Studies

Depreciation studies can be classified into two broad camps. Those that are based on prices, and those that employ other techniques.

1. Price-Based Studies

Several literature reviews suggest that the Hulten-Wykoff depreciation rates are consistent with many, but not all, of the other studies based on price data.[336]

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[330] Hulten and Wykoff (1981a).
[331] Taubman and Rasche (1971) and Feldstein and Rothschild (1974).
[332] Gravelle (1999).
[333] Leigh (1979) and Wykoff (1970).
[334] Fraumeni (1997).
[335] Gravelle (1999), Hulten and Wykoff (1981a).
[336] Fraumeni (1997), Jorgenson (1996), and Gravelle (1999), and Hulten and Wykoff (1981a).

Most of the other used-price studies focus on only one, or at most a few assets. An exception to this is the Koumanakos and Hwang study of Canadian assets, which included 27 classes of assets and 43 industries.[337] This study is similar in several respects to the Hulten-Wykoff study, and comes to broadly similar conclusions. In particular, it concludes that geometric depreciation is a reasonable assumption for the depreciation patterns for individual assets and for industries.

A large number of studies have estimated depreciation rates for business use of various types of equipment. Several studies have focused on automobiles, trucks, or farm tractors. Many studies of these transportation assets find that a constant geometric rate of depreciation may be a reasonable approximation, even if depreciation is not exactly geometric,[338] while other studies assume that depreciation is geometric.[339] Studies of autos and trucks by the Office of Tax Analysis (OTA) find age price profiles that initially decline more rapidly than under straight-line, and to that extent are consistent with geometric depreciation.[340] The numerical values of the Hulten-Wykoff depreciation rate for autos, trucks and tractors is in rough agreement with depreciation rates estimated by several other researchers.[341] In a recent study of machine tools, Oliner concluded that a constant geometric rate is not the best way to characterize depreciation of this asset, but Beidleman's results are consistent with geometric depreciation for machine tools.[342] Despite this ambiguity, the size of Oliner's and Beidleman's estimates are broadly consistent with Hulten and Wykoff's estimate of depreciation for machine tools. In contrast, recent papers studying computers generally do not support a geometric rate of depreciation.[343] Papers studying ships also obtain depreciation patterns and rates that are inconsistent with those reported by Hulten and Wykoff.[344] An OTA study of scientific instruments reports age-value profiles that Fraumeni interprets as approximately geometric in shape.[345]

There also is a large empirical literature that estimates depreciation rates for residential and nonresidential buildings. Some of these studies are based on age-price profiles. A similar approach looks at age-rent profiles.[346] As with equipment, the literature is not entirely consistent in its results. Nonetheless, reviews conclude that a constant rate of geometric depreciation is a reasonable assumption to make for buildings. The Hulten-Wykoff estimates, moreover, appear to be in line with the balance of estimates on the depreciation of structures (whether price based or otherwise), which Gravelle puts at between 2 percent and 4 percent.[347] A recent empirical study by Deloitte and Touche also finds depreciation rates for structures that range between 2 percent and 4 percent.[348]

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[337] Koumanakos and Hwang (1988).
[338] Wykoff (1970 and 1989), Hall (1971), and Ohta and Griliches (1975).
[339] Ackerman (1973), Cagan (1971), and Griliches (1960).
[340] OTA (1991a) and (1991b).
[341] See the comparisons in Hulten and Wykoff (1981a) and Wykoff (1989).
[342] Oliner (1996) and Beidleman (1976).
[343] Oliner (1992 and 1993).
[344] Fraumeni (1997) and Hulten and Wykoff (1981a).
[345] OTA (1990) and Fraumeni (1997).
[346] Rental studies are similar to used price studies in that both use market prices to estimate depreciation. These studies also share some econometric problems, such as the vintage-price bias. The two approaches are not identical, however, as rental studies avoid the lemons problem, but face the problem of how to adjust for unrented units and for long-term fixed price rents. See Hulten and Wykoff (1981a) and Gravelle (1999).
[347] Gravelle (1999).
[348] Deloitte and Touche (2000).

2. Non-Price Approaches

Other approaches to estimating depreciation include the retirement approach, the investment approach, the polynomial benchmark approach, and the factor demand approach.

