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by

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ABSTRACT

What would you do if on January 13, 2016, you had won the $1.5 billion Powerball jackpot? The prize gives you the choice of a smaller lump sum now or the full jackpot parceled out for years to come. For the New York Times and numerous financial experts, the right choice is clear: take the money over time. While lump sums are nice, they are not worth a big discount when compared to "ultrasafe" income streams (like the Powerball annuity), especially in an "ultralow interest rate environment."

What everyone understands about Powerball seems to elude us when it comes to the United States' largest corporate tax expenditure. "Accelerated depreciation" rules give taxpayers a lump sum deduction now, rather than the gradual deductions they would normally claim. Called tax law's "standard method for combating recessions," accelerated depreciation has become the most important tax policy affecting businesses because it is thought to be an effective if costly way to stimulate the economy, particularly during tough economic times.

I argue, to the contrary, that accelerated depreciation debates ignore the lessons of Powerball. Like lottery payments, gradual depreciation deductions are highly certain, making them far more valuable than has been assumed. As a result, replacing them with accelerated depreciation is far less valuable than has been assumed. Further, the benefits of accelerated depreciation plummet during and following recession—precisely when these policies tend to be expanded. I illustrate these points with a numerical

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example exposing when real firms paid extra taxes (and the government collected extra revenue) as a result of the government's purported stimulus program.

INTRODUCTION

When, on January 13, 2016, the Powerball lottery reached a jackpot of $1.5 billion, the largest lottery prize in history,[1] financial experts published advice in many popular media outlets.[2] They urged the future lottery winner to forgo the tempting immediate lump sum payment and instead to choose to receive the winnings gradually in the form of an annual annuity. As they correctly observed, while money now is more valuable than money in the future, that differential is small in the case of "ultrasafe" gradual income streams (like the Powerball annuity[3]) and even smaller in "ultralow interest rate environment[s]"[4] (like those that occur in many economic recessions and recoveries, including our current recovery).

Given the dollars at stake for the lottery winner and the accessibility of the financial principles that gradual income streams retain more value relative to lump sum payments when they are low risk and paid when interest rates are low, it is not surprising that the "take the annuity" advice received such widespread and positive attention.[5] What is surprising is that these same principles generally are not applied to more frequent decisions made by more actors with hundreds of billions more dollars at stake—businesses' decisions

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1. Susie Poppick, *The Powerball Payout is Now $1.5 Billion, the Highest Prize in the History of North America*, TIME MONEY (Jan. 12, 2016, 1:25 PM), http://time.com/money/4171621/powerball-lottery-jackpot-record/ ("Until now, the record for the highest jackpot in North America has been $656 million, for a Mega Millions drawing in 2012."). Even presidential candidate Hillary Clinton "joined the frenzy and purchased a Powerball ticket." Eliza Collins, *Clinton: I'd Use Powerball Winnings to Fund Campaign*, POLITICO (Jan. 13, 2016, 12:00 PM), http://www.politico.com/story/2016/01/hillary-clinton-powerball-217715.

2. *See, e.g.*, Josh Barro, *Financial Advice for the Powerball Winner*, N.Y. TIMES, Jan. 14, 2016, at A3; Libby Kane, *Here's Mark Cuban's Advice for Whoever Wins the $1.5 Billion Powerball Lottery*, BUSINESS INSIDER (Jan. 12, 2016, 8:54 AM), http://www.businessinsider.com/mark-cuban-advice-powerball-lottery-winners-2016-1 (counting over 1 million views on Mark Cuban's advice "Don't take the lump sum.").

3. The lottery annuity is paid by the multi-state government operators of the lottery. POWERBALL, http://www.powerball.com/pb_about.asp (last visited Nov. 18, 2016). While the annuity payments to lottery winners are "ultrasafe" they are not entirely free of risk. *See, e.g.*, Tina Sfondeles, *Budget Impasse Means Big Winners Can't Be Paid, Lottery Says*, CHICAGO SUN TIMES (Aug. 28, 2015, 1:29 PM), http://chicago.suntimes.com/news/budget-impasse-means-big-winners-cant-paid-lottery-says (lottery payments were delayed during state budget impasse).

4. Barro, *supra* note 2, at A3.

5. *See supra* note 2.

about whether to forfeit the annual annuity-like tax savings offered by gradual depreciation in favor of the lump-sum-like savings offered by accelerated depreciation.

For decisions about accelerated depreciation (by which I mean any tax policy that allows tax deductions for asset depreciation to outpace the actual economic decline in an asset's value), the stakes could not be higher. Accelerated depreciation is among the most important and, by widespread accounts, costly tax policies we have. Government estimates of the cost[6] of accelerated depreciation are huge. For example, the government estimates that two forms of accelerated depreciation—the immediate expensing and bonus depreciation provisions enacted by the Protecting Americans from Tax Hikes Act on December 18, 2015—will decrease its revenue collections by one hundred and seventy *billion* dollars over the next four years alone.[7] Accelerated depreciation has been a significant tax expenditure for decades[8] and is often the largest corporate tax expenditure.[9]

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6. Throughout this paragraph, the term "cost" refers to the tax expenditure cost, which is a measure of how much less revenue is collected due to a tax break. *See infra* notes 99-102 for a description of why tax expenditure estimates, which do not discount cash flows to their present values and do not account for cash flows outside of a ten-year budget window, do not intend to or succeed in measuring accelerated depreciation's real, cumulative economic costs to the government.

7. *See* JOINT COMM. ON TAX'N, 114TH CONG., JCX-143-15, ESTIMATED BUDGET EFFECTS OF DIVISION Q OF AMENDMENT #2 TO THE SENATE AMENDMENT TO H.R. 2029 (RULES COMM. PRINT 114-40): THE "PROTECTING AMERICANS FROM TAX HIKES ACT OF 2015" 2 (2015) (estimating in line I.A. 15 a negative $54.589 billion budget effect for 2016-2020 for permanent extension of section 179 immediate expensing; and estimating in line I.B.3 a negative $116.901 billion budget effect for 2016-2020 for extension with phase down of section 168(k) bonus depreciation). According to the rules of a 2005 Joint Committee on Taxation Report, none of these estimates discount future receipts to present values or otherwise account for the time value of money. JOINT COMM. ON TAX'N, 109TH CONG., JCX-1-05, OVERVIEW OF REVENUE ESTIMATING PROCEDURES AND METHODOLOGIES USED BY THE STAFF OF THE JOINT COMMITTEE ON TAXATION 12 (2005) [hereinafter JCX-1-05]. For the discussion of the purposes and limitations of tax expenditure estimates, see *infra* Part I.F. This estimate does not include the tax expenditure cost of pre-existing forms of accelerated depreciation, including the accelerated recovery periods and double-declining-balance method of depreciation already incorporated into tax law's Modified Accelerated Cost Recovery System (MACRS).

8. *See* JOINT COMM. ON TAX'N, 114TH CONG., JCX-18-15, BACKGROUND INFORMATION ON TAX EXPENDITURE ANALYSIS AND HISTORICAL SURVEY OF TAX EXPENDITURE ESTIMATES 18 (2015) ("[S]ome form of accelerated depreciation is present on every list" of the ten largest "corporate tax expenditures at five-year intervals beginning with fiscal year 1975."). According to the rules of JCX-1-05, *see supra* note 7, this estimate does not discount future receipts to present values or

When a business elects to accelerate depreciation, it receives a lump sum-like tax benefit but forfeits or reduces the gradual stream of tax benefits that it would have otherwise received through gradual depreciation. If the tax benefits are of the same size and vary only in timing, then accelerating their receipt increases their present value. "[T]he present worth of the tax [savings] from the depreciation increases as the [savings] are shifted closer to the present."[10]

Value increases, but by how much? The lessons of Powerball show that the differential is small in the case of "ultrasafe" gradual income streams and even smaller in an "ultralow interest rate environment." Since information about the sources of risk to the income streams produced by gradual depreciation has been sparse and incomplete,[11] this article details

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otherwise account for the time value of money. For the discussion of the purposes and limitations of tax expenditure estimates, see *infra* Part I.F.

9. *See infra* note 105 and accompanying text; *see also infra* Part I.F. Since accelerated depreciation is available to pass-through and disregarded entities as well as corporations, these official corporate tax expenditure estimates show only part of the importance of tax policies that allow or require the acceleration of depreciation. *See infra* note 106 and accompanying text (estimating tax expenditure cost of providing accelerated depreciation to pass-through and disregarded entities).

10. E. Cary Brown, *Business-Income Taxation and Investment Incentives*, *in* INCOME, EMPLOYMENT AND PUBLIC POLICY: ESSAYS IN HONOR OF ALVIN H. HANSEN 300, 309 (1948).

11. To this author's knowledge, the most extensive previous discussion of the sources of risk to depreciation income streams was by Lawrence Summers in 1987. Lawrence Summers, *Investment Incentives and the Discounting of Depreciation Allowances*, *in* THE EFFECTS OF TAXATION ON CAPITAL ACCUMULATION 295 (Martin Feldstein ed., 1987). In a single paragraph, Summers discusses the sources of risk to depreciation income streams as follows: "The assumption that prospective depreciation deductions represent a riskless asset has been maintained so far. In fact, future depreciation deductions are subject to some risks. Depreciation deductions will be useless for firms that make losses and become nontaxable and are unable to make use of carryback and carryforward provisions. The results of Auerbach and Poterba . . . suggest that this is not an important factor for most large firms. There is also the possibility of changes in tax rules. Since depreciation deductions represent a hedge against changes in tax rates, this source of uncertainty may drive the appropriate discount rate down rather than up. Finally, there is always the possibility that the depreciation rules will be changed with respect to assets already in place. This has never occurred in the United States. On balance, it seems fair to conclude that depreciation tax shields represent an essentially riskless asset." *Id.* at 298. This article draws on the work of Summers and seeks to provide a more thorough discussion of the sources of risk to depreciation deductions (including depreciable basis, depreciation method, tax rate change, inflation, and disposition of the asset); to observe that private businesses and government experts continue to use discount rates much higher than the riskless rate; and, most

those sources of risk and concludes that, collectively, they present very little risk. The income streams produced by depreciation deductions are "ultrasafe."

Although the income streams produced by gradual depreciation deductions are ultrasafe, business experts and government experts have valued them as though they are subject to an average level of risk (assessing them like the firm's average-risk investments[12] or the private sector's overall average-risk investments[13]). By assuming average-risk discount rates, these experts have underestimated the value of gradual depreciation and, as a result, overestimated the value of accelerated depreciation.

Of course, business experts are skilled at valuing future income streams. However, their common errors in valuing income streams from depreciation deductions can be traced to a source. A well-developed economics literature, including empirical and survey data, establishes that business experts fall prey to a widespread bias in how they calculate the present values of future income streams. As a result, they value future income streams based on assumed average levels of risk without proper regard to the unique risk characteristics of the particular income stream.[14] While this bias has been exposed in the economics literature since a 1958 article by Nobel Prize Laureates Franco Modigliani and Merton Miller,[15] it still affects the overwhelming majority of current businesses' decisions.

Similarly, government experts are skilled at estimating the costs and benefits of various long-term government policies, including depreciation policies. However, when they discount future costs and benefits to their present values, they also base their estimates on assumed average levels of risk, without regard to the income stream's specific risk characteristics.[16] Doing so likely helps avoid controversial battles over input selection and facilitates comparisons between alternative policies. However, average-risk discount rates (like the 7% discount rate that government experts use for accelerated depreciation)[17] are particularly ill-suited for programs with predictable costs and benefits that are not just affected by the discount rate;

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importantly, to describe the effects of recent recessions on the value of accelerated depreciation.

12. *See infra* notes 161–171 and accompanying text.

13. *See infra* notes 174–184 and accompanying text.

14. *See infra* Part II.E (describing business experts' widespread use of a weighted average of the rates of interest they must pay lenders and the rates of return they must pay equity investors to discount future income streams).

15. *See infra* note 160.

16. *See infra* Part II.F (describing government experts' widespread use of an outdated measure of the rate of return on "*an average* investment in the private sector" to discount future costs and benefits) (emphasis added).

17. *See infra* notes 174–175 and accompanying text.

they are almost entirely a function of the discount rate.[18] Since accelerated depreciation primarily changes the timing–not the amount–of predictable benefits, the use of an average-risk discount rate distorts cost-benefit estimates to an especially large degree.

By applying average-risk rather than cash-flow-specific-risk discount rates, firms overestimate how much tax they save and the government overestimates how much revenue it loses due to accelerated depreciation policies. These errors are compounded during "ultralow interest rate environment[s],"[19] such as occur during many recessions and recoveries, including our current recovery. Yet the U.S. government often extends and expands accelerated depreciation *because* the economy is weak.[20] For example, accelerating depreciation was the primary method by which U.S. tax policy aimed to respond to the recessions beginning in 2001[21] and late 2007,[22] two recessions associated with ultralow interest rates.[23] In other words, accelerated depreciation was expanded at the very times when errors overestimating its value were particularly acute and widespread. And these two examples are not isolated. Prominent tax scholars have identified accelerated depreciation as our government's "standard method for combating recessions."[24]

The article proceeds as follows: Part I reviews the history of accelerated depreciation, the motivations for accelerating depreciation in recession, and its mixed impacts on capital investment activities. Part II argues that despite widespread belief to the contrary, accelerated depreciation does not significantly increase the present value of depreciation

18. *See infra* Table 2 (showing that when tax rates are fixed, the value of accelerated depreciation is a function of the discount rate) and accompanying text.

19. Barro, *supra* note 2, at A3.

20. *See infra* Part I.C.1 (showing how section 179 was made more generous in response to recession); Part I.D.1 (showing how section 168(k) was made more generous in response to recession).

21. The recession from March 2001 to November 2001 is attributed to many causes, including the dot.com bust, the September 11, 2001, terrorist attacks, and the loss of investor confidence following Enron and other accounting scandals. Dates of recession are from the National Bureau of Economic Research. NBER Business Cycle Dating Committee, *U.S. Business Cycle Expansions and Contractions*, http://www.nber.org/cycles.html (last visited Nov. 18, 2016).

22. The recession from December 2007 to June 2009 (arguably lasting much later) is attributed to many causes including: the housing bust, excessive leveraging, tight credit markets, and high unemployment. *Id.*

23. *See infra* Part II.G (explaining why interest rates dropped during and following the two most recent recessions).

24. Michael G. Graetz & Alvin C. Warren, Jr., *Income Tax Discrimination and the Political and Economic Integration of Europe*, 115 YALE L.J. 1186, 1225 (2006).

deductions, especially during recession. The article contributes to the existing literature by more thoroughly identifying the sources of risk to depreciation income streams and observing that, collectively, they make depreciation income streams low-risk. Since the low-risk discount rate properly applicable to depreciation income streams often plummets during and following recession, recession itself significantly depresses the value of accelerated depreciation. This insight might previously have been obscured because the appropriate discount rates for average-risk income streams generally stay high or even increase during recession.[25] Part III argues the other side of that same coin. Just as recession makes accelerated depreciation much less valuable to firms, it reduces the amount of tax revenue that the government loses due to accelerated depreciation. Part IV shows that in 2012, many businesses lost money on their decisions to accelerate depreciation, even while assuming they had benefited, and the government increased tax revenue, even while assuming it had lost.[26] Part V discusses implications.

I. HISTORY AND INTENTIONS OF ACCELERATED DEPRECIATION

Accelerated depreciation aims to encourage capital investing by increasing the present value of the tax benefits associated with capital investing. When a business makes a long-term capital investment, it balances the initial outlay of cash to purchase the asset against two future income streams. First, it expects a profit stream since capital inputs help manufacture goods for sale, increase productivity, or otherwise produce profits. The profit stream is uncertain and is beneficial to the owner to the extent of its after-tax present value based on a discount rate that reflects the risk that actual future profits might deviate from expected future profits. Second, it expects a stream of tax savings since a purchaser of a capital input can deduct the purchase price gradually over time through depreciation deductions. Since the stream of tax savings from depreciation deductions is more certain than the profit stream, it should be discounted using a lower discount rate than applies to the asset's profit stream. Nonetheless, accelerating depreciation reduces the impact of discounting by allowing businesses to receive the stream of tax savings more quickly. "By shortening the period during which an asset's cost can be recovered, the present value of the tax savings is increased,"[27] which correspondingly increases the present value of the capital

25. *See infra* notes 122 and 191 and accompanying text.

26. To this author's knowledge, this article is the first to identify this unintended consequence of accelerated depreciation.

