The just-passed Tax Relief Act of 2003 enacted a bonus depreciation for most equipment that will allow 50 percent of the cost of the equipment to be deducted as soon as the equipment is placed in service. Bonus depreciation is expensive — many times more expensive for next year than the dividend exclusion that got all the attention. For all that cost, bonus depreciation does harm, as measured by the market. Bonus depreciation will divert capital away from better investments and into equipment that gives returns worse than the prevailing fair market interest rates. Bonus depreciation makes inferior investments look good and that wastes precious capital. Wasting capital chokes off potential growth and loses jobs.

The new act allows 50 percent of the basis of most equipment to be deducted immediately. Last year Congress enacted a bonus, immediate depreciation deduction of 30 percent of cost. The new bonus depreciation reduces the real or effective tax rate on equipment, using reasonable assumptions, from the statutory rate of 35 percent for large corporations to 8 percent in real or effective rate tax. The managers of the act estimated the 2004 cost of the bonus depreciation at $33 billion, and the 2004 cost of 15 percent tax on dividends and capital gain at under $1 billion. Joint Explanatory Statement of the Committee of Conference on Jobs and Growth Tax Relief Reconciliation Act of 2003, Appendix on Estimated Budgetary Effects (May 22, 2003), Doc 2003-12885 (328 original pages), 2003 TNT 101-40.

The new act allows 50 percent of the basis of most equipment to be deducted as soon as the equipment is placed in service. Bonus depreciation is irresponsible, Professor Johnson argues, because it generates a negative tax for debt-financed investments that is like the government paying for 27 percent of the cost of privately held equipment. The negative tax is both expensive and does harm, he says. Under the assumptions of Johnson’s model, investments in equipment that returns only 70 percent of the prevailing fair market value interest rates can go forward. That will mean, Johnson says, that inferior investments will outbid better investments and waste precious capital. Wasting capital, he claims, will choke potential growth and destroy jobs. Johnson argues that bonus depreciation must have passed because of the carnival atmosphere.


2Jobs and Growth Tax Relief Reconciliation Act of 2003, 108th Cong., 1st Sess. section 201(a) adding to the Internal Revenue Code (code) section 168(k)(4) to increase first-year depreciation deduction of 30 percent of cost. The new bonus depreciation reduces the real or effective tax rate on equipment, using reasonable assumptions, from the statutory rate of 35 percent for large corporations to 8 percent in real or effective rate tax. The managers of the act estimated the 2004 cost of the bonus depreciation at $33 billion, and the 2004 cost of 15 percent tax on dividends and capital gain at under $1 billion. Joint Explanatory Statement of the Committee of Conference on Jobs and Growth Tax Relief Reconciliation Act of 2003, Appendix on Estimated Budgetary Effects (May 22, 2003), Doc 2003-12885 (328 original pages), 2003 TNT 101-40.

terms. Inferior projects giving a profit that is only 70 percent of fair market interest become justified by the tax shelter aspects of the project once the new bonus depreciation is in place. Both the 8 percent effective rate and the break-even profit at 70 percent of fair market interest are calculated in a spreadsheet model in the appendix to this report.

Debt-financed investments in equipment eligible for bonus depreciation give the investors the benefit of a negative tax, they see, of minus 27 percent. The negative tax is like a cash payment or subsidy for projects that have no special merit. The interest deduction on debt used to buy the equipment, saves tax at 35 percent, and the tax savings from the interest, even with the tax on both the equipment and creditors, carries the total tax burden into the negative range. A positive tax makes money for the Treasury to pay off the war debts or whatever, but a negative tax hurts the Treasury and makes its revenue needs more extreme. Equity investments in equipment, however, do not benefit from a negative tax and for equity investment, the distortion problem is not very serious.

The negative tax does economic harm in making inferior investments look good. The prevailing interest rate measures the price of capital, as determined by the battle between the supply of capital from savings and the demand for capital from investment projects. Projects that can carry the prevailing fair market interest rate are good projects that will be able to get capital from the free market. Projects that cannot pay the prevailing interest rates are inferior projects, measured by their return. Diverting capital from projects that can pay the prevailing fair market interest rates into inferior projects that could not pass over the fair market value hurdle is a silly thing to do.