The retirement approach estimates retirements, or withdrawals, from the capital stock. It then applies these estimates to an assumed depreciation pattern to get an estimate of total depreciation. Until recently, the Bureau of Economic Analysis used a retirement approach.[349] Hulten and Wykoff[350] compared their depreciation rates to those implied at the time by the BEA methodology and found substantial differences for particular assets. On average the Hulten Wykoff rates are somewhat smaller than the BEA rates for both equipment and structures, but the difference between the two for equipment is fairly small. This comparison may be somewhat dated, however. Nadiri and Prucha[351] report an average BEA depreciation rate of 3.4 percent for the manufacturing sector, substantially below the BEA figures reported in Hulten and Wykoff, as well as below the 7.9 percent weighted average of Hulten and Wykoff's estimated rates.[352]

The investment approach estimates depreciation using a model of investment behavior. Robert Cohen's[353] work is closely associated with the investment approach. His results are broadly supportive of geometric depreciation at the industry level for aggregate equipment and aggregate structures.[354]

The polynomial benchmark approach uses a perpetual inventory equation to estimate depreciation. The perpetual inventory formula links the stock of capital to net investment and depreciation, with depreciation based on last year's capital stock: $K_t = I_t + \delta K_{t-1}$, where K is capital, I is net investment, and δ is the (constant) geometric depreciation rate. Because these studies assume that depreciation is geometric, they cannot directly address whether geometric depreciation is the most appropriate pattern for depreciation. The polynomial benchmark approach has been used to study depreciation of equipment in Japan.[355] The Japanese depreciation rates differed substantially from their Hulten-Wykoff counterparts. The polynomial benchmark approach also has been used to estimate depreciation for housing in the U.S., and the estimated rates are roughly similar to Hulten and Wykoff's. Polynomial benchmark studies sometimes find, however, that depreciation rates vary over time and between rental and owner-occupied residential structures.[356]

Some papers have estimated depreciation using a factor demand approach. This approach estimates a depreciation rate that is a component of the demand for factors or of the production function. Nadiri and Prucha is an example of a recent study that uses a factor demand approach. They estimate a depreciation rate of 5.9 percent for physical capital in the

[349] The BEA has recently switched to measures of depreciation that are largely based on the Hulten-Wykoff estimates as discussed in Fraumeni (1997).
[350] Hulten and Wykoff (1981a).
[351] Nadiri and Prucha (1996).
[352] Calculated by the Office of Tax Analysis using 1996 capital stock weights.
[353] Cohen (1975) and (1980).
[354] Hulten and Wykoff (1981) and Cohen (1980).
[355] Hulten and Wykoff (1981a).
[356] Gravelle (1999).

manufacturing sector. This is somewhat smaller than the 7.9 percent weighted average of the Hulten-Wykoff depreciation rates for the U.S. economy. Nadiri and Prucha also report that their estimate is smaller than estimates in several older papers that use a factor demand approach; these older papers estimate a depreciation rate ranging between 10 percent and 14 percent. Doms[357] is another recent paper that uses the factor demand approach. He finds that geometric-like depreciation is roughly consistent with plant-level data for the U.S. steel industry.

[357] Doms (1996).

APPENDIX 2

EXPERIENCE OF THE DEPRECIATION ANALYSIS DIVISION (DAD)

A. History of DAD

In September 1987, Treasury established the Depreciation Analysis Division (DAD) within the Office of Tax Analysis. That division, established in accordance with the mandates of the 1986 Act was created to monitor and analyze actual depreciation and to recommend asset class lives for assets that did not have ADR guideline lives or to replace existing ADR guideline lives. Over the next several months, DAD announced its intention to study four classes of assets (and, over time, an additional eleven classes of assets) and held public meetings with industry representatives to discuss the nature of the information needed for its studies and how that information might be obtained. In general, the information was to be obtained through special surveys of owners and operators of the assets whose depreciation was being examined. The scope of each study, the nature of the survey instruments, the potential survey recipients, the timetable for conducting the survey and other related issues were negotiated with industry representatives in a series of public meetings.[358]