27. Christopher H. Hanna, *Tax Theories and Tax Reform*, 59 SMU L. REV. 435, 441 (2006); *see also* OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, ECONOMIC REPORT OF THE PRESIDENT, FISCAL YEAR 2004 (2004) at 44–

investment.[28] Efforts to stimulate capital investing through accelerated depreciation are extremely common in tax law, especially during and following recession.[29]

A. *Matching Depreciation to Decline in Asset Value*

Historically, tax law provided that depreciation deductions were to be taken gradually over the period of time an asset was expected to produce profit (the economic useful life of the asset) such that the cost to acquire the asset would be fully recovered by the end of the asset's useful life.[30] As the United States Tax Court explained in *Simon v. Commissioner*, "[t]he primary purpose of allocating depreciation to more than 1 year is to provide a more meaningful matching of the cost of an income-producing asset with the income resulting therefrom…"[31] Since the depreciation deductions

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45 ("Moving the depreciation closer to the time of new investment increased the present value of depreciation allowances and the net after-tax return on investment… These tax changes lowered firms' cost of capital and likely provided support for investment at a crucial time.").

28. *See, e.g.*, U.S. DEPT. OF TREASURY, THE CASE FOR TEMPORARY 100 PERCENT EXPENSING: ENCOURAGING BUSINESS TO EXPAND NOW BY LOWERING THE COST OF INVESTMENT 3 (2010); *supra* notes 10–25 and accompanying text.

29. *See supra* note 20.

30. Simon v. Comm'r, 68 F.3d 41, 44 (2d Cir. 1995) ("In its traditional incarnation, therefore, the pace of depreciation deductions was determined by the period of time that the asset would produce income in the taxpayer's business.").

31. Simon v. Comm'r, 103 T.C. 247, 253 (1994); *see also Simon*, 68 F.3d at 44 ("The original rationale for the depreciation deduction was to allow taxpayers to match accurately, for tax accounting purposes, the cost of an asset to the income stream that the asset produced."). *But see* Deborah A. Geier, *The Myth of the Matching Principle as a Tax Value*, 15 AM. J. TAX POL'Y 17, 20 (Spring 1998) (objecting to the view that tax depreciation is or should be about matching expenses with revenues and arguing that while matching is properly a feature of financial accounting depreciation, it is not properly a feature of tax depreciation); *id.* at 22–23 ("[T]he matching principle is not, properly understood, a tax value…Those provisions in the Code where matching seems to be memorialized should be understood as based on independent tax values that can be articulated independently. That a few of them require matching is descriptively accurate, but matching for the sake of matching is not the value underlying these provisions."); *id.* at 23 (providing section 1211, "which delays the deduction of realized capital losses until future years when it can be matched with capital gain inclusions" as an example of a matching provision supported by independent tax values since it prevents taxpayers from strategically realizing capital gains when rates are low and capital losses when rates are high).

Economic depreciation, which attempts to measure the actual decline in an asset's value for accounting purposes, still generally reflects this matching

associated with a capital investment and the tax liabilities associated with the profit stream from that same investment were both realized gradually, they offset each other to a meaningful extent. When tax rates increased, it increased the tax on profits produced by the investment but also made the offsetting depreciation deductions more generous.

Although tax law initially aimed to match depreciation deductions to the period of time in which an asset earned profits, it quickly departed from this aim. Tax depreciation has long been accelerated relative to economic depreciation even in non-recessionary times.[32] In connection with recent recessions, and especially since 2008, the acceleration of depreciation became much more rapid.[33]

B. Modified Accelerated Cost Recovery System (MACRS)

The tax system has provided for accelerated depreciation for many decades. Prior to 1954, the Code exclusively authorized straight-line depreciation, which allocates the total decline in asset value ratably over the recovery period.[34] Starting in 1954, owners of certain depreciable assets were offered the option to use the declining balance method,[35] which frontloads depreciation deductions so that greater deductions are taken earlier in an asset's recovery period.

In 1962, the Treasury Department promulgated "useful lives" for various classes of assets such that an asset would no longer be depreciated over its actual economic useful life but over a shorter recovery period that depended on the asset's classification.[36] In 1971, these recovery periods were shortened by another 20%.[37]

In 1981, a tax provision appropriately called the *Accelerated* Cost Recovery System (ACRS)[38] was enacted to stimulate the economy by

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principle. *See, e.g.*, Massey Motors, Inc. v. United States, 364 U.S. 92, 104 (1960) ("[I]t is the primary purpose of depreciation accounting to further the integrity of periodic income statements by making a meaningful allocation of the cost entailed in the use . . . of the asset to the periods to which it contributes.").

32. *See infra* note 48 and accompanying text.

33. *See supra* note 20.

34. Yoram Margalioth, *Not a Panacea for Economic Growth: The Case of Accelerated Depreciation*, 26 VA. TAX REV. 493, 505 (Winter 2007).

35. Act of August 16, 1954, ch. 736, Pub. L. No. 591, 68A Stat. 1.

36. Revenue Act of 1962, Pub. L. No. 87-834, § 13(b), (c)(1), 76 Stat. 960, 1034; Rev. Proc. 62–21, 1962–2 C.B. 418.

37. Revenue Act of 1971, Pub. L. No. 92-178, § 109(a), 85 Stat. 497, 508–09 (shortening recovery periods); Margalioth, *supra* note 34, at 506 (estimating the change at about 20%).

38. Economic Recovery Tax Act of 1981, Pub. L. No. 97-34, § 201(a), 95 Stat. 172, 203–04 (enacting I.R.C. § 168, Accelerated Cost Recovery System).

encouraging increased investment in depreciable assets.[39] Legislators hoped that "the more rapid acceleration of cost recovery deductions" would be "an effective way of stimulating capital formation, increasing productivity and improving the nation's competitiveness in international trade."[40]

The ACRS became our current Modified Accelerated Cost Recovery System (MACRS). MACRS accelerates depreciation through several techniques. It provides that: 1) the cost of an investment can be recovered (i.e., depreciated) as long as the investment is subject to "wear and tear,"[41] even if it is expected to increase in value;[42] 2) the cost of an asset is recovered over a recovery period that typically is much shorter than an asset's actual economic useful life;[43] 3) because the Code treats the salvage value for a depreciable asset as zero,[44] the full cost of an asset is recovered over the recovery period;[45] 4) for most depreciable assets other than real property, depreciation occurs via the declining balance method,[46] which frontloads deductions so that they are larger in the earlier years of an asset's recovery period; and 5) for most depreciable assets other than real property,

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39. H.R. REP. NO. 97-215, at 206 (1981) (Conf. Rep.), *reprinted in* 1981 U.S.C.C.A.N. 105, 152.

40. S. REP. NO. 97-144, at 47 (1981), *reprinted in* 1981 U.S.C.C.A.N. 105, 152.

41. I.R.C. §§ 167(a), 168(c) (depreciable property is trade or business or investment property that is subject to "exhaustion, wear and tear," or "obsolescence.").

42. Simon v. Comm'r, 68 F.3d 41, 43 (2d. Cir. 1995) (granting depreciation deductions during a period in which the depreciable assets appreciated in value since violin bows were purchased in 1985 for $21,500 and $30,000, were deemed depreciable in 1989, and were appraised in 1990 for $35,000 and $45,000).

43. I.R.C. § 168(e) (converting asset class lives to shorter recovery periods).

44. I.R.C. § 168(b)(4). Since the salvage value is treated as zero, the entire cost of a depreciable asset is recovered over time, rather than the smaller value actually used up by the taxpayer.

45. *See, e.g.*, *Simon*, 68 F.3d at 45 (rejecting arguments that depreciable property would retain value after use in a business based on "ERTA's explicit rejection of 'salvage value.'"); Clinger v. Comm'r, T.C. Memo. 1990-459, 60 T.C.M. (CCH) 598 (1990) (explaining that ERTA eliminated the concept of salvage value). Recall, however, that when a depreciated asset is sold, any excess of sale proceeds over the depreciated basis will be treated either as gain (to the extent that sale proceeds exceed the initial cost of the asset) or as depreciation recapture (to the extent that sale proceeds are less than the initial cost of the asset but greater than the adjusted basis as reduced by depreciation deductions).

46. I.R.C. § 168(b)(1) (making the default method the double-declining-balance method until the first taxable year "for which using the straight line method with respect to the adjusted basis as of the beginning of such year will yield a larger allowance.").

the half-year convention allows taxpayers to take a half-year's worth of depreciation in the year of purchase even if the asset is purchased toward the end of the year.[47] As a result of these techniques, tax depreciation far outpaces economic depreciation.

With each of these changes, "Congress' stated aim [in accelerating depreciation via MACRS] was to stimulate investment . . . and with this overriding goal in view it simply discarded accuracy of measurement as an objective for the tax law to pursue . . . [pursuing instead] a Congressional policy of encouraging growth and expansion."[48]

Although tax depreciation was accelerated relative to economic depreciation via MACRS, acceleration became much more rapid in response to recent recessions through the expansion of Internal Revenue Code section 179 (section 179) immediate expensing and the enactment and expansion of Internal Revenue Code section 168(k) (section 168(k)) bonus depreciation. These provisions allow a taxpayer to immediately deduct a significant portion of the basis of a depreciable asset in the year the asset is purchased. Since a large portion of the basis is recovered in the year of purchase, section 179 and section 168(k) significantly reduce the remaining depreciation deductions to be taken over the rest of the asset's recovery period.

C. Immediate Expensing

Section 179 authorizes a portion of a capital investment to be immediately expensed (in other words, deducted in the year of purchase). While section 179 initially aimed to simplify tax accounting for small businesses, it has been expanded in response to recent recessions to allow much larger businesses to immediately expense much larger portions of much larger investments.

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47. I.R.C. § 168(d)(1) (making half-year convention the default); I.R.C. § 168 (d)(4)(A) (defining half-year convention).

48. MARVIN A. CHIRELSTEIN, FEDERAL INCOME TAXATION 162–63 (9th ed. 2002). For a counterargument that the apparent acceleration in early depreciation tax policy was instead an indirect way of correcting for the lack of inflation adjusting in tax depreciation as part of an attempt to synchronize tax and economic depreciation and only later became accelerated relative to economic depreciation because of declines in the inflation rate, see Jane Gravelle, *Reducing Depreciation Allowances to Finance a Lower Corporate Tax Rate*, 64 NAT'L TAX J. 1039, 1043 (2011) ("Since the depreciation system is not indexed for inflation (i.e., depreciation deductions are based on original cost [of an asset] and lose value over time when inflation is present), the rate of recovery should be somewhat accelerated to make up for the loss in present value due to the lack of inflation indexing. [Although tax depreciation might now appear accelerated, a]t the time the system was developed, the expected inflation rate was about 5 percent. Currently, a more reasonable expectation is 2 percent ….").

1. History

Section 179 was enacted[49] to relieve small businesses of the burden of tracking gradual basis recovery for low-cost investments.[50] Initially, it allowed a taxpayer to immediately expense up to $2,000[51] of the cost of qualified investments. The $2,000 initial immediate expensing cap remained in effect for more than two decades. Over the following two decades, it slowly increased to $25,000.[52] In sum, for the first 45 years of its existence, the section 179 immediate expensing provision was subject to low caps, consistent with its goal of reducing tax compliance burdens for small businesses.[53]

In response to an economic recession, the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) significantly increased the scope of section 179 and the generosity of its benefits, apparently focusing less on simplifying tax compliance for small businesses and more on general economic stimulus. Because JGTRRA also increased the generosity of the benefits available under section 168(k) bonus depreciation, described below, it dramatically increased the percentage of a qualified investment that could be recovered in the year of purchase.

As the following table of maximum expensing allowances and bonus depreciation amounts shows, the acceleration of depreciation became much more rapid in response to recent economic recessions.[54]

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49. Small Business Tax Revision Act of 1958, Pub. L. No. 85-866, § 204(a), 72 Stat. 1606, 1679.

50. GARY GUENTHER, CONG. RESEARCH SERV., RL31852, SECTION 179 AND BONUS DEPRECIATION EXPENSING ALLOWANCES: CURRENT LAW, LEGISLATIVE PROPOSALS IN THE 113TH CONGRESS, AND ECONOMIC EFFECTS 5 (2014).

51. *See* Technical Amendments Act of 1958, Pub. L. No. 85-866, § 204, 72 Stat. 1606, 1679 (adding section 179 to the Code and providing in section 179(a) that "at the election of the taxpayer" an additional depreciation deduction shall be allowed in the year a section 179 asset is purchased "of 20 percent of the cost of such property" but limiting the dollar amount in section 179(b) "only to the extent of an aggregate cost of $10,000").

52. Small Business Job Protection Act of 1996, Pub. L. No. 104-188, § 1111(a), 110 Stat. 1755, 1758.

53. In fact, because the immediate expensing caps under section 179 generally are phased down and then out if a taxpayer places total section 179 property into service in a tax year in excess of set threshold amounts, the early benefits of section 179 were targeted at small businesses (or at least businesses with capped amounts of section 179 property).

54. The table is compiled from various sources. Protecting Americans from Tax Hikes Act of 2015, Pub. L. No. 114-113, Div. Q, § 124(a)(1), 129 Stat. 2242, 3053 (providing data for 2015–2019); Tax Increase Prevention Act of 2014, Pub. L. No. 113-295, 128 Stat. 4010 (providing data for 2014); American Taxpayer Relief Act of 2012, Pub. L. No. 112-240, 126 Stat. 2313 (2013) (providing data for

Table 1: Section 179 Amounts and Section 168(k) Percentages by Year

Year	**Section 179 immediate expensing allowance**[55]	**Section 179 immediate expensing allowance begins to phase out when section 179 investment exceeds:**	**Section 168(k) bonus depreciation amount**
2001	$24,000	$200,000	NA – not yet enacted
2002	$24,000	$200,000	30% as of 9/11
2003	$100,000	$400,000	30% thru 5/5, then 50%
2004	$102,000	$410,000	50%
2005	$105,000	$420,000	50%
2006	$108,000	$430,000	NA – expired
2007	$125,000	$500,000	NA – expired
2008	$250,000	$800,000	50%
2009	$250,000	$800,000	50%
2010	$500,000	$2,000,000	50% thru 9/8, then 100%
2011	$500,000	$2,000,000	100%
2012	$500,000	$2,000,000	50%
2013	$500,000	$2,000,000	50%
2014	$500,000	$2,000,000	50%
2015	$500,000	$2,000,000	50%
2016	$500,000[56]	$2,000,000[57]	50%

2012 and 2013); JANE GRAVELLE, CONG. RESEARCH SERV., R43432, BONUS DEPRECIATION: ECONOMIC AND BUDGETARY ISSUES 4 (2014) (providing section 168(k) data for enactment in 2002–2011); GUENTHER, *supra* note 50, at 3 tbl.1 (providing section 179 data for 2001–2011).

55. At various times, section 179 has applied higher immediate expensing caps for firms that placed qualified assets into service in designated Enterprise Zones, designated Renewal Communities, designated post-disaster areas, and the Liberty Zone (the area of New York most directly impacted by the September 11 attacks on the World Trade Center). GUENTHER, *supra* note 50, at 5–6. For discussions of the use of section 179 and section 168(k) in these areas, see, for example, Ellen P. Aprill & Richard Schmalbeck, *Post-Disaster Tax Legislation: A Series of Unfortunate Events*, 56 DUKE L.J. 51 (2006); Kimberly E. Smith, *The GO Zone Act: An Innovative Mechanism for Promoting Economic Recovery for the Gulf Coast*, 77 MISS. L.J. 807 (2008); Patrick Tolan, Jr., *The Flurry of Tax Law Changes Following the 2005 Hurricanes: A Strategy for More Predictable and Equitable Tax Treatment of Victims*, 72 BROOK L. REV. 799 (2007).

56. This permanent immediate expensing allowance will be indexed for inflation per section 179(b)(6).

57. This permanent phaseout threshold will be indexed for inflation per section 179(b)(6).

The Protecting Americans from Tax Hikes Act (PATH), enacted on December 18, 2015, made section 179 immediate expensing permanent.[58] As a result, taxpayers can immediately expense up to $500,000 of eligible investment in 2015,[59] provided their total eligible investment for the year does not exceed $2,000,000.[60] For tax years 2016 and beyond, these permanent benefits will be adjusted for inflation.[61] Thus, whenever inflation is positive, these benefits will automatically increase.

2. Application and Limitations

Immediate expensing under section 179 is elective.[62] Taxpayers who elect into section 179 treatment do so by completing a Form 4562 and specifying which section 179-eligible items[63] they wish to expense.[64]

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58. Protecting Americans from Tax Hikes Act of 2015, Pub. L. No. 114-113, Div. Q, § 124(a)(1), 129 Stat. 2242, 3053.

59. *Id.*

60. I.R.C. § 179(b)(2). If the taxpayer's total eligible investment exceeds $2,000,000, that excess causes a dollar-for-dollar reduction in the $500,000 immediate expensing cap.

61. I.R.C. § 179(b)(6).

62. *See* I.R.C. § 179(a) ("A taxpayer may elect to treat the cost of any section 179 property as an expense which is not chargeable to capital account. Any cost so treated shall be allowed as a deduction for the taxable year in which the section 179 property is placed in service."). Taxpayers who do not elect into section 179 treatment simply depreciate their assets under the default rules of section 168's MACRS system.