Debt Financing

The new depreciation schedules are available on projects paid for with borrowed money. In a consumption tax borrowed proceeds would offset depreciation deductions or would be included in income, because borrowing is not saving, but rather negative saving that draws down existing capital. Borrowing represents not new savings, but just a diversion of existing capital from other projects. The new depreciation schedules create serious problems because they do not deal coherently with borrowing.

When equipment is debt financed, the tax on the investor drops to -27 percent: For a large 35 percent tax-rate corporation, the tax of 8 percent effective rate on the investment in bonus depreciation equipment is combined with a 35 percent tax savings on interest paid to carry the investment. The sum of 8 percent and -35 percent yields the -27 percent tax. The combined tax effect is like the government exempting the profit from tax and, moreover, giving a subsidy beyond exemption of 27 percent of the income from the project. The best definition of a “tax shelter” is a transaction that has higher rate of return after tax than before tax, and debt-financed investments in bonus depreciation are a fine tax shelter under that definition. A subsidy of 27 percent of income is also like a capital grant to the investor equal to 27 percent of the cost of the equipment. Economically, the government is paying for over a quarter of the cost of the equipment.

The best definition of a ‘tax shelter’ is a transaction that has a higher rate of return after tax than before tax, and debt-financed investments in bonus depreciation are a fine tax shelter under that definition.

It is one thing to preach that investments should be free from tax so that the economy can spring upward, free from the weight of tax. Tax does need to be collected from somewhere to pay the war debts or whatever so that even exemption is an opportunity cost. But selective negative taxes go beyond mere exemption into the realm of government subsidy, akin to welfare grants from the government. Negative tax is not freeing the free market from the burden of tax, but distorting the investment decisions reached by the battle of real cost and real demand in the free market. Selective negative taxes stretch the springs of the economy in twisted directions. They make the government’s revenue needs worse, they waste capital and destroy jobs.

One can safely assume that Congress did not know what it was doing. The benefits are economically equivalent to a program in which Congress forgave all tax on the profit from equipment, and on top of that Congress spent government money to give a capital grant when the equipment purchased was equal to 27 percent of the cost of routine equipment. One would think that exemption of profits from tax would not be so easy. One would think that a capital grant of that level would have to be justified by some special public benefit. One would think that a capital grant of that level would have to be justified by some special public benefit. Private investments ordinarily are expected to float on their own bottoms. Congress should therefore not do the equivalent to an exemption of profits plus a 27 percent grant through little understood depreciation schedules.

Creditors pay some tax on interest received, but the tax paid by creditors is not enough to prevent debt-financed investments in bonus depreciation from being a revenue drain, overall. When one traces the full course of equipment investments with borrowed money, profit from equipment creates not a revenue source but a revenue loss to Uncle Sam. Recipients of interest pay tax at a rate no higher than 10 percent. We know this because those creditors that would pay tax on interest at higher than 10 percent can flee to

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4Before the change, with 30 percent first-year bonus depreciation, the effective tax rate, under my assumptions used in the appendix, was 13.3 percent.

tax-exempt bonds instead. Large 35 percent tax-bracket corporations pay an effective 8 percent tax on their profit from bonus depreciation equipment, then they save tax at their 35 percent marginal rates on interest paid, and then the creditor pays tax on the interest at no more than 10 percent. The sum of 8 percent, -35 percent, and 10 percent is -17 percent, meaning that the government loses 17 cents, considering both debtor and creditor, for every dollar of equipment profits paid over as interest.

Creditor tax, moreover, is uniform across interest, and creditors cannot discriminate between corporate borrowers using the money for bonus depreciation or for some other investment. Thus creditor tax does nothing to help solve the economic distortion of debt-financed equipment because it does not affect the borrower who is deciding where the borrowed proceeds will go.