Two of the asset classes initially chosen for study - clothing held for rental (tuxedos) and scientific instruments - were mandated by the 1986 Act. Studies of two other asset classes - cars and light trucks - were mandated by the Omnibus Budget Reconciliation Act of 1989. Three of the asset classes chosen for study - horses (primarily racehorses), fruit and nut trees, and crop-bearing vines (such as grapevines) - were chosen because these assets did not have class lives, and in the legislative history to the 1986 Act Congress indicated that such assets were to be given priority of study.[359] The other depreciation studies initiated - assets used in the electronics industry, assets used in television and radio broadcasting, assets used in the cable television industry, assets used in the manufacture of fabricated metal products, assets used in the manufacture of motor vehicles, assets used in the chemical industry, assets used in the telecommunications industry, and aircraft and air transport assets - were chosen because of their importance in the economy, the apparent disparity between their existing class lives and their implied class lives based on the 1981 Hulten-Wykoff geometric depreciation rates, their relationship to other assets under examination, or because they presented methodological issues (such as how to deal with the issue of technological obsolescence) that needed to be addressed.

Although Treasury always had the authority to administratively change depreciation classes and class lives, and initially retained that authority after enactment of the 1986 Act, not long after DAD announced its intention to study the depreciation of aircraft and air transport assets, the Congress repealed that authority in the Technical and Miscellaneous Revenue Act of

[358] Because the surveys were to be sent to a large number of businesses, the Office of Management and Budget also had to approve the survey instrument used to obtain the required information.

[359] The legislative history of TRA 86 also indicated that the Congress desired that Treasury give priority to a study of racehorses and older horses.

1988. Henceforth, although Treasury was still required to study asset depreciation, it could only report the results of its studies to the Congress.

As might be expected, owners of assets who felt that the existing class lives assigned to their assets were too long sought DAD's assistance in documenting such evidence. Conversely, owners of assets who were comfortable with the existing assignment of class lives to their assets suggested reasons why DAD should not give priority to an examination of their assets. For most assets, the data required to establish the appropriate class life for an asset class could only be obtained from owners and operators of those assets. However, as discussed below, it frequently was the case that the determination of the actual depreciation of an industry's assets on the basis of the information provided by the business community was problematic.

B. Absence of a Used Asset Market

As noted earlier, economic depreciation may be defined as the annual decline with age in the value of a durable asset, suitably adjusted for inflation. There are several possible value measures that might be considered. If there is a meaningful used asset market, the resale prices of the asset at different ages generally provides the cleanest measure of economic depreciation. However, if the only resale data available are those compiled from distress sales or from the sale of an entire business, the use of such data would be questionable.[360]

For a number of assets, primarily those that are often leased and used in many industries, such as aircraft, cars, and light trucks, the determination of a class life was relatively straightforward, and involved relatively few conceptual or methodological issues. For such assets, a meaningful used asset market exists and information regarding the dispositions of used assets of varying vintage is generally available. However, assets such as certain distribution assets used in the telecommunications and cable television industry, where the cost of installation or removal is very significant, generally are neither acquired nor sold (except for scrap value) after their initial use. For some types of assets used in the chemical and electronics industries, environmental hazards associated with the used assets precludes their sale. For tuxedos, the owner's desire to avoid having the existence of a stock of used assets competing with the rental of newer assets generally results in the destruction, rather than sale, of the older assets. In general, only relatively mobile used assets, especially those that can be used by several different industries or used in less critical functions in the same industry, are likely to be bought and sold in a competitive market. This was one of the most difficult problems encountered by DAD.

Absent a meaningful used asset market, the value-in-use of a class of assets might provide an adequate measure to determine the economic depreciation of assets in that class. In this alternative method (sometimes referred to as the rental or income method), the decline in the value-in-use of an asset can be estimated from the pattern of rentals with age if the assets are rented (as was done in DAD's study of the depreciation of tuxedos), or may be inferred from the

[360] Although a number of unsolicited industry-sponsored depreciation studies submitted to DAD recognized that used asset sales were relatively infrequent, and thus focused on alternative methods of analysis, a few sought to determine the economic depreciation of the assets involved using resale data involving less than 2 percent of all asset dispositions, or data representing so few sales of relatively young assets that over ninety-five percent of the sales were at a price of less than ten percent of the asset's initial cost. DAD did not find the results of analyses based on such evidence compelling.

decline in productivity of the asset with age (as was done in DAD's study of the depreciation of fruit and nut trees).