63. Section 179(d)(1) defines "section 179 property" as tangible property (or certain computer software) that is depreciable, was acquired by purchase for use in the active conduct of a trade or business, and is either personal property or other "section 1245 property." Section 1245 property includes personal property and a few limited types of real property (including real property amortized under special elections, including pollution control facilities, qualified refinery property, and certain energy efficient buildings). I.R.C. § 1245(a)(3). While used property does not qualify for bonus depreciation under section 168(k), it does qualify for immediate expensing under section 179. *See also* GARY GUENTHER, CONG. RESEARCH SERV., RL31852, SECTION 179 AND BONUS DEPRECIATION EXPENSING ALLOWANCES: CURRENT LAW, LEGISLATIVE PROPOSALS IN THE 114TH CONGRESS, AND ECONOMIC EFFECTS 2 (2015 ("With a few minor exceptions, this property consists of machinery and equipment used in manufacturing, mining, transportation, communications, the generation and transmission of electricity, gas and water distribution, and sewage disposal. Most buildings and their structural components . . . do not qualify for the allowance…").

64. Section 179 is an elective opt-in provision (*see supra* note 62), section 168(k) is an elective opt-out provision (*see infra* note 85), and section 168(a) is

Immediate expensing under section 179 is subject to two types of limits: dollar limits and taxable income limits. For 2016, section 179 allows a taxpayer to expense up to $500,000 worth of section 179 property placed into service in the tax year.[65] However, consistent with the provision's small business roots, this cap phases out for businesses making large capital investments. If a taxpayer places more than $2,000,000 worth of section 179 property into service in a single tax year, the immediate expensing cap is reduced dollar for dollar by the amount exceeding the $2,000,000 threshold.[66] Thus, a taxpayer placing into service $2,300,000 of section 179 property can immediately expense up to $200,000 of it (since the $500,000 cap has been reduced by the excess $300,000 over the $2,000,000 threshold), and a taxpayer placing more than $2,500,000 worth of section 179 property into service cannot immediately expense any of it.[67] Amounts not immediately expensed under section 179 are recovered to the extent allowed and elected under the bonus depreciation rules of section 168(k) and under the default MACRS rules of section 168.

Section 179 is also subject to a taxable income limit, which provides that a taxpayer may not claim a section 179 deduction in excess of her taxable income from the active conduct of her trade or business.[68] Amounts not immediately expensed due to application of the taxable income limit are carried forward to future tax years.[69]

Many investments that are eligible for immediate expensing under section 179 are also eligible for bonus depreciation under section 168(k).[70]

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effectively a mandatory provision. Although a taxpayer is not technically required to take the full depreciation deductions permitted by section 168(a), a depreciable asset's basis will be reduced by the greater of the amount actually taken as a deduction and the full amount allowable (*see* section 1016(a)(2)), meaning that a taxpayer is only disadvantaged by taking less than the full amount allowable.

65. I.R.C. § 179(b)(1)(B).

66. I.R.C. § 179(b)(2)(B).

67. However, as will later be described, a taxpayer placing more than $2.5 million worth of section 179 property is likely to receive very significant benefits under section 168(k) bonus depreciation.

68. I.R.C. § 179(b)(3).

69. Taking the dollar limits and taxable income limits together, for a taxpayer whose investment in section 179 property is less than $2 million, section 179 expensing is capped at the lesser of $500,000 or the taxpayer's taxable income derived from the active conduct of trade or business.

70. GUENTHER, *supra* note 63, at 4–5 (discussing assets eligible for both section 179 immediate expensing and section 168(k) bonus depreciation).

D. Bonus Depreciation

Section 168(k) authorizes bonus depreciation. After any eligible portion of an investment is recovered via section 179 immediate expensing, and before the default first-year depreciation deduction is calculated via MACRS, section 168(k) authorizes the deduction of an additional "bonus" percentage of the adjusted basis of an asset in the year of acquisition. Bonus depreciation has been authorized during and following economic recessions, allowing at various times 30%, 50%, and even 100% additional recovery in the year of acquisition.

1. History

While immediate expensing under section 179 got off to an early and modest start, bonus depreciation under section 168(k) got off to a late and generous start. Section 168(k) was enacted as part of the Job Creation and Worker Assistance Act of 2002[71] in an effort to strengthen the economy following the terrorist attacks on September 11, 2001. It allowed an immediate deduction of 30% of the basis of new qualified property acquired after September 11, 2001.[72] JGTRRA[73] increased this "bonus depreciation" to 50% for property acquired after May 5, 2003. Bonus depreciation expired at the end of 2005, as the economy recovered.[74]

In response to a later recession in 2008, Congress reinstated 50% bonus depreciation under section 168(k).[75] Hoping to address the sluggish recovery in 2010,[76] it increased bonus depreciation to 100% for property acquired and placed into service in late 2010 and 2011.[77] As a result, the entire cost of eligible property could be deducted immediately if it was placed into service in late 2010 or in 2011. Beginning in 2012, bonus

71. Job Creation and Worker Assistance Act of 2002, Pub. L. No. 107-147, § 101, 116 Stat. 21, 22.

72. GUENTHER, *supra* note 63, at 3. In order to qualify for 30% bonus depreciation, the property was required to be acquired after September 11, 2001, and placed in service no later than December 31, 2004 (although the placed in service date would be extended by later laws).

73. Jobs and Growth Tax Relief Reconciliation Act of 2003, Pub. L. No. 108-27, § 201(a), 117 Stat. 752, 756.

74. GUENTHER, *supra* note 50, at 3.

75. Economic Stimulus Act of 2008, Pub. L. No. 110-185, § 103, 122 Stat. 613, 618–19.

76. Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Pub. L. No. 111-312, § 401, 124 Stat. 3296, 3304.

77. GUENTHER, *supra* note 50, at 8.

depreciation returned to 50%.[78]

Bonus depreciation was meant to be temporary. It "was intended for a specific, short-term purpose: to provide an economic stimulus during a recession."[79] Consistent with this purpose, it has been allowed to expire during periods of relative economic stability (2005–2008) and has been reinstated during periods of relative instability.

However, recently legislators extended bonus depreciation again, this time through the end of 2019. As a result of PATH, taxpayers may elect to bonus depreciate 50% of the adjusted bases of eligible assets.[80] Beginning in 2018, the 50% bonus depreciation percentage is set to phase down such that for 2018, it will be 40%[81] and for 2019, it will be 30%.[82]

Many scholars predict that, given the political support for bonus depreciation, it likely will be further extended or made permanent.[83] Indeed, PATH proved similar predictions to be true for section 179 immediate expensing.[84]

2. Application and Limitations

When bonus depreciation under section 168(k) is in effect, taxpayers may elect out of its application[85] by completing a Form 4562 and specifying

78. *See id.* at 3 tbl.1; *supra* note 54 and accompanying text.

79. JANE G. GRAVELLE, DONALD J. MARPLES, & MOLLY F. SHERLOCK, CONG. RESEARCH SERV., R43510, SELECTED RECENTLY EXPIRED BUSINESS TAX PROVISIONS ("TAX EXTENDERS") 11 (2015); *see also* Darrel Cohen & Jason Cummins, *A Retrospective Evaluation of the Effects of Temporary Partial Expensing* 2 (Fed. Reserve Bd., Fin. & Econ. Discussion Series Paper No. 19, 2006), http://www.federalreserve.gov/pubs/feds/2006/200619/200619pap.pdf ("To help stimulate short-run economic activity, a tax bill was enacted in March 2002 and subsequently expanded in May 2003 that included a temporarily enhanced incentive to invest in business equipment and software. This incentive, a form of accelerated depreciation . . . is commonly referred to as temporary partial expensing or bonus depreciation.").

80. I.R.C. § 168(k)(1)(A).

81. I.R.C. § 168(k)(6)(A).

82. I.R.C. § 168(k)(6)(B).

83. *See, e.g.*, David Walker, *Financial Accounting and Corporate Behavior*, 64 WASH. & LEE L. REV. 927, 986-87, (predicting that section 168(k) will be made permanent); Lawrence Zelenak, *The Loophole that Would Not Die: A Case Study in the Difficulty of Greening the Internal Revenue Code*, 15 LEWIS & CLARK L. REV. 469 (2011) (explaining why it is likely that section 168(k) will be extended permanently).

84. Zelenak, *supra* note 83 (predicting correctly that section 179 would be made permanent).

85. I.R.C. § 168(k)(7) ("If a taxpayer makes an election under this paragraph with respect to any class of property for any taxable year," the additional

which section 168(k) eligible items[86] will not be bonus depreciated. Assets not bonus depreciated under section 168(k) are depreciated under the default rules of section 168's MACRS system.

In contrast to immediate expensing under section 179, section 168(k) bonus depreciation is not subject to dollar limitations. For 2016, section 168(k) allows a taxpayer to immediately deduct up to 50% of the adjusted basis of *each* eligible asset in the year of purchase, regardless of the taxpayer's total investment in eligible assets. Bonus depreciation may be used, and often is used, in combination with section 179. Like immediate expensing under section 179, bonus depreciation is subject to a taxable income limitation. A taxpayer may not claim a section 168(k) deduction in excess of her taxable income from the active conduct of her trade or business.[87]

E. Interaction of Accelerated Depreciation Provisions

There is considerable overlap between property that is eligible for immediate expensing under section 179 and property that is eligible for bonus depreciation under section 168(k). Under both provisions, qualified property is depreciable property with a recovery period of 20 years or less.[88] Most real property is excluded from both section 179 and section 168(k)[89] and primarily depreciated according to straight-line depreciation methods

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allowance for bonus depreciation "shall not apply to any qualified property in such class placed in service during such taxable year.").

86. Per section 168(k)(2)(A), "qualified property" means depreciable property with a recovery period of 20 years or less and certain computer software, water utility property, and leasehold improvement property. Because section 168(k) is currently drafted as a temporary tax provision, albeit a frequently expanded and extended one, to be eligible for section 168(k) "50% bonus depreciation" the "qualified property" must also meet requirements that it be acquired and put into original use within certain timeframes.

87. I.R.C. § 179(b)(3).

88. *See supra* note 63 (discussing definition of "section 179 property"); *supra* note 86 (discussing definition of section 168(k)(2) "qualified property"). While each provision includes required dates after which qualified property must have been acquired and by which it must be placed into service and while each provision has different dates, the two provisions otherwise overlap to a significant extent. *See* I.R.C. § 168(k)(2)(A)(ii) (providing bonus depreciation at various percentages for eligible assets acquired and put into original use in tax years from 2008 to 2019); I.R.C. § 179(b) (providing immediate expensing (at different dollar limits) for eligible assets purchased in tax years beginning in 2008).

89. *See supra* note 63.

even as investments in personal property are rapidly depreciated.[90] Further, while section 179 immediate expensing is available for new and used assets[91] and section 168(k) bonus depreciation is only available for new assets,[92] this difference is minor since only about 5% of eligible assets are purchased in used condition.[93]

For assets that are eligible for immediate expensing allowances under section 179, bonus depreciation under section 168(k), and MACRS depreciation under section 168(a), depreciation occurs in that order.[94] Together, these provisions cause tremendous acceleration of depreciation.

For example, a $1,000,000 five-year recovery period asset purchased in 2016 gives rise to a combined depreciation deduction of $800,000 (or 80% of basis) in the year of acquisition.[95] Only $200,000 (or 20% of basis) remains to be depreciated over the following four years of the asset's recovery period. This $800,000 first-year deduction reflects $500,000 of immediate expensing per section 179, plus $250,000 of bonus depreciation per section 168(k),[96] plus $50,000 of MACRS recovery per section 168(a).[97] Further, these provisions not only accelerate depreciation, they can replace multi-year depreciation altogether with full immediate expensing. For example, any section 179-eligible asset purchased in 2016 for $500,000 or

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90. *See* I.R.C. § 168(b)(3) (applying straight-line method to real property). This difference likely creates distortions to investment decisions.

91. Used assets are assets that were purchased following use by a previous owner. *See supra* note 63 (describing section 179 property as not limited to "original use" property).

92. *See* I.R.C. § 168(k)(2)(A)(ii) (requiring the taxpayer to make "original use" of the property in order for it to qualify for bonus depreciation); *supra* note 86 (discussing qualified property for purposes of section 168(k) bonus depreciation).

93. *See* Matthew Knittel, *Corporate Response to Accelerated Tax Depreciation: Bonus Depreciation for Tax Years 2002-2004* 12 (Office of Tax Analysis, Working Paper No. 98, 2007), https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/WP-98.pdf ("The Annual Capital Expenditures Survey published by the Census Bureau indicates that approximately five percent of all equipment sales are purchases of used equipment.").

94. Reg. § 1.168(k)–1(a)(2)(iii); *see* GUENTHER, *supra* note 50, at 4 ("The Section 179 expensing allowance [must] be taken first, lowering the taxpayer's basis in the asset by that amount. If there still [is] a basis, the taxpayer then [can] apply the bonus depreciation allowance [of section 168(k)] to that amount, further reducing her basis in the property. Finally, the taxpayer [is] allowed to claim a depreciation allowance under the MACRS for any remaining basis, using the double declining balance method.").

95. These calculations assume application of the half-year convention.

96. Reflecting 50% of the $500,000 basis remaining after immediate expensing.

97. Reflecting 20% of the $250,000 basis remaining after immediate expensing and bonus depreciation.

less can be fully expensed in the year of purchase, leaving no remaining basis to be recovered over later years.

Since total depreciation deductions for an asset equal the cost basis of that asset, increases in depreciation deductions in early years correspond to decreases in depreciation deductions in later years of an asset's recovery period. While accelerated depreciation primarily changes the timing rather than the amount of taxes that businesses owe, businesses are assumed to far prefer frontloaded deductions and delayed taxes.

F. Magnitude of Accelerated Depreciation

At the heart of this article is the argument that firms overestimate their real savings and the government overestimates its real losses due to accelerated depreciation. Primarily, this is an argument about how time-value-of-money principles apply to cash flows resulting from gradual depreciation as compared to those resulting from accelerated depreciation and about how this comparison is affected in periods of recession and economic recovery. However, there is no dispute that accelerated depreciation policies shift the timing of when businesses owe (and when the government can collect) hundreds of billions of dollars of tax revenue.

Most official government estimates of the impacts of accelerated depreciation policies are nominal, cash-based tax expenditure estimates[98] conducted within a ten-year measuring window that do not discount future receipts to present values or otherwise account for the time value of money.[99] These nominal tax expenditure estimates, which are completed by the Government Accountability Office (GAO) and the Joint Committee on

98. *See, e.g.*, OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2016, 219 (2016) ("Tax expenditures are defined in the law as 'revenue losses attributable to provisions of the Federal tax laws which allow a special exclusion, exemption, or deduction from gross income or which provide a special credit, a preferential rate of tax, or a deferral of tax liability.'"). Accelerated depreciation offers a deferral of tax liability, consistent with the definition of a tax expenditure.

99. *See, e.g.*, JCX-1-05, *supra* note 7, at 12 ("Because the budget resolutions require revenue estimates to be expressed in nominal dollars over a fixed period (currently 10 years), the Joint Committee staff does not discount the revenue cost of proposals for the time value of money.").

Taxation (JCT), are helpful to understand how given tax policies (like accelerated depreciation) will affect the government's revenue collections in any given year and therefore its ability to pay its bills in that same year.[100]

However, they do not answer the question of how much a tax break costs the government in any real economic sense. Estimating the government's real economic losses requires application of an appropriate discount rate and consideration of effects outside a ten-year measuring window.[101] In the case of accelerated depreciation, nominal tax expenditure estimates far exceed the government's real economic costs,[102] especially during and following recession.[103] Misunderstanding the purpose of nominal tax expenditure estimates threatens to entrench and worsen misperceptions about the real economic losses suffered by the government because of accelerated depreciation policies. Nonetheless, these estimates indicate the magnitude of timing effects from accelerated depreciation policies.

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100. This straightforward explanation comes from David Kamin, *Risky Returns: Accounting for Risk in the Federal Budget*, 88 IND. L.J. 723, 727 (2013) ("the overriding purpose of the budget is as a means of measuring and controlling the federal government's fiscal position—the position of the federal government relative to its intertemporal budget constraint. This idea is a simple one. The federal government has to pay its bills, and the budget should show the degree to which we must adjust current policies to achieve that and how incremental policies affect our ability to do so.").

101. *See* JCX-1-05, *supra* note 99, at 12 ("To provide a complete estimate of the present discounted value of a proposal that effects tax revenue into the future, the Joint Committee staff would be required to project the revenue effect of the proposal many years beyond the budget window to fully capture all costs and benefits. Currently, the economic forecast provided by CBO, which underlies the Joint Committee staff's revenue estimates, only covers 10 years into the future. An economic forecast well beyond the budget window would be a necessary first step to providing estimates in present-value terms. Another practical issue is determining the correct discount rate. Even within a 10-year budget window, the discounted revenue effect of proposals will vary considerably with the choice of discount rate.").