In a wrong but very influential piece, Martin Feldstein and Lawrence Summers argued that the debt financing could be ignored because under their calculations, the tax on interest received was the same as tax saved on interest paid, so that debt could drop out of the calculations. Feldstein and Summers made a number of crude mistakes. The worst is that they counted the shareholder (double) tax on corporate income on the recipient side, but made the adjustment for the shareholder tax on the payor side in the wrong direction, subtracting rather than adding shareholder tax. Shareholder tax should probably not be counted on either side, but if it is counted, it should be counted consistently. Starting afresh and using the implicit tax to measure tax on interest recipients, the assumption of 35 percent marginal tax savings on the payor’s side and 10 percent tax paid on the recipient side, at very least, describes a broad and very important range of other typical tax savings. Interest always loses the government money because taxpayers line up into clienteles in which high-bracket taxpayers become debtors and pay interest and low-bracket taxpayers become creditors and receive interest. The revenue loss on interest is especially bad now because our tax system has decayed so badly that the tax on interest on the creditor’s side is low, and dropping.

The negative tax on debt financing will allow projects benefiting from bonus depreciation to go forward, even when the project cannot meet fair market value interest. The market sets the interest rate by the intersection of supply and demand. People who want to rent capital for various projects come to that market. Savers who have capital to provide show up as well. The market is fluid, global, and largely electronic but it functions not very differently from ancient town markets in which price was set by supply and demand. The fair market value interest rate represents the market-determined rental cost of capital. Projects that produce real returns from real demand and real utility, that pass over the hurdle of better than fair market value interest, will go forward. Projects that cannot pass the hurdle will go home empty and will have to come to market on some other day.

In a wrong but very influential piece, Feldstein and Summers argued that the debt financing could be ignored because under their calculations, the tax on interest received was the same as tax saved on interest paid.

The brutal cutting off of inferior projects that cannot meet the market price for capital is one of the wonderful things that a functioning free market does for us. It might make sense to lower the interest cost for all projects by increasing the supply of savings, but it makes no sense to lower the hurdle for inferior projects. Projects that cannot meet fair market value interest, wherever it is, should be cut off.

On my estimates, shown in the appendix, assuming the 5 percent interest rate now available for low-risk intermediate term borrowing, a project eligible for bonus depreciation that gets only 3.5 percent return could go forward. That return is too low for precious capital.

The demand from the inferior projects will also do a second round of harm in raising interest rates generally. The new demand for loans from projects giving below a 5 percent — but higher than 3.5 percent return — will tend to drive up interest rates more generally. The government will also need to go into the market to finance its deficits caused by the negative

6See Calvin H. Johnson, “A Thermometer for the Tax System: The Overall Health of the Tax System as Measured by Implicit Tax,” 56 SMU L. Rev. 13 (2003) (showing the reduction in tax-exempt interest or “implicit tax” has been under 10 percent in recent years). Municipal bond interest with the low implicit tax sets a discount rate that applies to all investments throughout the tax system.


9The “new view” of shareholder taxes argues that they should be ignored for investments made out of accumulated earnings. Accumulated earnings give the corporation a source of capital that has not been subject to shareholder tax and under the theorem that exemption of capital from tax is systematically equivalent to exemption of income, the shareholder-tax-free source of investment is like not paying shareholder tax on earnings. See, e.g., George Zodrow, “On the ‘Traditional’ and ‘New’ Views of Dividend Taxation,” 44 Nat. Tax J. 497 (1991).

10Independently, corporate managers are judged by accounting earnings that include corporate tax, but not shareholder tax. It is plausible that since shareholder tax is not on the managers’ report card, it does not affect their behavior.

The shareholder-level tax at maximum is enough to turn the total tax on equity investment in bonus depreciation equipment up to 21.8 percent. In any event, equity investment in bonus depreciation does not generate a negative tax and does not look materially distortive.

If corporate investments generally were bearing a tax of 35 percent, then there would be no difference in the distortion between debt and equity investments. Equity investment in bonus depreciation equipment means foregoing some other investment. If that other investment were bearing 35 percent tax, then foregoing that other investment would be avoiding a 35 percent tax. There is no difference between an interest deduction saving 35 percent tax and foregoing a 35 percent taxed alternative investment, saving 35 percent tax. Withdrawing capital from a bank by borrowing and withdrawing capital from another investment by selling or foregoing that other investment are fundamentally the same phenomenon. But withdrawal now is like a deduction saving under 10 percent tax because the alternative investment is taxed now at under 10 percent. Ironically, bonus depreciation with equity is not materially distortive because the tax system is so weak now that alternative investments are taxed, in the current environment, at so low a rate.