However, relatively few assets are typically rented, or allow a ready determination of the decline in their productivity with age. More commonly, in any enterprise a broad mix of depreciable assets is used in combination with a variety of intangible assets (including managerial skills) to produce a revenue stream (that may also be subject to business cycle shocks), so that disentangling the decline in productivity with age of the depreciable assets from a knowledge of the decline over time in the overall productivity of the enterprise may be quite problematic.[361] At a minimum, the use of such methods put a premium on the appropriate asset classification scheme. Only an asset class sufficiently broad so as to encompass the mix of depreciable assets required for revenue generation would appear appropriate for such analysis. Moreover, the determination of the depreciation of such assets would need to account for the future replacement of the shorter-lived assets within that mix.[362]

In addition to measuring economic depreciation, DAD was also required to determine the useful lives of the assets examined, which can provide a bound on the potential range of economic depreciation. DAD found that, once an asset had been fully depreciated, the accounting records of many companies were not well suited to provide information on whether the asset was still owned by the company, and if so, where within the company it was located. This is not surprising, because accounting systems are designed to provide information needed by the company, and few companies appeared to need such information regarding their older assets. However, this limitation suggests that the results of alternative methods of estimating depreciation that rely heavily on the accounting records of the company (such as a perpetual inventory approach) should be viewed with caution.

C. The Problem of Technological Obsolescence

Several industries suggested that technological obsolescence was a more important factor in the disposition of their assets than was the physical decline with age. The decline in value of their assets was said to be associated with the introduction of newer vintages of assets that are more productive, offer reduced operating costs or are superior in other ways to the existing vintages of assets. Some degree of continuing technological obsolescence is typically captured in the resale price data for used assets, so that a moderate level of technological obsolescence may not be troublesome in the determination of actual depreciation where used asset markets exist. Even for such assets, however, some industries claimed that technological change would occur more frequently than had been experienced in the past, thus reducing the value of the results obtained.

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[361] A few of the unsolicited industry-sponsored depreciation studies received by DAD that focused on assets used to manufacture products incorporating world-class technological innovation effectively attributed all of the decline over time in product sales margins to a decline in productivity of the assets used to manufacture the products; none of the income generated was attributed to the intangibles generated by the industry's research activities. DAD did not find such evidence compelling.

[362] Unfortunately, the class life of such asset classes (such as the existing industry-oriented asset classes) is highly dependent upon the particular mix of assets in the class, which is likely to vary over time with changes in both technology and industrial organization.

Moreover, it was often suggested by an industry that the introduction of these technologically superior assets would trigger an abnormally rapid disposition of assets of earlier vintage, and thus the pattern of their future asset dispositions may be anticipated to reflect the pattern of anticipated future technological innovation in their industry. More specifically, they suggested a paradigm in which the interval between the onset of succeeding generations of technology, rather than the age of the assets owned, essentially determines the pattern of asset investment and disposition in their industry. This paradigm implies that the prices for used assets of a given generation (if observable) would be more dependent on the specific date at which the assets are sold, and not on their age.[363]

Examination of high-tech asset survivor curves (based on industry property records) could offer evidence of "avalanche curves" reflecting the abnormal disposition of earlier generations of assets, although continued growth in demand for the goods or services produced by the earlier generations of assets may reduce the rapidity of the avalanche.[364] While DAD acknowledged the potential importance of technological innovation and the need to develop a methodology which would adequately reflect its impact on asset depreciation, it was reluctant to accept the assumptions inherent in the suggested paradigm absent evidence suggesting the initiation of one or more cycles of technology substitution and the availability of adequate historical data to estimate the rates of transition.[365] Although recognizing the limitations of historical data, DAD was not convinced that all technological innovations are likely to result in an avalanche of asset disposals. DAD also wondered about the extent to which the increasing modularity of asset components might prevent the occurrence of some avalanches, and more generally, how to validate judgements regarding the timing of future avalanches.

By itself, DAD did not have the data or technical expertise required to conduct analyses reflecting that paradigm. It recognized that such expertise may reside within an industry, but if it could not rely on historical data, it required assurance that the implied projections of future asset acquisitions and dispositions were consistent with the actual investment and financial planning of the companies in the industry. However, information regarding company planning was viewed by most of the companies in the high-tech industries that DAD had contacted as highly proprietary. Absent the sharing of company planning information, the determination of the economic depreciation of these assets appeared to be an even more difficult task that contributed to DAD's inability to complete studies of the depreciation of assets used in a number of high-tech industries.[366]

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[363] Based on unsolicited material given DAD by the computer industry, this characterizes the market for used computers, although evidence of this was not presented.