102. Indeed, the government's nominal, cash-based revenue estimates primarily reflect the number of revenue dollars that would have been inside the ten-year measuring window if gradual depreciation deductions were used but are pushed outside of that window if accelerated depreciation deductions are used. Again, the real economic cost of pushing revenue collections from one budget window to another depends on the discount rate. *See* JCX-1-05, *supra* note 99, at 12 ("In general, the effect of discounting within the budget window is to lower the revenue effect (either positive or negative).").

103. *See infra* Parts III and V.B.

In March 2013, the GAO published a list of the largest corporate tax expenditures incurred in 2011.[104] At $76.1 billion (or 42% of total corporate tax expenditures) "accelerated depreciation of machinery and equipment" was the largest corporate tax expenditure.[105] And this number reflected only the corporate side of the expenditure. Since accelerated depreciation is also available to pass-through and disregarded entities, the GAO estimated that an additional $42.4 billion in individual income tax was lost in 2011 due to accelerated depreciation of machinery and equipment alone.[106]

On October 27, 2015, the JCT estimated that making 50% bonus depreciation permanent would result in $280.659 billion less revenue collected between 2016 and 2025.[107]

Digging into tax expenditure estimates on a year-by-year basis shows how much these estimates are about timing and how little they are about the government's real economic losses. For example, JCT's $280.659 billion estimate covers 2016 to 2025.[108] If a taxpayer accelerates depreciation in 2025, that decreases revenue collections in 2025 but increases revenue collections in 2026 and later years of the recovery period. Unfortunately, the revenue increases in 2026 and beyond are outside of the ten-year budget window and thus are not reflected in the $280.659 billion estimate. Because nominal tax expenditure estimates ignore offsetting revenue increases in 2026 and beyond, they are higher than real economic losses.

Similarly, if a taxpayer accelerates depreciation in 2016, that reduces revenue collections in 2016 but increases revenue collections in 2017 and later years of the recovery period. Fortunately, much of this increase in revenue in 2017 and beyond is inside of the ten-year budget window and is, therefore, captured in the $280.659 billion estimate.

Because 2016 shows only revenue losses from accelerated depreciation on assets purchased in 2016, while 2017 shows revenue losses from assets purchased in 2017 and offsetting revenue gains from assets purchased in 2016, the nominal tax expenditure estimate drops from $97.532

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104. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-339, CORPORATE TAX EXPENDITURES: INFORMATION ON ESTIMATED REVENUE LOSSES AND RELATED FEDERAL SPENDING PROGRAMS (2013).

105. *Id.* at 11.

106. *Id*.

107. JOINT COMM. ON TAX'N, 114TH CONG., JCX-134-15, A REPORT TO THE CONGRESSIONAL BUDGET OFFICE OF THE MACROECONOMIC EFFECTS OF H.R. 2510, "BONUS DEPRECIATION MODIFIED AND MADE PERMANENT," AS ORDERED TO BE REPORTED BY THE HOUSE COMMITTEE ON WAYS AND MEANS 4 (2015) [hereinafter JCX-134-15]. According to the rules of JCX-1-05, see *supra* note 7, this estimate does not discount future receipts to present values or otherwise account for the time value of money.

108. JCX-134-15, *supra* note 107, at 4.

billion in 2016 to $43.362 billion in 2017. Indeed, this causes a precipitous drop in tax expenditure estimates in each subsequent year of the budget window. Of the $280.659 billion less revenue collected due to bonus depreciation from 2016 to 2025, about 35% is attributable to 2016 and only about 4% (or $10.307 billion) is attributable to 2025. The 2025 revenue losses are far lower not because the real economic impacts of accelerated depreciation changed dramatically but because the nominal revenue losses due to accelerated depreciation on assets purchased in later years of the budget window are largely offset by nominal revenue gains due to lower residual depreciation on assets purchased in earlier years of the budget window.

While it is always important to understand the difference between tax expenditure estimates made on a nominal cash basis over a ten-year measuring window and the government's real economic losses, there is an especially large gap between these concepts in the case of accelerated depreciation.

G. Mixed Economic Impacts of Accelerated Depreciation

Although it is well documented that accelerated depreciation policies delay the government's ability to collect hundreds of billions of dollars of tax revenue,[109] legislators have been willing to extend and expand accelerated depreciation.[110] They assume that businesses want accelerated depreciation so much that they will increase their capital investing, and therefore stimulate the economy, in order to take advantage of accelerated depreciation opportunities. However, empirical evidence does not neatly or unequivocally support this assumption. To the contrary, empirical evidence has presented "a puzzle from the standpoint of basic economics."[111] Because accelerated depreciation is usually optional[112] for taxpayers, empirical evidence comes in two main categories. First, it considers how often taxpayers opt into and out of accelerated depreciation. Second, it considers whether taxpayers in fact

109. *See* Part I.F (providing GAO and JCT estimates that accelerated depreciation policies shift the timing of when businesses owe and when the government can collect hundreds of billions of dollars of tax revenue).

110. *See* Parts I.C.1 and I.C.2 (showing that on December 18, 2015, PATH extended accelerated depreciation).

111. Christopher House & Matthew D. Shapiro, *Temporary Investment Tax Incentives: Theory with Evidence from Bonus Depreciation* 29 (Nat'l Bureau of Econ. Research, Working Paper No. 12514, 2006), http://www.nber.org/papers/w12514.

112. *See supra* note 64.

increase their capital investing when accelerated depreciation is made more generous. In each category, the data is mixed.

Using data about how often taxpayers opt to recover capital investments via accelerated as opposed to gradual depreciation, studies consistently show that many taxpayers predictably opt into the benefits of accelerated depreciation. However, given the widespread perception that accelerated depreciation is tremendously valuable, a surprisingly high percentage of taxpayers opt out, choosing instead to recover the costs of their capital investments gradually.[113] The opt-out phenomenon is especially perplexing because taxpayers often opt out of accelerated depreciation for assets with long recovery periods. Since present-value discounting is most severe for assets with long recovery periods, accelerated depreciation offers the greatest potential increase in present value for these assets.[114] Yet data shows that taxpayers opt into accelerated depreciation more frequently for assets with short recovery periods and less frequently for assets with long recovery periods.[115]

Similarly, data is mixed on how much accelerated depreciation increases capital investing. It confirms that capital investing increases following the implementation of more generous accelerated depreciation.[116] However, the increased investment is often less than economic models would

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113. *See, e.g.*, Cohen & Cummins, *supra* note 79 at 18 (explaining that about 55% "of eligible investment dollars" were "claimed for purposes of receiving bonus depreciation"); Knittel, *supra* note 93, at 3 (showing that taxpayers elected bonus depreciation for only 55–63% of eligible investments); Thomas Vasquez, *The Effects of the Asset Depreciation Range System on Depreciation Practices* 10 (Office of Tax Analysis, Working Paper No. 1, 1974), https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/WP-1.pdf (showing that when the asset depreciation range system first gave taxpayers the option to elect shortened recovery periods, only 63% of taxpayers with assets exceeding $1 billion opted in).

114. *See, e.g.*, Cohen & Cummins, *supra* note 79, at 4 (explaining that bonus depreciation offers the greatest net present-value benefits for long-term assets by noting that "the decline in the user cost of capital is larger, the longer-lived the asset.").

115. *Id.* at 14 (observing taxpayers opting into bonus depreciation for shorter-term assets for one period more frequently than the theoretical model would predict); Knittel, *supra* note 93, at 3 (showing that taxpayer decisions to opt into bonus depreciation skewed toward short-recovery-period assets and away from long-recovery-period assets).

116. Eric Zwick & James Mahon, Do Financial Frictions Amplify Fiscal Policy? Evidence from Business Investment Stimulus 1 (Nov. 25, 2013) (unpublished manuscript) (on file with author) (concluding that "bonus depreciation raised investment by 18.5 percent on average between 2001 and 2004 and 31.2 percent between 2008 and 2010" with the effects being the greatest for "financially constrained firms" and "when the [tax] policy generates immediate cash flows.").

predict. And again, most perplexingly, the increase in investment in long-recovery-period assets (which will experience the greatest net present-value increase from accelerated depreciation) is not higher than the increase in investment in short-recovery-period assets.[117] This deviation of actual impacts from predictions might partially be explained by errors in common assumptions about the value of accelerated depreciation and by the effects of low interest rates on its value.

II. RECESSION GUTS NET PRESENT-VALUE BENEFITS TO FIRMS

The value of accelerated depreciation is depressed when interest rates are low or "ultralow," as they were in the United States during and following its two most recent recessions. To understand why, it is useful to distinguish the various reasons that firms prefer money now to money in the future.

A firm's preference for earlier/accelerated deductions over later/gradual deductions is based on familiar time-value-of-money considerations. First is inflation—a dollar of tax savings today is worth more than a dollar in tax savings one year from today because in a typical economy, the purchasing power of a dollar declines over time as market prices increase. Second is opportunity cost—a dollar received today can be invested and produce a year's worth of return on investment, while a dollar received a year from today cannot. Calculating a firm's preference for a dollar today as compared to a dollar in a year from today (i.e., whether a dollar today is worth $1.07 or $1.10 in a year from today) depends on a combination of these factors.

Inflation can be determined with reference to a market-wide measurement. How quickly is the purchasing power of a dollar declining? Since recent recessions and recoveries were associated with extremely low inflation rates,[118] the costs of delay for guaranteed income streams (and benefits of acceleration) were also low. Since low inflation makes guaranteed income streams more valuable, guaranteed income streams are often most valuable during and following recession.

Opportunity cost can be determined by comparing the potential future receipt (e.g., $1.07 one year from now) to the immediate receipt plus an anticipated return on the investment (e.g., $1.00 plus 7% anticipated annual return on investment). But different investments produce different returns. Investors in high-risk investments demand high returns to

117. Cohen & Cummins, *supra* note 79, at 14 (observing that the availability of bonus depreciation increased investment in 5-year property more than 7-year property for one period "counter to the [authors'] model prediction").

118. *See supra* note 23 and accompanying text.

compensate for the possibility that amounts they receive in the future might not meet their expectations while investors in low-risk investments must settle for lower returns.[119] Accordingly, when comparing $1.00 today to $1.07 one year from today, present-value calculations consider the potential return on investment of the immediate receipt (here $1.00) over the deferral period (here 1 year) with reference to a similarly risky cash flow. If the $1.07 one year from now is guaranteed, then returns on a nominal risk-free investment are the basis of comparison.[120] Would $1.00 invested over one year in a nominal risk-free investment produce more or less than a 7% annual return? In contrast, if the $1.07 one year from now is anticipated but not guaranteed, then returns on an investment producing a similarly risky cash flow should provide the basis for comparison.

If, as Part II.C argues, accelerated depreciation offers immediate tax benefits in exchange for near guaranteed future tax benefits, then the appropriate discount rate to calculate the present value of gradual depreciation and to determine how much that present value is increased by accelerating depreciation, is close to the nominal risk-free rate. Importantly, the nominal risk-free rate has plummeted in connection with recent recessions.[121] Thus, common errors overestimating the value of accelerated depreciation have been compounded by recent recessions. This observation might previously have been obscured because the appropriate discount rates for average-risk income streams generally stay high during recession due to increases in the risk premium component of average-risk returns.[122]

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119. *See, e.g.*, STEPHEN A. ROSS, RANDOLPH W. WESTERFIELD & JEFFREY JAFFE, CORPORATE FINANCE 363 (10th ed. 2013) ("It is commonplace to argue that the expected return on an asset should be positively related to its risk. That is, individuals will hold a risky asset only if its expected return compensates for its risk.").

120. *Id.* at 365 ("Because a security with zero beta has no relevant risk, its expected [future] return should equal the risk-free rate.").

121. *See infra* note 193 and accompanying text.

122. *See, e.g.*, John Campbell & John Cochrane, *By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior*, 107 J. POL. ECON. 205 (explaining that risk premia are higher in recession because investors tend to become more risk-averse in recession); George M. Constantinides, *Understanding the Equity Risk Premium Puzzle* 1, 34 (March 6, 2006), http://faculty.chicagobooth.edu/george.constantinides/documents/Premium%20Essay%202006.pdf ("[T]he risk premium is highest in a recession because the stock is a poor hedge against the uninsurable income shocks, such as job loss, that are more likely to arrive during a recession."); *id.* at 29 ("In economic recessions, investors are exposed to the double hazard of stock market losses and job loss. Investment in equities not only fails to hedge the risk of job loss but accentuates its implications. Investors require a hefty equity premium in order to be induced to hold equities.").

In sum, recent recessions made it much less costly to wait for guaranteed income streams. As a result, the value to firms of gradual depreciation is much higher than has been assumed, and the potential benefit to firms from accelerating depreciation is much lower than has been assumed, especially during and following recession.

I argue that although firms have had more opportunities to accelerate depreciation during and following recent recessions, both the firm-side benefits and the government-side costs of accelerated depreciation are overstated. Further, these benefits and costs are significantly reduced by the low risk-free interest rates experienced during and following recession.

My thesis is based on the following: first, that the value of accelerating depreciation depends on the discount rate; second, that the discount rate should be the risk-free rate applicable over the asset's recovery period plus a risk premium based on the risk that the future tax savings resulting from depreciation deductions will be of amounts other than the projected amounts; third, that the risk that depreciation deductions will be of amounts other than the projected amounts is extremely low; fourth, that the discount rate should therefore be close to the risk-free rate expected over the asset's recovery period; and fifth, that risk-free rates tend to be atypically low during and following economic recession. As a result, recession itself reduces the appropriate discount rate and, therefore, makes accelerated depreciation much less valuable than it would be in non-recessionary times.

A. Discount Rate Drives Value of Accelerated Depreciation

The value of accelerated depreciation depends most significantly on the discount rate. It does not depend exclusively on the discount rate because, as will become important below, the value of all deductions depends on the taxpayer's marginal tax rate and how close the taxpayer is to a lower bracket in the rate schedule, both of which can change during an asset's recovery period. Nonetheless, the discount rate is a powerful driver of the value of accelerated depreciation.

Table 2 below[123] shows the savings at various assumed discount rates attributable to full acceleration of depreciation as compared to straight-line depreciation for a highest-rate taxpayer who purchased a $100,000 five-year recovery asset in 2012. It assumes that the taxpayer's marginal tax rate

123. For these calculations, I assumed that a taxpayer in the 35% bracket purchased property with a five-year recovery period for $100,000 to which the half-year convention applied and took the full amount of available immediate expensing under section 179.

does not change during the recovery period and that this fixed marginal tax rate applies to the full amount of every depreciation deduction. I included the 0% discount rate as a reminder that, provided that all deductions are taken at the same marginal rate, the benefits of acceleration depend on a positive discount rate. I included the 0.76% discount rate because it was the average nominal annual rate of return on five-year Treasury notes sold in 2012[124] (a measure that should reflect inflationary risk over the period from 2012-2017 but virtually no risk that the nominal income stream will be other than as projected).[125] I included the 2.3%[126] discount rate because it was the Office of Management and Budget's nominal discount rate in 2012 for federal budget estimates of future internal/federal government savings from federal investments.[127] Seven percent is a typical discount rate used by government experts in the Congressional Research Service and the Office of Tax Analysis.[128] Seventeen percent is a typical discount rate used by firms.[129]

124. The Financial Forecast Center, *Historical Economic and Financial Data: 5-Year Treasury Constant Maturity Rate* http://www.forecasts.org/data/data/GS5.htm (providing the 5-year Treasury Constant Maturity Rate for each month of 2012, which averaged to 0.76%).

125. *See, e.g.*, ANDREW B. ABEL, BEN S. BERNANKE & DEAN CROUSHORE, MACROECONOMICS 115 (7th ed. 2011) ("Federal government debt is believed to be free from default risk..."); ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 404 ("No U.S. Treasury instrument has ever defaulted and, at least at the present time, no instrument is considered to be in the slightest danger of a future default. For this reason, [the rates of return on] Treasury instruments are generally considered to be [the] risk-free [rates for investments of a similar duration].").

126. *See* OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, TABLE OF PAST YEARS DISCOUNT RATES FROM APPENDIX C OF OMB CIRCULAR NO. A-94 (2015), https://www.whitehouse.gov/sites/default/files/omb/assets/a94/dischist-2016.pdf [hereinafter OMB, APP. C] (showing a nominal discount rate for internal/federal government savings from federal investments in 2012 with a 5-year horizon of 2.1% and with a 7-year horizon of 2.5%.). I used the average of these rates (2.3%) because "seven-year property and five-year property" are the two largest categories of assets eligible for accelerated depreciation. Gravelle, *supra* note 48, at 1045.

127. *See infra* note 179 and accompanying text (directing use of the floating rates in Appendix C of OMB Circular A-94 (*see supra* note 126) for internal/federal government savings from federal investments).

128. *See infra* notes 174–175 and accompanying text.

129. *See infra* note 166 and accompanying text.

Table 2: Effect of Discount Rate on Present Value of Accelerated Depreciation

Present value of depreciation if discount rate:	**Straight Line**	**DDB**	**50% bonus +DDB**	**$500,000 immediate expense + 50% bonus + DDB**[130]	**Savings from accelerated depreciation**[131]
0% (baseline)	35,000	35,000	35,000	35,000	0
0.76% (T. note)	34,087	34,302	34,519	34,736	649
2.3% (OMB internal)	32,341	32,957	33,585	34,213	1,872
7% (gov't)	27,763	29,358	31,034	32,710	4,947
17% (firms)	20,768	23,603	26,759	29,915	9,147

As this table shows, any difference in the present value of alternative depreciation schedules is a function of the discount rate. When the discount rate is zero, all depreciation schedules have the same present value. When the discount rate is high, it is costlier for firms to wait for gradual depreciation, and acceleration offers more savings. Therefore, a greater discount rate drives a higher value of accelerated depreciation.

130. In this column, the full $100,000 purchase price can be expensed in the year of acquisition. However, Table 2 assumes that depreciation deductions are received at the end of the year, meaning that one year of discounting is included in this column.

131. This measure of the savings from accelerated depreciation is found by subtracting the net present value of the tax savings resulting from the least accelerated form of depreciation (here, straight-line depreciation) from the net present value of the tax savings of the most accelerated form of depreciation (here, immediate expensing plus bonus depreciation plus MACRS depreciation). One alternative calculation of the least accelerated form of depreciation is Samuelson depreciation, which assumes that an asset declines in value more in later years than in earlier years. Paul A. Samuelson, *Tax Deductibility of Economic Depreciation to Insure Invariant Valuations*, 72 J. POL. ECON. 604 (1964); *see* MARVIN A. CHIRELSTEIN, FEDERAL INCOME TAXATION 171 (10th ed. 2005) (providing a helpful example of Samuelson depreciation); Hanna, *supra* note 27, at 445–48 (summarizing Samuelson depreciation helpfully).

This article uses straight-line depreciation, rather than Samuelson depreciation, since straight-line depreciation is widely used in tax law. *See, e.g.*, I.R.C. § 168(b)(3) (using straight-line depreciation for real property).

B. Proper Discount Is Based on Level of Risk to Cash Flows

Having considered the importance of selecting an appropriate discount rate, I argue that the discount rate for depreciation deductions should be the risk-free rate applicable over the asset's recovery period plus a risk premium based on the risk that the tax savings resulting from depreciation deductions will be of amounts other than expected amounts. This method to compute a discount rate is based on the widely recognized Capital Asset Pricing Model (CAPM), which is used by investors to value stocks and bonds and by firms to make capital investment decisions, including decisions about whether to purchase depreciable assets.[132] The CAPM predicts the value of a capital asset based on the assumption that the rates of return demanded by investors will accurately compensate for the riskiness of the investment[133] and the risk-adjusted present value of the future cash flows that the asset is expected to produce.[134] A capital investment "will, after an initial outlay, generate a stream of uncertain future operating profits that will then be taxed. It will also generate a stream of future depreciation deductions that can be subtracted from the firm's income to reduce its tax liabilities."[135] Because these two streams of income (one from profits and one from tax savings) are subject to different levels of risk, classic corporate finance theory calls for each stream to be discounted separately at a unique discount rate reflecting its specific level of risk.[136] Unlike the profit stream produced by an asset, the stream of tax savings produced by depreciation deductions is subject to little risk.

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132. *See, e.g.*, John R. Graham & Campbell R. Harvey, *The Theory and Practice of Corporate Finance: Evidence from the Field*, 60 J. FIN. ECON. 187 (2001) (a survey of 392 CFOs indicates that "firms rely heavily on . . . the capital asset pricing model").

133. RICHARD A. BREALEY, STEWART C. MYERS & FRANKLIN ALLEN, PRINCIPLES OF CORPORATE FINANCE 204 (11th ed. 2014) (noting that even for modified CAPMs "expected return still depends on market risk"); ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 365 (explaining that CAPM "implies that the expected return on a security is *positively* related to its beta [a measure of risk reflecting the covariance between the securities returns and overall market returns]").

134. ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 135–37 (explaining that capital budgeting calculates whether the initial cost of an investment is exceeded by the present value of the investment's "future cash flows" discounted at a correct discount rate selected based on the riskiness of those future cash flows).

135. Summers, *supra* note 11, at 297.

136. *See infra* notes 158–160 and accompanying text.

C. Few Sources of Risk Threaten Depreciation Cash Flows

The risk that depreciation deductions will be of amounts other than the projected amounts is extremely low.[137] The value of depreciation deductions depends on several factors: 1) the depreciable basis, 2) the percent of depreciable basis that is recovered in any given year, 3) the tax rate at which the depreciation deduction is taken,[138] 4) the extent to which the nominal tax savings due to depreciation have less buying power over time because of inflation, and 5) the possibility that the firm taking depreciation deductions will dispose of the asset.

1. Depreciable Basis

Factor one (the depreciable basis) does not introduce any uncertainty. The depreciable basis is known at the time of asset acquisition. Except in cases when a depreciable asset is gifted[139] or bequeathed to the taxpayer,[140] the depreciable basis is simply the amount that the taxpayer paid to acquire the asset.[141]

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137. *See* Alan J. Auerbach & Kevin Hassett, *Tax Policy and Business Fixed Investment in the United States*, 47 J. PUB. ECON. 141–70 (1992); Summers, *supra* note 11, at 296 ("Because prospective depreciation allowances are very nearly riskless, they are more valuable than other prospective sources of cash flow."); *id.* ("[thus] a very low or negative real discount rate should be applied"); *id.* at 297 (explaining that the present value of "future depreciation tax shields is . . . close to being riskless. They therefore should be evaluated by discounting at a riskless rate"); *cf.* James B. Mackie III, *Unfinished Business of the 1986 Tax Reform Act: An Effective Tax Rate Analysis of Current Issues in the Taxation of Capital Income*, 55 NAT'L TAX J. 293, 302 (2002) ("Summers . . . argues that firms should use a lower discount rate for determining the present value of riskless tax depreciation allowances than for determining the present value of risky cash-flows…It is not clear what to make of the Summers critique. His [survey] results are inconsistent with his theory, making it difficult to implement his ideas. In addition, while tax depreciation may be less risky than other cash flows, it is not free from risk. Furthermore, the standard assumption of a low real after-tax discount rate that does not vary by type of cash flow seems appropriate since effective tax rate analyses typically abstract from risk.").

138. Changes in the tax rate at which depreciation deductions are taken may occur because of changes in the statutory tax rate, other changes in tax law, or changes in a particular taxpayer's marginal rate.

139. I.R.C. § 1015 (establishing carryover basis for gifted assets).

140. I.R.C. § 1014 (establishing basis as the fair market value at the time of death for bequeathed assets).

141. I.R.C. § 1012 (establishing cost basis for purchased assets).

2. Depreciation Method

Factor two (the depreciation method) introduces a very small amount of uncertainty. The depreciation method determines the percentage of an asset's depreciable basis that is recovered during each year of the recovery period. Depreciation methods include immediate expensing, bonus depreciation, double-declining-balance depreciation, straight-line depreciation, etc. As with the depreciable basis, the depreciation method is known at the time of asset acquisition.[142] The main reason that the percentage of basis actually recovered might differ from the percentage expected to be recovered is that a limitation on depreciation may apply (for example, the limitation that depreciation deductions may not exceed the taxpayer's taxable income from the active conduct of trade or business).[143] The risk presented by this limitation depends on the specific characteristics of a firm,[144] making it impossible to calculate a discount rate for depreciation deductions that would be accurate for all firms. However, if a limitation applies, depreciation that is not available in one tax year is simply carried forward to the next tax year. If a low discount rate applies (as I argue it should), it follows that the "cost" of such a carryforward is also low.

3. Tax Rate Change

Factor three (that the tax rate at which depreciation deductions can be taken will drop) likely introduces the greatest risk that depreciation deductions will be less valuable than was expected when the asset was

142. Indeed, the depreciation tables published in Rev. Proc. 87–57, 1987–2 C.B. 687, incorporate the recovery period, depreciation method, and applicable convention into a percentage of the asset's basis that can be recovered each year.

143. I.R.C. § 179(b)(3)(A) (providing that the deduction shall not exceed "the aggregate amount of taxable income of the taxpayer for such taxable year which is derived from the active conduct by the taxpayer of any trade or business during such taxable year"); I.R.C. § 179(b)(3)(B) (providing that the amount disallowed as a deduction may be carried forward to a future tax year). Other factors, including disposition of the asset (which could result in application of the half-year convention and could trigger depreciation recapture), might also cause the percentage of basis actually depreciated to vary from projections. *See* Reg. § 1.168(i)–8 (dispositions of MACRS property). This would be true regardless of whether the disposition of the asset was in connection with the ongoing operation or the liquidation of the firm.

144. The risk presented by this limitation will depend on the firm's average taxable income from active conduct of trade or business, the variance in that taxable income, and the likelihood that the taxable income will drop in a year for which depreciation deductions would otherwise be available.

acquired. However, far from being a harmful risk, this risk is beneficial because it provides a hedge against the taxpayer's greater exposure to the risk that tax rates will increase over the asset's useful life.[145] As noted above, a taxpayer who purchases a capital asset expects two streams of income: the profits produced by the asset (high risk) and the depreciation deductions produced by the asset (low risk). A taxpayer only benefits from the profits produced by the asset to the extent of their after-tax value. Thus, after an asset is purchased, the taxpayer is highly exposed to the risk that its marginal tax rate will rise,[146] causing the after-tax profits produced by the asset to underperform the taxpayer's expectations.[147] Faced with this risk of tax rate increase, the taxpayer would benefit by having offsetting depreciation deductions that could also be taken at the increased tax rate. Far from adding to the overall risk of an investment decision, the dependence of the value of depreciation deductions on the tax rate is a risk-reducing hedge. This factor could justify a risk-reducing decrease to the discount rate rather than a risk-increasing premium.[148]

4. Inflation

Factor four (that inflation will erode the buying power of depreciation deductions even if these deductions nominally equal expectations) introduces an uncertainty that can be solved by the use of a nominal discount rate. Because the buying power of future tax savings can be eroded by inflation, it is necessary to apply a discount rate that is higher than would apply in the absence of inflationary risk. In the absence of inflationary risk, a real discount rate would be appropriate. However, the selection of a nominal discount rate, here a "risk-free rate" that compensates for the risk of inflation over the recovery period but that is not subject to default risk,

145. *See* Summers, *supra* note 11, at 298 (explaining that as to the risk of change in the applicable tax rates, "[s]ince depreciation deductions represent a hedge against changes in tax rates, this source of uncertainty may drive the appropriate discount rate down rather than up."). Notably, decisions to accelerate depreciation either undermine or forfeit this valuable hedge since they cause assets to produce taxable income in years when they do not also produce offsetting depreciation deductions.

146. An increase in tax rates could either be due to changes in statutory rates or the taxpayer's position on the rate schedule.

147. This could be true even if the pre-tax income exactly meets expectations.

148. This hedging argument is similar to the provision in the CAPM to compensate risk if it is covariant with risk already assumed.

should properly account for inflation risk.[149] Accordingly, all calculations in this article have been made using a nominal discount rate.

5. Disposition of Asset

Factor five (that depreciation deductions will be of amounts other than expected amounts because the depreciable asset is sold or otherwise disposed of by the taxpayer) introduces a very small amount of uncertainty. If a taxpayer anticipates owning a depreciable asset for the entirety of the tax year and instead disposes of the asset prior to the end of the tax year, depreciation deductions will fall short of taxpayer expectations.[150] Asset disposition might occur independently or as part of a business's overall liquidation.[151] However, this risk of deviation from expectations is not as great as it might initially appear to be.

In the year that a depreciable asset is disposed of, tax law applies various conventions to determine the final depreciation deduction. The depreciable assets eligible for section 179 immediate expensing and section 168(k) bonus depreciation are subject to the half-year convention.[152] The

149. ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 404 n.2 (suggesting that an appropriate approach to estimate a nominal risk-free rate "is to select a U.S. Treasury security whose maturity matches the maturity[/duration] of [the] particular project. Th[is] match would need to be exactly correct because while U.S. Treasury securities are probably close to default-free, they have interest rate risk…").

150. Partial dispositions, whether they occur involuntarily or through election, may also have an impact. *See* Reg. § 1.168(i)–8.

151. This article assumes that a firm liquidating its business would sell any depreciating assets rather than, for example, gratuitously disposing of them. This assumption seems reasonable because an asset's recovery period is designed to be shorter than the timeframe within which it is expected to produce income. If a firm liquidates at a time it owns an asset that is still expected to produce income, rationally, it should sell that asset, which will trigger application of the half-year convention and the recognition of gain.

152. *See* I.R.C. § 168(d)(1) (unless property is specifically excepted in the statute, it is subject to the half-year convention). Most real property is subject to the mid-month convention. I.R.C. § 168(d)(2). However, the mid-month convention is not relevant to this analysis since property subject to the mid-month convention is ineligible for accelerated depreciation. *See supra* note 63 (explaining that section 179-eligible property excludes real property that is subject to the mid-month convention by limiting section 179-eligible property to depreciable property (which excludes land) and "section 1245 property" (which specifically excludes "a building or its structural components" in section 1245(a)(3)(B))); *supra* note 86 (explaining that section 168(k)-eligible property excludes real property that is subject to the mid-month convention by limiting "qualified property" to depreciable property (which excludes land) with a recovery period of *20 years or less* (which excludes buildings

half-year convention provides that depreciation deductions are taken as though the asset was owned until the midpoint of the year of disposition.[153] Thus, whether an asset is disposed of on January 1 or on December 31, the taxpayer calculates depreciation deductions as though it was disposed of on July 1. No matter the date of disposition, the depreciation deduction in the year of asset disposition is exactly one half of what was expected.

The half-year convention not only minimizes the potential deviation from expectations, it limits risk by presenting one and only one predictable alternative to expectations. Because during the recovery period, a depreciable asset will always either give rise to the expected amount of depreciation deduction or will give rise to exactly one half of that expected amount, even in the year the asset is disposed of, risk to the stream of depreciation deductions is low. Further, depreciable assets eligible for section 179 immediate expensing and section 168(k) bonus depreciation are usually fully depreciated by the initial owner (causing no deviation from expectations) and only infrequently resold (potentially causing a deviation).[154] In sum, the risk that disposition of the asset will cause depreciation cash flows to deviate from expectations is low.

D. Proper Discount Rate Is Low-Risk Rate

If a cash flow is subject to high risk, the cost of waiting to receive it is also high, including both the cost of delay and the cost of uncertainty. If a cash flow is subject to low risk, the cost of waiting to receive it is also low. The recipient need not be compensated for much uncertainty about when or how much she will receive; she need only be compensated for concerns that dollars received in the future will be worth less than dollars received immediately. This phenomenon can be observed in the rates of return on U.S. Treasury notes. Purchasers of Treasury notes do not have uncertainty about when or how much they will receive. Thus, they need only be compensated for the risk that inflation will erode the buying power of their future dollars. Accordingly, the rate of return on Treasury notes establishes how the market prices the cost of delay when the delayed cash flow is certain. This is known as the nominal risk-free rate.

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since, per I.R.C. section 168(c), they typically have a recovery period of 27.5 or 50 years)).

153. I.R.C. § 168(d)(4)(A) ("The half-year convention is a convention which treats all property placed in service during any taxable year (or disposed of during any taxable year) as placed in service (or disposed of) on the mid-point of such taxable year.").

154. Jane Gravelle, *Whither Tax Depreciation?*, 54 NAT'L TAX J. 513, 522 (2001).

Because depreciation deductions are subject to little net risk[155] other than the risk of inflation, a discount rate near the nominal risk-free rate should apply to them. Specifically, a rate near the rate of return on Treasury notes with durations equal to the recovery period of the depreciable asset and issued at the same time the depreciable asset is purchased likely offers an appropriate discount rate for depreciation deductions.[156] Deviation from that nominal Treasury note rate would typically only be appropriate when firm-specific factors make the risk-increasing threats of depreciation denials and carryforwards exceed the risk-reducing benefits of the hedge against tax rate changes offered by gradual depreciation.

E. Proper Discount Rate Is Not the Cost of Capital Used by Firms

The suggestion to discount depreciation deductions at a rate near the nominal risk-free rate might strike some readers as theoretically appealing but ignorant of the financial realities faced by firms. Firms generally cannot borrow money at the nominal risk-free rate and instead must pay heftier interest in order to borrow money to finance investment decisions. Thus, it would seem to follow that the discount rate measuring the cost of delay should be based on the interest rate that the firm would have to pay in order to borrow money over the period of delay. Or, more precisely, since a firm can raise money by borrowing and paying interest or by selling equity and paying market-demanded returns on that equity commensurate with the risk level of the firm (not the risk level of a specific cash flow), the discount rate applicable to future cash flows should be based on the firm's weighted average cost of capital (WACC). The WACC is a weighted average of the interest rate a firm would have to pay to borrow money and the market-demanded returns it would have to pay on equity.