[364] Based on unsolicited material given to DAD by the telecommunications industry, the shift from electromechanical to electronic switching did appear to provide evidence of an avalanche curve, although the transition lasted for more than a decade.

[365] The Fisher-Pry methodology that has sometimes been used to forecast the pattern of substitution of one technology for another was intended to be used with sufficient historical data as to allow the determination of the transition rate. Although the methodology can be extended to apply to sequential technology substitutions, such approach would make even greater demands on data availability.

[366] DAD's unwillingness to accept at face value industry-sponsored reflected its understanding of its responsibility under the 1986 Act.

D. Summary of DAD Reports

In August 1989, DAD submitted a report to the Congress on the depreciation of tuxedos. In March 1990, DAD submitted separate reports to the Congress on the depreciation of scientific instruments, fruit and nut trees, and racehorses. DAD submitted reports to the Congress on the depreciation of cars in April 1991, and on the depreciation of light trucks in September 1991.

The first study, *Report to the Congress on the Depreciation of Clothing Held for Rental*, primarily focused on the depreciation of rental tuxedos. The study found that the average useful life of a rental tuxedo is 3.7 years, and their average economic life is 1.9 years. Based on these findings, Treasury recommended that if clothing held for rental were to constitute a separate asset class, that asset class should be assigned a 2-year class life. However, it did not specifically recommend the establishment of a separate asset class for rental clothing, which under current law is considered part of asset class 57.0 (assets used in the Distributive Trades and Services) with a class life of 9 years.

The second study, *Report to the Congress on the Depreciation of Scientific Instruments*, analyzed information on the useful lives and dispositions of eight specific types of scientific instruments from 262 firms in a variety of industries (such as the chemical, electronic, health and research service industries) that use scientific instruments. The results of this study concluded that the existing range of class lives to which scientific instruments are currently assigned (the class life depends on the specific industry using the instruments) appear appropriate.[367]

The third study, *Report to the Congress on the Depreciation of Horse*s, found that the average useful life of all horses is 8.8 years, while their economic life is 10.6 years if the appreciation in value of the more successful horses is ignored, and 12.7 years if it is taken into account. The study concludes that the existing distinction between racehorses and horses used for work or breeding is at variance with the general criteria established in the 1986 Act for determining class lives. Treasury thus recommended that all of the existing asset classes relating to horses (Asset classes 01.221, 01.222, 01.223, 01.224, and 01.225) be combined into a single asset class with a 10-year class life (and a 7-year recovery period).

In *Report to the Congress on the Depreciation of Fruit and Nut Trees* DAD estimated that the economic life of fruit and nut trees ranged from 23 to 70 years, with an average economic life of 61 years. Because most of the data related to fruit and nut trees grown in California, and economic conditions might be different elsewhere, the study did not make any specific recommendations.

The last two studies, *Report to the Congress on the Depreciation of Business-Use Passenger Cars and Report to the Congress on the Depreciation of Business-Use Light Trucks,* concluded that the average economic life of business-use passenger cars (including both fleet and non-fleet investment) ranged from 3.5 to 3.8 years (depending on the weight assigned to non-fleet investment), and that the average economic life of light trucks was 4.5 years. Treasury thus

[367] DAD noted that it would require at least a 600-percent declining balance pattern of productivity decline (for which there was no evidence) to conclude that scientific instruments should have a shorter recovery period than the 5- to 7-year recovery periods allowed under current law.

recommended that the class life of asset class 00.22 (Automobiles, Taxis) be increased from 3 years to 3.5 years, and that the class life of asset class 00.241 (Trucks with an unloaded weight of less than 13,000 pounds) be increased from 4 to 4.5 years. Since both passenger cars and light trucks were assigned a recovery period of five years for both the regular and alternative depreciation system, these recommended increases in class lives would not have affected the depreciation claimed with respect to these assets. In addition to the overall estimated economic lives, these studies also determined estimated economic lives for various sub-classes of passenger cars (by size, with imported cars grouped together) and trucks (by gross vehicle weight rating).

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