Discounting firm cash flows at the firm's WACC initially makes intuitive sense. Indeed, it seems nonsensical that a firm would choose to borrow money or issue equity in order to finance the delay of depreciation deductions (or to receive any other low-risk cash flow) when the benefits of that cash flow are less than the WACC it must pay to finance the period of delay. Only if the benefits of a cash flow (including delaying depreciation deductions) exceed the WACC does it seem economically efficient to tolerate delay.

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155. "Net risk" considers both risk-reducing hedges and risk-increasing threats. Part II.C argues that there are few sources of risk to depreciation cash flows and perhaps the biggest of these—the risk that a future depreciation deduction will be less valuable because tax rates decrease—is in fact a hedge against a taxpayer's higher exposure to the risk of tax rate increases.

156. *See supra* notes 125 and 149.

While discounting cash flows at the firm's WACC might initially make intuitive sense, it is incorrect to do so. For present-value calculations, which assume an efficient market,[157] discounting should be based on the risk level of the specific cash flow, not the general risk level of the firm. Accordingly, present-value discounting should occur at a rate lower than the firm's WACC for cash flows that are less risky than the firm's average cash flows.

To see why, it is helpful to start with a counterfactual. Imagine that you lent money to a firm so that it could acquire a low-risk cash flow by buying Treasury notes. Now imagine that instead of paying your interest and repaying your principal out of the firm's general funds, the firm committed to pay you interest and repay your principal out of the cash flows from the Treasury notes. Knowing that cash flows from Treasury notes are highly certain, you should only demand an interest rate for the loan near the rate of return on the Treasury notes (i.e. a "cash-flow-specific" discount rate, which in this example would be near the nominal risk-free rate). If you demanded much more than a cash-flow-specific discount rate, the firm would simply find another lender who was willing to agree to an interest rate nearer the nominal risk-free rate. As noted above, the cash flows from gradual depreciation deductions are also highly certain, so if a firm committed to pay you out of the cash flows generated by gradual depreciation deductions, the same analysis should apply.

Although the move from the above counterfactual to a factual analysis recognizing that firms generally repay investors out of general (rather than specifically-designated) cash flows might initially appear to change the above analysis, it does not change that analysis in a meaningful way. In an efficient market, interest rates on debt and required rates of return on equity are not static. Thus, a firm's WACC is not static. Each cost of capital changes in response to changes in the creditworthiness of a firm. As the firm anticipates lower-risk cash flows, it becomes more creditworthy and can properly pay less interest and lower returns on equity.

Returning to our example, imagine that you lent money to a firm so that it could acquire a low-risk cash flow by buying Treasury notes. Consistent with common practice, the firm will pay you interest and repay your principal out of the firm's general funds. Knowing that the cash flows from the Treasury notes are highly certain, you should only demand an interest rate for the debt that is slightly lower than the firm's prior cost of debt in recognition that by engaging in this low-risk investment, the firm has become more creditworthy. Again, if you insisted on the firm's prior cost of debt, the firm would simply find another lender who would agree to a lower interest rate that properly reflected its new and decreased overall risk profile.

157. Part V.C addresses the possibility that the market might be inefficient.

Because low-risk investments change the risk of the firm's cash flows, they also modify the expected rate of return.[158]

Even though current lenders should accept lower interest rates than were previously paid by a firm, they should still demand rates that exceed the rate of return on Treasury notes since they will be paid from the firm's general revenues. Fortunately, the increase in the firm's creditworthiness will cause *future* lenders to accept lower interest rates as well. In an efficient market, when a firm acquires a lower-than-average-risk cash flow, the reductions to its cost of debt occur on a long-term basis (affecting current and future lenders) in a way that is mathematically equivalent to the lower-than-average-risk cash flow receiving funding at a cash-flow-specific discount rate.[159]

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158. Philipp Krüger, Augustin Landier, & David Thesmar, The WACC Fallacy: The Real Effects of Using a Unique Discount Rate 4–5 (June 2012), http://www.hbs.edu/faculty/Lists/Events/Attachments/325/wacc_fallacy.pdf.

159. Tim Thompson, Memo of Notes on the Appropriateness of Project-Based Cost of Capital (August 28, 2013) (unpublished manuscript) (on file with author) (assuming an efficient capital market, "the appropriate discount rate to apply to a project is the project-specific discount rate incorporating the project's systematic risk" and noting that the company-wide beta of the firm "does not matter" because in perfect capital markets, investors are perfectly diversified so the "incremental expected return" must match the incremental risk of the project. If a firm invests in a project with lower risk than the firm's average, returns on stock from this firm should go down but "[t]he market's expected (indeed [its] required) rate of return has gone down for the stock overall because the firm is now a portfolio" with lower-risk investments and more dependable cash flows. Accordingly, when the firm raises money to make a lower-risk investment, in an efficient market, the market will see that the firm is becoming less risky than it used to be (before the investment), apply a lower beta, and require lower returns.); *id.* at 2–6 (working through the mathematical equivalence by showing that a company with a beta of 1.25 should discount a lower-than-average-risk project (with a beta of 0.25) at a project-specific discount rate. Assuming that the firm invests 1/6 of its capital in the lower-than-average-risk project, investment in the project will bring the firm's overall beta down from 1.25 to 1.0833334 (a weighted average of its risk on investment in high-risk projects and its risk on investment in low-risk projects. As a result of this reduction in beta, the rate of return demanded by shareholders will decrease as shareholders recognize that the firm has decreased its overall risk by investing in a lower-than-average risk project. The firm's savings as a result of this reduction in beta and reduction in the required rate of return demanded by its shareholders is equal to the expected return on the lower-than-average risk investment, discounted at its project specific beta of 0.25)); *id.* at 8–9 (discussing how a similar, if delayed, phenomenon occurs for bondholders, who should demand less interest after a firm decreases its overall risk. While there is a risk that existing bondholders may be overcompensated when a firm engages in lower-than-average-risk investments since interest rates will have been previously set, this can be offset by the firm taking on higher-than-average-risk investments at the same time to maintain its prior level of

In addition to the debt-financed investments described above, the same analysis holds true for equity-financed investments. In an efficient market, when a firm engages in lower-than-average-risk investments, the rate of return demanded by shareholders will reduce commensurate with the reduction in the overall risk profile of the firm. Put another way, economically-rational shareholders will be satisfied even if the returns they receive on stock are lower than they expected at the time they purchased the stock as long as the lower returns are associated with a commensurate reduction in the firm's risk profile. Taking the cost of debt and the cost of equity changes together, when a firm engages in lower-than-average-risk investments, its overall WACC declines.

The above analysis has been detailed in the economic literature. For example, Modigliani & Miller, in their seminal 1958 article, *The Cost of Capital, Corporation Finance and the Theory of Investment*, conclude that a cash flow should be discounted at a rate that reflects that cash flow's unique level of risk rather than at one that reflects the firm's WACC.[160]

Despite the widespread agreement with Modigliani & Miller's conclusion, many economists note how frequently firms erroneously use their WACCs to calculate the net present value of a cash flow regardless of that cash flow's specific risk level. Economists Philipp Kruger, Augustin Landier, and David Thesmar term this behavior "the WACC fallacy" and measure significant effects of the WACC fallacy, including underinvestment in activities that would produce low-risk cash flows.[161]

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creditworthiness or by the times when other existing bondholders are undercompensated when a firm engages in higher-than-average risk investments after the interest rates on the bonds have been set. As for bonds, unless a firm engages in simultaneous higher-than-average and lower-than-average investing, the rough mathematical equivalence described above can experience a lag).

160. *See also* ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 413 ("each project should be discounted at a rate commensurate with its own risk. . . . If a project's beta differs from that of the firm, the project's cash flows should be discounted at a rate commensurate with the project's own beta…. Unless all projects in the corporation are of the same risk, choosing the same discount rate for all projects is incorrect…[and] a bias would result. The firm would …reject too many low-risk projects . . . ."); Krüger, Landier, & Thesmar, *supra* note 158. *See generally* Franco Modigliani & Merton H. Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. R. 261 (1958).

161. Krüger, Landier, & Thesmar, *supra* note 158, at 1 ("a key result of corporate finance theory is that a project's cash flows should be discounted at a rate that reflects the project's risk characteristics" and the erroneous use of a firm's weighted average cost of capital (WACC) causes "potential distortions"); *id.* at abstract (noting that use of a firm's WACC rather than a specific "discount rate determined by the risk characteristics of the project" can lead to erroneous

Krüger, Landier, and Thesmar attribute the WACC fallacy to managerial lack of sophistication[162] and agency problems. They support this attribution by observing that sophisticated CEOs and CEOs who own "a larger stake in the company" [163] are less likely to use WACCs and more likely to use cash-flow-specific discount rates than their less-sophisticated and less-invested counterparts.

The extensive economics literature showing that firms erroneously use their WACCs to discount cash flows from investments with atypically low risk may be a key to understanding why firms appear to undervalue gradual depreciation and thus overvalue accelerated depreciation.

As Part II.C argues, the cash flows from depreciation deductions are highly certain. Accordingly, when firms calculate the present-value impacts of electing to accelerate depreciation as compared to waiting for gradual depreciation deductions, they should apply a cash-flow-specific—and therefore low—discount rate. If firms do not do so and instead apply a WACC, they risk dramatically overestimating the value of accelerated depreciation.

In the 1980s, the top 200 firms were surveyed specifically about whether they fall prey to the WACC fallacy when calculating the value of depreciation deductions.[164] Overwhelmingly, they do.[165] As a result, "[t]he

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underinvestment in projects with low risk); *id.* at abstract (showing that significant misallocations of capital result from the "use of a single discount rate").

162. *Id.* at 24 (hypothesizing that firms use a single discount rate due to lack of sophistication of CEOs and other firm actors making capital investment decisions); *id.* at 18 (locating firm managers, rather than capital markets, as the primary source of error by noting "[w]e also test whether the prevalence of the 'WACC fallacy' depends on whether a firm is using internal vs. external financing. Indeed, it might be that financial markets (rather than firms' managers) are subject to the 'WACC fallacy' and fail to properly adjust the firm's cost of capital as a function of the real risks of its investments… The results show that the 'WACC fallacy' does not depend on the use of new external finance. This conclusion holds irrespective of whether new equity, new debt or the sum of both is used… In unreported regressions we also find no link between the [WACC fallacy] and financial constraints") (footnotes omitted); *see also* Ravi Jagannathan, David Matsa, Iwan Meier, & Vefa Tarhan, Why Do Firms Use High Discount Rates? (August 28, 2013), http://bus.miami.edu/_assets/files/faculty-and-research/conferences-and-seminars/finance-seminars/Jagannathan%20Paper.pdf (suggesting that firms use high discount rates not because of capital constraints but because of operational constraints, including efforts to ration the time and attention of managers so that these resources can be invested in the highest return projects). This thesis is interesting because, while manager time and attention is needed to oversee most low-risk projects, it is not needed to oversee the tax savings resulting from depreciation deductions.

163. Krüger, Landier, & Thesmar, *supra* note 158, at 5.

164. Summers, *supra* note 11, at 299.

reported discount rates for depreciation allowances were surprisingly high, with a median of 15% and a mean of 17%—far in excess of the after-tax nominal interest rate."[166] While an updated study asking specifically about how firms discount depreciation deductions would be helpful, several recent studies indicate that firms continue to use their WACCs to discount all cash flows regardless of risk.

Studies in the last several decades show that firms continue to use their WACCs to discount all cash flows regardless of risk.[167] For example, a 1999 survey of Fortune 500 companies found that most firms still engage in the WACC fallacy.[168] Although a small percentage of firms are more accurate in that they apply project-specific discount rates, even this more accurate method still values depreciation deductions as though they are as uncertain as the anticipated profits from a project.[169] Similarly, a 1993 survey of top 100 firms found that 93% of responding firms use their WACCs to value cash flows.[170] When firms use something other than their WACCs, they typically use project-specific or division-specific discount rates rather than cash-flow-specific discount rates that would properly account for the low-risk nature of depreciation deductions.[171] By using the wrong discount rates, firms impute far more value to accelerated depreciation than it actually offers.

F. Proper Discount Rate Is Not the 7% Used by Government

Just as business experts must select a discount rate to estimate a firm's real, cumulative tax savings from accelerated depreciation, government experts must select a discount rate to estimate the government's

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165. *See id.* at 299, 303 (surveying firms with a leading question "some companies discount prospective depreciation tax shields at a low rate because there is not much uncertainty associated with them. Does your company treat different components of cash flow differently?" and still getting a "no" response from 94% of responding firms).

166. *Id.* at 300.

167. *See supra* note 161.

168. *See* Graham & Harvey, *supra* note 132, at 187.

169. *Id.* at 191, 205–09 (noting that in a survey of highly profitable companies in which 392 responded, many firms reported using a firm-generic WACC to evaluate all cash flows regardless of risk. Although some reported using a project-specific discount rate, "[v]ery few firms use a different discount rate to separately value different cash flows within the same project.").

170. Harold Bierman, Jr., *Capital Budgeting in 1992: A Survey*, FIN. MGMT., Autumn 1993, at 24.

171. *Id.* (showing that 72% of responding firms rely on project-based and 35% of responding firms rely on division-based discount rates, whether using them independently or in combination with WACCs).

real, cumulative losses due to accelerated depreciation.[172] Unfortunately, in preparing cost-benefit analyses, government experts make errors that are similar to those made by firms. Like business experts, they generally appear to use average-risk discount rates to value the low-risk cash flows from depreciation deductions. Further, they also appear to not fully incorporate the effects of recession and recovery on low-risk discount rates. As a result, they overestimate the government's real economic losses due to accelerated depreciation.

Official cost-benefit analyses are conducted by the Congressional Research Service (CRS) and the U.S. Treasury Department's Office of Tax Analysis (OTA). Much of the CRS's analysis of accelerated deprecation is completed by its Senior Specialist in Economic Policy, Jane Gravelle. This analysis assumes a 7% nominal[173] discount rate.[174] Much of the OTA's analysis of accelerated depreciation is completed by its depreciation expert, Matthew Knittel and assumes a 6-6.5% nominal discount rate.[175] While

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172. The level of risk to depreciation cash flows is a bit different on the government side than the firm side. All of the sources of risk presented for firms (depreciable basis, depreciation method, tax rate change, inflation, and disposition of the asset) present similarly for the government. However, while firms do not have to fear that the government will fail to provide them the benefits of depreciation deduction, the government does have to fear that firms will not pay their taxes. Thus, the government experiences an additional risk to the cash flows from depreciation deductions–the risk of tax evasion.

173. A nominal discount rate is the discount rate including inflation. A real discount rate is the discount rate excluding inflation.

174. Statement of Jane Gravelle, Senior Specialist in Economic Policy, Congressional Research Service, Before The Committee on Finance, United States Senate, Tax Reform Options: Incentives for Capital Investment and Manufacturing 12 tbl. 4 (March 6, 2012), http://www.finance.senate.gov/imo/media/doc/Testimony%20of%20Jane%20Gravelle.pdf?n=04706 (assuming a 7% nominal discount rate in connection with 2012 testimony before the Senate Finance Committee exploring tax reform options for the treatment of capital investments); Jane Gravelle, *Reducing Depreciation Allowances to Finance a Lower Corporate Tax Rate*, 64 NAT'L TAX J. 1039, 1041 tbl.1 & 1049 tbl.7 (2011) (assuming a 7% nominal discount rate in 2011 before concluding that accelerated depreciation is easily the largest corporate tax expenditure and "about twice as large as each of the next largest [corporate] tax expenditures."); Gravelle, *supra* note 154, at 516 (assuming a 7% nominal discount rate before comparing resulting effective tax rates on investments in equipment to investments in structures).

175. Knittel, *supra* note 93, at tbl.3 (assuming a 6.5% discount rate for depreciation deductions); Matthew Knittel, *Small Business Utilization of Accelerated Tax Depreciation: Section 179 Expensing and Bonus Depreciation*, 98 NAT'L TAX ASSOC. 273, 286 n.12 (2005) (assuming a 6% nominal discount rate for depreciation deductions); *see also* U.S. DEPT. OF TREASURY, THE CASE FOR TEMPORARY 100 PERCENT EXPENSING: ENCOURAGING BUSINESS TO EXPAND NOW BY LOWERING THE

neither the CRS nor the OTA cost-benefit analyses provide much detail about why their assumed discount rates were selected, their assumed discount rates cluster near seven percent[176], the percentage that is recommended by the Office of Management and Budget's Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (Circular A-94).[177]

Circular A-94 recommends that one of two potential discount rates be selected for certain official cost-benefit estimates.[178] When a program primarily provides internal benefits to the government itself, Circular A-94 recommends that its costs and benefits be discounted using a risk-free rate that varies over time to reflect changing economic conditions.[179] In the last decade, within which the CRS and OTA cost-benefit analyses cited above

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COST OF INVESTMENT 3 (2010) (assuming a 6% discount rate for depreciation deductions).

176. Interestingly, the cost-benefit analyses by CRS and OTA tend to use rates near a 7% nominal discount rate (5% real plus 2% inflation) while the Office of Management and Budget's Circular A-94 (Circular A-94) recommends use of a 7% real discount rate. OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, OMB CIRCULAR A-94, GUIDELINES AND DISCOUNT RATES FOR BENEFIT-COST ANALYSIS OF FEDERAL PROGRAMS (1992) [hereinafter OMB, CIRC. A-94]. Still, Circular A-94's recommended discount rate is close to those used by CRS and OTA and provides a detailed description of what rates in this range might assume.

177. *See* OMB, CIRC. A-94, *supra* note 176, at 3 (requiring compliance with Circular A-94 for A-11 "Preparation and Submission of Annual Budget Estimates" and A-19 "Legislative Coordination and Clearance"); Michael Abramowicz, *Information Markets, Administrative Decisionmaking, and Predictive Cost-Benefit Analysis*, 71 U. CHI. L. REV. 933, 1020 n.127 (2004) ("The Office of Management and Budget has standardized [certain] cost-benefit analysis in Circular A-94.").

178. OMB, CIRC. A-94, *supra* note 176, at 3. While the difficulty of distinguishing between internal benefits to the government itself, which are discounted at a floating nominal risk-free rate, and external public benefits, which are discounted at a fixed 7% real discount rate, has always presented a problem, the magnitude of this problem has grown as difference between these rates has widened. When Circular A-94 was issued, 3–10 year floating nominal risk-free rates ranged from 6.1% to 7.0%. OMB, APP. C, *supra* note 126. By 2015, 3–10 year floating nominal risk-free rates ranged from 1.7% to 2.8%. *Id.* As a result, the difficult and often artificial distinction between programs that primarily benefit the government and those that primarily benefit the public is now a significant driver of budget estimates.

179. *See* OMB, CIRC. A-94, *supra* note 176, at 9–10 ("The Treasury's borrowing rates should be used as discount rates . . . [to weigh government costs against *internal* benefits].") (emphasis added); *id.* at 10 ("The net present value to the Federal Government of holding an asset is best measured by discounting its future earnings stream using a Treasury rate.").

were completed, the floating nominal risk-free rates ranged from a high of 5.0% to a low of 0.5%.[180] The discount rates used by CRS (7%) and OTA (6–6.5%) far exceed these rates, indicating that the CRS and OTA did not discount depreciation cash flows as though they are nearly risk free.

In contrast, when a program primarily benefits the public[181] or provides mixed government/public benefits, Circular A-94 recommends that its costs and benefits be discounted using a fixed 7% discount rate. Circular A-94 explains that the fixed 7% discount rate was selected because it approximated "the marginal pretax rate of return on an *average* investment in the private sector in recent years."[182] That CRS and OTA experts use rates near 7% indicates that they likely intend to use an average-risk discount rate. Interestingly, CRS expert Jane Gravelle has, in other work, identified 7% as "the real return to equity after corporate tax," again indicating that this rate may aim to reflect average returns on equity.[183] If, as Part II.C argues, future benefits from depreciation deductions are nearly guaranteed, then the discount rate that should apply to them is far lower than the discount rate that should apply to average-risk private sector investments.[184]

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180. *See* OMB, APP. C, *supra* note 126 (the high of 5.0 was for ten-year duration projects in 2006 and 2007 and the low of 0.5 was for three-year duration projects in 2013). Twenty-year and thirty-year duration projects were not considered since accelerated depreciation is limited to assets with recovery periods not exceeding twenty years.

181. *See* OMB, CIRC. A-94, *supra* note 176, at 10 (providing that the net present value of external/social benefits should be "evaluated with the 7 percent real discount rate").

182. *Id.* at 9 (emphasis added).

183. JANE GRAVELLE & DONALD MARPLES, CONG. RESEARCH SERV., R42111, TAX RATES AND ECONOMIC GROWTH 7 n.14 (2014).

184. *See* Richard L. Revesz, *Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives*, 99 COLUM. L. REV. 941, 979 (1999) (citing FRANK S. ARNOLD, ECONOMIC ANALYSIS OF ENVIRONMENTAL POLICY AND REGULATION 180 (1995)) (explaining that because a government project trades costs and benefits on behalf of affected citizens "[i]t then seems reasonable to discount the future benefits to the present using the same rate that the affected citizens would use, for it is on their behalf that the project is undertaken.").

As explained in Part II.E, affected citizens should use a discount rate based on the specific risk profile of the project, not a market-wide average. *See also* Cass R. Sunstein, *The Real World of Cost-Benefit Analysis: Thirty-Six Questions (and Almost as Many Answers)*, 114 COLUM. L. REV. 167, 199–200 (2014) (explaining that because Circular A-94's real discount rate of 7% "approximates the opportunity cost of capital, . . . it is the appropriate discount rate whenever the main effect of a regulation is to displace . . . the use of capital in the private sector."). Since accelerated depreciation is not a policy that decreases the availability of capital (it affects timing), the discount rate that applies to it should be based on the specific risk profile of the project.

Additionally, that the rates used by CRS and OTA experts fall near a rate recommended by Circular A-94 that approximated the "rate of return on an average investment in the private sector *in recent years* [i.e. in the years immediately prior to the 1992 issuance of Circular A-94]"[185] indicates that they may reflect the high cost of delay for average-risk income streams experienced prior to 1992 rather than the low cost of delay for low-risk income streams in our recent ultralow interest rate economies.[186]

In sum, it appears that the government engages in its own form of the WACC fallacy by applying a single, average-risk discount rate rather than a cash-flow-specific discount rate that would properly reflect the atypically low risk to depreciation cash flows. As a result, official cost-benefit analyses likely overestimate the government's real economic losses due to accelerated depreciation.

G. Low-Risk Discount Rates Are Even Lower During Recession

Since depreciation deductions are very low risk, they should be discounted at a rate near the nominal risk-free rate applicable over the asset's recovery period. When business experts apply their firms' WACCs and government experts apply the overall "rate of return on an average investment in the private sector,"[187] they overestimate the firm-side benefits and government-side costs of accelerated depreciation in all economies. Unfortunately, their errors are compounded during and following recession, when the average-risk discount rates they use stay high while the low-risk

185. *See* OMB, CIRC. A-94, *supra* note 176, at 9 (emphasis added).

186. Unfortunately, the fixed 7% discount rate has not been modified since 1992. Each year, the Office of Management and Budget updates the risk-free rate to be used for the coming calendar year. *See, e.g.*, OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, M-15-05, 2015 DISCOUNT RATES FOR OMB CIRCULAR NO. A-95 (Jan. 22, 2015), *https://www.whitehouse.gov/sites/default/files/omb/memoranda/2015fm-15-05.pdf*. The 7% discount rate, however, remains fixed. As a result, the 7% fixed rate still reflects the "the marginal pretax rate of return on an average investment in the private sector" (*see* OMB, CIRC. A-94, *supra* note 176, at 9) measured as of the 1992 issuance of Circular A-94, ignoring how these returns were affected by our two most recent recessions and recoveries. This is not the first time a government-mandated discount rate has become outdated. From 1972 until 1992, the Office of Management and Budget required official estimates to use a fixed real discount rate of 10% which, although initially reflective of the average pre-tax rate of return on private investments, became outdated in the two decades of its application. That it dropped from 10% before 1992 to 7% after 1992 is evidence of how outdated that discount rate had become. A 3% difference in discount rates will have huge impacts on cost estimates for long-term projects.

187. *See supra* note 182 and accompanying text.

discount rates they should use plummet.[188] While tax law frequently uses accelerated depreciation as a key method of stimulating investment during and following recession, recession itself guts many of the benefits offered by accelerated depreciation in non-recessionary times.

The nominal risk-free rate is not a constant. While the historic average nominal risk-free rate is estimated to be approximately 3.6%,[189] it tends to drop significantly during and following economic recession.[190] This drop is due to many forces, likely including investor behavior (pessimism about future economic growth and a flight to safe investments during periods of high volatility, which drive up the risk premium[191] and drive down the nominal risk-free rate[192]) and government monetary and fiscal policies (including expanding the supply of money, reducing taxes, and increasing government spending). As a result, nominal risk-free rates were low during and following the recession beginning in 2001 and even lower during and following the recession beginning in late 2007.[193] For example, the average annual rate of return on five-year Treasury notes sold in 2012 was only 0.76%.[194]

Accordingly, recession itself often makes the appropriate discount rate that a firm should apply to low-risk cash flows (and, therefore, use to calculate the value of accelerated depreciation) much lower than it would be in non-recessionary times.

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188. *See infra* notes 189–194 and accompanying text.

189. ROSS, WESTERFIELD & JAFFE, *supra* note 119, at 317.

190. *See infra* note 192.

191. *See supra* note 122.

192. *See, e.g.*, ABEL, BERNANKE & CROUSHORE, *supra* note 125, at 298 (explaining that nominal interest rates including Treasury note rates are "procyclical and lagging," meaning that they tend to be depressed late in a recession and during recovery); *id.* at 115 (explaining that interest rates "including those on Treasury bills, notes, and bonds of various maturities . . . decreased between July 2008 and July 2009"); HOWARD J. SHERMAN, THE BUSINESS CYCLE: GROWTH AND CRISIS UNDER CAPITALISM 287 (1991) (observing that interest rates are lower during the late stages of recession and during recovery); Jean-Pierre Danthine, Vice Chairman of the Governing Board of the Swiss National Bank, Speech at the Swisscanto Market Outlook 2014: Causes and Consequences of Low Interest Rates 2–3 (Nov. 14, 2013), https://www.snb.ch/en/mmr/speeches/id/ref_20131114_jpd/source/ref_20131114_jpd.en.pdf (attributing low interest rates during and following recession to "low or negative output growth," "pessimism about future prospects," and "heightened uncertainty in global financial markets [that] has increased the demand for safe assets like government bonds").

193. *See, e.g.*, ABEL, BERNANKE & CROUSHORE, *supra* note 125, at 315.

194. *See supra* note 124.

III. RECESSION REDUCES COST TO GOVERNMENT

Just as recession itself drives down the appropriate discount rate that a firm should use to calculate the firm-side benefits of accelerated depreciation, it drives down the appropriate discount rate that the government should use to calculate its costs.

Following recent recessions, as investors fled to safe investments in response to high volatility and pessimism, the government's cost to borrow money as reflected by the Treasury note rate has hovered near zero.[195] Accordingly, it is inexpensive for the government to accelerate tax benefits since the period of acceleration can be financed by very low-rate government borrowing.[196]

Although the low-rate government borrowing available following recent recessions drives down the government-side costs of accelerated depreciation, official cost estimates have not reflected this phenomenon.[197]

IV. IN 2012, ACCELERATORS LOST WHILE THINKING THEY WON AND THE GOVERNMENT WON WHILE THINKING IT LOST

By applying overly high discount rates, firms likely have overestimated the tax savings they enjoy from accelerated depreciation and

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195. *See, e.g.*, Sylvain Leduc & Zheng Liu, *Uncertainty, Unemployment, and Inflation*, FED. RESERVE BANK OF SAN FRANCISCO ECON. LETTER 2012-28, Sept. 17, 2012, at 1 ("[I]n the recent recession and recovery, nominal interest rates have been near zero."); *id.* at 2 ("[N]ominal rates cannot go significantly lower than their current near-zero level."); Binyamin Appelbaum, *Deferring Action for Now, Fed Signals Openness to a December Rate Increase*, N.Y. TIMES, Oct. 29, 2015, at B1 (noting that in October 2015, the Federal Reserve announced it would "keep rates near zero" as the economic recovery was marked by "growth [that] continues to wobble along rather than power ahead on a clear upward path"); Binyamin Appelbaum, *Fed Raises Rates Closing Chapter of U.S. Recovery*, N.Y. TIMES, Dec. 17, 2015, at A1 (noting that the Federal Reserve's December 2015 announcement that it would gradually raise interest rates came seven years after it cut interest rates "nearly to zero."); Danthine, *supra* note 192, at 1 ("In the wake of the financial crisis, long-term and short-term interest rates have been at historically low levels for several years already.").

196. To be sure, this approach to government finance could be dangerous when applied in higher risk contexts. For example, it probably would not be prudent for the government to make high-risk, long-term investments during periods of recession on the basis that the government's low cost of capital (the Treasury note rate) would make such investments profitable. However, because the risk to depreciation cash flows is low, this approach is much less dangerous in this context.

197. *See supra* notes 182–186 and accompanying text.

the government likely has overestimated its tax losses. Indeed, the application of too high discount rates likely has impeded firms from recognizing the times when they paid *more* taxes due to accelerated depreciation and has impeded the government from recognizing that it received more revenue at those same times.

For example, imagine that a sole proprietor who was at all times in the top federal income tax bracket purchased a $100,000 five-year-recovery-period asset in 2012 and elected to accelerate depreciation to the full extent available in the year of purchase. In 2012, the top federal income tax rate was 35%. Starting in 2013, the top federal income tax rate increased to 39.6%. Because the sole proprietor elected to fully accelerate depreciation, the asset would have been fully recovered in the year of acquisition, for a total tax benefit of $35,000 given the 35% maximum federal income tax rate in 2012.[198] In contrast, had the asset been depreciated via the straight-line method, most of its basis would have been recovered in 2013 and later years and thus at the new highest tax rate of 39.6%. Not accounting for the time value of money, the total benefit of depreciation deductions would be $39,140 according to the straight-line method[199] (instead of only $35,000 according to fully accelerated depreciation).

Although the application of a high discount rate like the 7% used in many government publications or the 17% average rate used by firms would cancel out the benefit caused by later, higher tax rates and still make accelerated depreciation valuable, the application of a more accurate discount rate shows that this taxpayer (and many similarly situated taxpayers) lost money by choosing to accelerate depreciation. For example, if a discount rate of 0.76% is used,[200] the taxpayer lost $3,374 due to her election to accelerate depreciation.[201] In fact, the taxpayer lost money at any

198. The total tax benefit of $35,000 reflects a 2012 $100,000 depreciation deduction multiplied by the 2012 tax rate of 35%.

199. The total tax benefit of $39,140 is the sum of (1) $10,000 (reflecting $100,000 cost basis/5–year-recovery period * 1/2 year convention) multiplied by the 2012 tax rate of 35%; and (2) $90,000 (the remaining basis to be recovered) multiplied by a 39.6% tax rate for years 2013–2017. The half-year convention causes the depreciation deduction to be $10,000 for the first and last year (i.e., for 2012 and 2017, $100,000 cost basis/5-year-recovery period * 1/2 year convention = $10,000). A depreciation deduction of $20,000 is available in the other years (i.e., for 2013, 2014, 2015, and 2016, $100,000 cost basis/5-year-recovery period = 20,000).

200. Recall that the 0.76% discount rate tracks the average annual rate of return on five-year Treasury notes sold in 2012 (a measure that should reflect inflationary risk over the period from 2012–2017 but no risk that the nominal income stream will be other than as projected). *See supra* note 124.

201. The loss of $3,374 is derived by subtracting the $38,110 potential tax benefit from straight-line depreciation from the $34,736 potential tax benefit from immediate expensing. The $34,736 potential tax benefit from immediate expensing

discount rate lower than 4.6115% (a rate far in excess of the then-applicable risk-free rate).[202]

Taxpayers who elect to accelerate their depreciation deductions likely lose money not only if they experience a statutory tax rate increase (as demonstrated above),[203] but also if they move up the rate schedule during the recovery period, or if their use of accelerated depreciation causes a bunched deduction in the year of acquisition that forces some of the deduction to be taken at a rate lower than the taxpayer's marginal rate.[204] These risks are especially serious since both the recessions beginning in 2001 and in late 2007 were associated with effective tax rate decreases followed by gradual increases during the recovery period.[205] Further, in both recessions, many

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is calculated by taking the 2012 depreciation deduction of $100,000, multiplying it by the 2012 tax rate of 35%, and discounting it for one year at a 0.76% rate. Even tax savings from immediate expensing are discounted for one year since taxpayers experience a delay as to when their taxes are due and, therefore, when they receive actual economic benefit from their tax deductions. The $38,110 potential tax benefit from depreciating via straight-line method is calculated by discounting the amounts determined *supra* note 199, using a 0.76% discount rate and taking into account the time horizon (e.g., for 2014, discounting for three years). All discounting uses the formula 1/((1+discount rate)^number of years discounted).

202. Methodology is described in note 201, *supra*. If a 4.6115% discount rate is used, the potential tax benefit from immediate expensing and the potential tax benefit from straight-line depreciation are equal, meaning that neither opting in nor opting out of accelerated depreciation offers any value.

203. *See supra* Part IV (explaining how the 2013 statutory tax rate increase affected accelerated depreciation).

204. *See, e.g.*, Theodore S. Sims, *Debt, Accelerated Depreciation, and the Tale of a Teakettle: Tax Shelter Abuse Reconsidered*, 42 UCLA L. REV. 263, 281 (1994) (noting that "accelerated depreciation *by itself* bunches the deductions produced by the asset into the beginning of its productive life. With expensing the bunching is extreme. The entire cost is allowable as a deduction when the investment is made at Time 0. On the flip side, however, no further deductions for depreciation are allowed.").

205. *See, e.g.*, Gene Amromin & Steven A. Sharpe, *From the Horse's Mouth: Economic Conditions and Investor Expectations of Risk and Return*, 60 MGMT. SCI. 845 (2014) ("The consensus view is that such variation [in the returns investors require on stocks] is tied to the business cycle… [I]nvestors require a higher risk premium (i.e., expect higher returns) when economic conditions are poor because, at such times, investors experience high economic risk, high aversion to risk, or both. Thus, in expectation, investors are compensated for exposure to time-varying macroeconomic risks."); Robert J. Barro & Charles J. Redlick, *Macroeconomic Effects from Government Purchases and Taxes*, 126 Q. J. ECON. 51 (2011) (noting that the government responded to the "global recession and financial crisis of 2008-09" by giving tax breaks that lowered "marginal income-tax rates."); Carlos A. Vegh & Guillermo Vuletin, *How Is Tax Policy Conducted over the Business Cycle?* (Nat'l Bureau of Econ. Research, Working Paper No. 17753, 2012),

taxpayers fell into lower tax brackets during the recession and only slowly climbed into higher tax brackets during the recovery period.[206] These phenomena cause taxpayers to take accelerated depreciation deductions at atypically low rates. Since economic recessions and recoveries are associated with atypically low effective tax rates, taxpayers that accelerate depreciation during recession face a significant risk that they will lose the benefit of bigger depreciation deductions that would otherwise have been available in later years with higher tax rates.

V. IMPLICATIONS

As is described above, while opportunities to accelerate depreciation may be more plentiful during and following recession, recession itself often makes these opportunities less valuable. Yet business and government experts generally behave as though accelerated depreciation is extraordinarily valuable, even during recession.

These observations suggest a number of implications. First, businesses may be incentivized by a belief in accelerated depreciation's value to make more capital investments than they otherwise would. Second, government studies may conclude that the elimination or curtailing of accelerated depreciation would fund bigger tax rate reductions, tax expenditures, deficit reductions, or direct spending programs than is accurate. Third, the biggest benefit and risk that accelerated depreciation actually provides to businesses during recession may be something other than increasing the present value of depreciation deductions.

A. Overestimation May Drive Investing

While this article argues that accelerating depreciation in recession is much less valuable than has been assumed, it does not conclude that firms *generally* should elect gradual depreciation.[207] While much smaller than is

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http://www.nber.org/papers/w17753 (noting that the United States is a country with one of the highest correlations between recession and low tax rates).

206. *See, e.g.*, Barro & Redlick, *supra* note 205, at 65 (noting that low-growth periods are associated with low average-effective tax rates "because falling incomes within a given tax structure push[] people into lower rate brackets"); Vegh & Vuletin, *supra* note 205, at 4 ("[T]ax revenues almost always increase during booms and fall in recessions as the size of the tax base . . . [the amount of income subject to tax] moves positively with the business cycle.").

207. This is in contrast to the advice given to Powerball lottery winners, which did say "take the annuity." Barro, *supra* note 2, at A3. Experts advised Powerball winners to take the annuity because during the deferral period (the period between when a lump-sum payout would have been received and when the final annuity payment would have been made), the government operators of the Powerball

widely assumed, the present-value impacts of accelerating depreciation are still positive whenever the nominal risk-free rate is positive and tax rates are steady. Yet, there are instances like the instance described in Part IV above when, in retrospect, a firm should have elected gradual depreciation.

This insight offers a planning opportunity. Whenever a firm anticipates an increase in statutory tax rates or an increase in its applicable tax rate[208] or determines that accelerating depreciation would cause a bunched deduction that would force some of the deduction to be taken at a lower rate, it should consider opting out of accelerated depreciation. If future deductions can be taken at higher rates, the anticipated marginal-tax-rate increase might be enough to outweigh the present-value benefits of accelerating depreciation. A firm that overestimates the present-value benefits of accelerated depreciation risks missing this planning opportunity.

As discussed earlier, some businesses opt out of opportunities to accelerate depreciation.[209] In fact, businesses opt out more frequently than economic models would predict, meaning that their opt-out behavior has presented "a puzzle from the standpoint of basic economics."[210] This article has identified certain factors that might explain their opt-out behavior as more rational than has previously been assumed. These businesses might simply anticipate tax rate increases that would be sufficient to outweigh the potential present-value benefits of accelerating depreciation.

Although some businesses opt out of accelerated depreciation, most opt in and use their WACCs as discount rates to calculate the value of accelerated depreciation.[211] In so doing, they likely dramatically overestimate the value of accelerated depreciation. Because they overestimate the value of accelerated depreciation, they may increase their capital investing more than they otherwise would and more than they rationally should.

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lottery invest the winnings in an investment that produces 2.843% interest. *Id.* As a result, the winner is able to take advantage of that interest and tax benefits from delaying receipt of that interest. *Id.* In contrast, during the deferral period for depreciation, the Treasury does not invest the delayed tax savings. As a result, firms receive no returns on the investment of their delayed tax savings.

208. While many corporations are effectively subject to a flat tax of 34% or 35%, the corporate tax rate schedule is graduated. *See* I.R.C. § 11 (a corporation's taxable income can be subject to rates of 15%, 25%, 34%, and 35%). Further, depreciation deductions will affect the tax imposed on shareholders when they sell appreciated stock or receive dividends. Thus, changes in the effective rate on shareholder capital gains and dividends should be considered. Changes in the effective rate that applies to pass-through and disregarded entities may be more common than changes in the effective rate that applies to corporations.

209. *See supra* notes 113–115 and accompanying text.

210. *See supra* note 111.

211. *See supra* notes 161–171 and accompanying text.

An important implication of this article is that accelerated depreciation may increase capital investing because of a business's *perceptions* of its value beyond what would occur on the basis of the reality of its value. A reader might see this implication as reflecting good tax policy. Accelerated depreciation was enacted to increase capital investing and may have extra-bang-for-the-buck effects because it gives taxpayers an incentive (to which they assign a subjectively high value) at a lower cost to the government than has been estimated previously. Or a reader might see it as problematic tax policy because accelerated depreciation might encourage taxpayers to make economically inefficient decisions.[212] The answer is likely a matter of political disposition. While this article does not attribute a positive or negative value to this implication, it does point to the possibility that overestimation of the value of accelerated depreciation may drive increased capital investing.

B. Overestimation May Drive Tax Policy

This article argues that by using discount rates that do not account for the atypically low risk to depreciation cash flows or the depression of risk-free rates that occurs during and following recession, government experts overestimate accelerated depreciation's real cost to the government. As a result, official estimates may misinform taxpayers and cause inefficient legislative decisions about whether to expand or limit accelerated depreciation policies.

For example, after applying a fixed 7% discount rate,[213] some government experts have identified eliminating accelerated depreciation as "[t]he most important source of base broadening among tax expenditures."[214]

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212. *See, e.g.*, Theodore P. Seto, *The Problem with Bonus Depreciation*, 126 TAX NOTES 782, 782–83 (Feb. 8, 2010) (explaining that while bonus depreciation likely increases capital investing, this increase likely reallocates funds away from investment in labor and encourages businesses to engage in activities that use "more capital and less labor").

213. *See, e.g.*, Gravelle, *supra* note 48, at 1041 tbl.1 (estimating lost revenues based on an assumed nominal discount rate of 7% and the assumption that tax rates would not change); *id.* at 1049 tbl.7 (same). *But see id.* at 1048 tbl.5 (using a 5% nominal discount rate in other estimates).

214. *See id.* at 1039 ("Both President Obama and congressional leaders have expressed an interest in corporate tax reform that would lower the rate but be revenue neutral. The most important source of base broadening among tax expenditures is accelerated depreciation on equipment, which accounts (after being purged of the effects of temporary bonus depreciation) for about a quarter of corporate tax expenditures. As a corporate tax expenditure, accelerated depreciation is about twice as large as each of the next largest tax expenditures…") (citation omitted).

Media sources have speculated that "[a]s the largest corporate tax expenditure, accelerated depreciation will almost certainly be on the chopping block to finance another reduction in the corporate tax rate."[215] And think tanks predict that "[a]s the largest corporate tax break, accelerated depreciation will play a central role in any corporate tax reform plan."[216] Experts who overestimate the government-side costs of accelerated depreciation may advise policymakers that the elimination or reduction of accelerated depreciation could fund a greater tax rate reduction,[217] more deficit reduction,[218] or more indirect or direct spending[219] than is accurate.

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215. Bruce Bartlett, *Depreciation's Place in Tax Policy*, N.Y. TIMES BLOG (September 10, 2013, 12:01 AM), http://economix.blogs.nytimes.com/2013/09/10/depreciations-place-in-tax-policy/.

216. *The Tax Break-Down: Accelerated Depreciation*, COMM. FOR A RESPONSIBLE FED. BUDGET (Sept. 20, 2013), http://crfb.org/blogs/tax-break-down-accelerated-depreciation. This speculation appears at least partially informed by official government estimates since the Committee for a Responsible Federal Budget, a nonpartisan, nonprofit think tank, includes former members of the CBO, OMB, GAO, and Federal Reserve Board. *See About Us*, COMM. FOR A RESPONSIBLE FED. BUDGET, http://crfb.org/about-us (last visited Nov. 18, 2016).

217. *See, e.g.*, Gravelle, *supra* note 48, at 1048 (concluding that eliminating accelerated depreciation would fund a revenue-neutral reduction in the corporate tax rate and estimating "the corporate tax rate could be reduced by 2.2 percentage points rather than 4.7 percentage points under the alternative depreciation system. For the CBO budget option, the reduction falls from 2.2 percentage points to 0.9 percentage points.").

218. *See e.g.*, David Super, Opinion, *A Costly and Outrageous Tax Break*, N.Y. TIMES, Dec. 3, 2014, at A33 (appearing to rely on nominal tax expenditure estimates limited by a ten-year budget window to conclude that the cost of proposed bonus depreciation would be "staggering: nearly $300 billion over the next decade…[enough to] wipe out roughly one-third of deficit reduction from higher tax collections from the wealthy as a result of last year's 'fiscal cliff' deal."). Although the Opinion-Editorial does not cite a source for the nearly $300 billion estimate, the Joint Committee on Taxation had, on May 27, 2014, published a nominal, cash-based estimate that revenue collections would be $287.413 billion less for 2014–2024 if H.R. 4718, a bill to make bonus depreciation permanent, was passed (which estimate included $262.911 billion less revenues due to bonus depreciation and $24.502 less revenues due to the elective AMT credit offered in lieu of bonus depreciation). STAFF OF THE JOINT COMM. ON TAX'N, 113TH CONG., JCX-57-14, DESCRIPTION OF H.R. 4718, A BILL TO MODIFY AND MAKE PERMANENT BONUS DEPRECIATION 10 (2014). This estimate was incorporated into a Congressional Budget Office Cost estimate on June 5, 2014 ("The staff of the Joint Committee on Taxation (JCT) estimates that enacting H.R. 4718 would reduce revenues, thus increasing federal budget deficits, by about $287 billion over the 2014–2024 period."). CONG. BUDGET OFFICE, COST ESTIMATE, H.R. 4718, at 1 (2014), https://www.cbo.gov/sites/default/files/113th-congress-2013-014/costestimate/hr47180_0.pdf. According to the rules of JCX-1-05, *see supra* note 7, this estimate does not discount

Further, the use of an inaccurately high discount rate may impede government experts from identifying circumstances when accelerated depreciation increases government revenues. For example, prior to 2012,[220] government researchers estimating the revenue loss impacts of immediate expensing and bonus depreciation assumed high discount rates and assumed that tax rates would not change. When, in 2013, tax rates increased, their estimates proved particularly inaccurate.[221] While large revenue losses were predicted, revenue gains were realized.

C. Overestimation May Obscure Actual Benefit and Risk

This article argues that the primary perceived benefit of accelerated depreciation—that it increases the present value of depreciation deductions and thus increases the net present value of capital investing[222]—is dramatically and broadly overestimated, particularly during and after recession. In addition to present-value impacts, however, accelerated depreciation offers a second benefit by providing firms with free access to capital.[223] By accelerating depreciation deductions, firms can enjoy tax savings earlier and use those tax savings as capital to fund new investments. If firms did not have this free access to capital, they would need to raise capital by issuing debt or equity and would be required to pay market-demanded rates of return on that debt or equity.

The provision of free access to capital to firms that would otherwise be required to pay market-demanded rates of return on capital is potentially a benefit and potentially a risk. As long as the market is efficient and demands rates of return on capital that are commensurate with the risk level of the capital investment, a firm's need to pay market-demanded rates of return will serve as a check against the risk that firms might otherwise make inefficient investments. The provision of free capital sacrifices that check and increases the risk of inefficient investments.

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future receipts to present values or otherwise account for the time value of money. For the discussion of the purposes and limitations of tax expenditure estimates, see Part I.F, *supra*.

219. *See e.g.*, Super, *supra* note 218, at A33 (appearing to rely on nominal tax expenditure estimates limited by a ten-year budget window to conclude that the cost of proposed bonus depreciation is "more than three times what we spend on nutrition supplements for pregnant women, infants and young children.").

220. *See supra* Part IV.

221. *See, e.g., supra* note 213.

222. *See supra* notes 10–27 and accompanying text.

223. *See* Zwick & Mahon, *supra* note 116, at 4-5 (finding that companies with low cash holdings and limited access to capital respond more to accelerated depreciation, and that "firms *only* respond to investment incentives when the policy immediately generates cash flows.") (emphasis in the original).

However, markets can experience inefficiencies. Perhaps particularly during recession, as investors experience atypically high pessimism and risk aversion, driving up the risk premium,[224] access to capital may be inefficiently constrained. Firms may find themselves unable to raise capital at efficient rates even when they are funding efficient investments. Accelerated depreciation's primary benefit might be that it functions as a cheaper than previously assumed method of mitigating this market inefficiency. It allows firms to use year-of-acquisition tax savings rather than external financing to fund capital investments when access to external financing is inefficiently constrained.

It is beyond the scope of this article to establish whether recessionary markets generally are more or less efficient than non-recessionary markets, whether recession is always inefficient, or whether recession is sometimes a correction that is necessary to restore market efficiency. However, this article does imply the possibility that the greatest potential benefit of accelerated depreciation is also its greatest potential risk—the provision of free access to capital to finance investments that might otherwise not be undertaken. This possibility has previously been obscured by the focus on the net present-value benefits of accelerated depreciation.

If a firm believes that it has a wonderful investment opportunity but cannot access capital at an efficient rate to fund the investment, it can use the tax savings from accelerated depreciation as capital. A firm using this approach should be aware of two things. First, that firm will have implicitly rejected the assumption of an efficient market. In an efficient market, good investments should attract investors willing to accept appropriate rates of return. Second, rejecting the assumption of an efficient market is risky both for the firm and the economy. If the firm's assessment of the investment as wonderful is correct and the market's assessment of the investment as less wonderful is incorrect, then accelerated depreciation facilitates efficient investing. This might occur for a number or reasons, including a firm's greater access to information about the investment. However, if the market's assessment of the investment is more accurate, then accelerated depreciation facilitates inefficient investing, which presents risks for the firm and the economy as a whole. This might occur for a number of reasons, including managerial optimism, bias, or the greater ability of a diverse market to catch and correct individual errors. It seems likely that sometimes firms assess investment opportunities more accurately and sometimes they assess them less accurately than the market.

224. *See supra* note 122.

CONCLUSION

As was discussed in this article's introduction, in January 2016, financial experts urged the future winner of the Powerball lottery to forgo the tempting immediate lump sum payout of the jackpot and instead choose to receive the winnings gradually over time in the form of an annual annuity. They correctly noted that, while money now is more valuable than money in the future, that differential is small in the case of "ultrasafe" gradual cash flows and even smaller in "ultralow interest rate environment[s]," such as occur during many recessions and recoveries, including our current recovery. While these principles have not previously been applied to the decision to accelerate depreciation in recession, this article has argued that they should apply and has applied them to conclude that accelerated depreciation is much less valuable than has been assumed, particularly during recession.

Some of the experts advising the future lottery winner spoke directly to a hypothetical future winner who hoped to evaluate investment opportunities more accurately than the market. "[M]aybe you have a brilliant business idea ready to go and all you've been waiting for is the several hundred million dollars in investment capital you need to make it happen."[225] To these optimistic types, the experts said "[b]ut this leads us to the biggest advantage of the annuity: protecting you from yourself."[226]

This article urges business and government experts to reconsider their previously high estimates of the net present-value benefits of accelerated depreciation and then to focus their attention on the question that emerges: whether by providing firms with free access to capital during recession, accelerated depreciation protects firms from an inefficient market or interferes with the various ways that an efficient market protects firms from themselves.

225. Barro, *supra* note 2, at A3.
226. *Id.*