The Limits of Negative Tax

The negative tax from debt-financed investments in bonus depreciation property seems powerful enough to strip the corporate tax base, but not beyond. In addition to inducing inferior investments, the negative tax, from the combination of interest deductions and bonus depreciation, does seem to have the capacity of making the remaining corporate tax base disappear. The effective tax rate on corporate income is already under 10 percent and dropping. It is difficult to see how the remaining tax base can be defended from the new bonus depreciation shelters, combined, of course, with the continued aggression of tax planners, who have been so successful in making corporate tax disappear already.

It seems unlikely, however, that the bonus depreciation shelters will make the individual tax base on salary disappear. The passive activity loss limitations of section 469 have been surprisingly successful over the last 17 years in preventing individuals from sheltering their salary for tax. Section 469 does allow sheltering of cash income from real estate rent and similar investment income, because losses from one shelter can be used, even under section 469, to shelter income from another. Still, section 469 has served to defend the tax base to the extent of salary and it will probably continue to do so.

The corporate income base, however, has no defender analogous to section 469. The corporate alternative minimum tax, on its face, looks like it will impose a tax of 20 percent, but the base subject to min-

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12 Calvin Johnson, supra note 6.

13 Jobs and Growth Tax Relief Reconciliation Act of 2003, 108th Cong., 1st Sess. sections 301, 302 reducing capital gains rates to a maximum of 15 percent and adding to the code new subsection 1(h)(11) to include corporate dividends within the meaning of net capital gain.

14 Calvin Johnson, supra note 6.

15 Section 55(b).
The corporate income base has no defender analogous to section 469. The corporate alternative minimum tax, on its face, looks like it will impose a tax of 20 percent, but the base subject to minimum tax is porous.

Section 469 will also do nothing to stop tax-free luxury consumption derived from dividends and capital gain. Zero or near zero corporate tax will unburden the consumption of shareholders from tax. When the Treasury Department developed its proposals to relieve dividends and accumulated earnings from shareholder tax, it extended its relief only to income for which the corporation had paid a 35 percent corporate tax. That safeguard, however, was not included in the dividend tax relief that was enacted. Thus the 15 percent tax on dividends and capital gain will be available for quite luxurious consumption that has never borne any prior tax.

Carnival Knowledge

Eligibility for the bonus depreciation does not require any special merit. The equipment has to have a tax life of less than 20 years, except that water utility equipment is always treated as if it were less than 20 years, as long as it was built, or cost more than $1 million and took more than a year to build. The equipment has to have a tax life of longer than 20 years. The corporate income base includes only corporations as if all corporations were members of a single consolidated group.18

18Section 168(k)(2)(B).

19Section 168(k)(2)(B) by reference to sections 263A(f)(1)(B)(ii) and (iii).


21Patti Mohr, “Senate Passes Tax Package with Dividend Exclusions,” Tax Notes, May 19, 2003, p. 943 (describing Senate defeat of Minority Leader Tom Daschle’s bill that included 50 percent bonus depreciation); H.R. 2, as introduced by Ways and Means Committee Chair William M. Thomas, R-Calif., Doc 2003-11672 (33 original pages), 2003 TNT 90-12 (bill does not include bonus depreciation); H.R. 2046, as introduced by Ways and Means ranking minority member Charles B. Rangel, D-N.Y, section 201 (providing for bonus depreciation).

the beneficiaries of junk tax provisions. Under the smog, the sovereign Congress can be deceived by proposals with campaign money attached, or perhaps, under the smog, members of Congress think they can deceive the sovereign people. This bonus depreciation smells like members trolling for campaign contributions under the cover of technical smog. Or perhaps the atmosphere for the 2003 Act just meant all restraints were off. It is unseemly to be in favor of tax, restraints, or rational analysis during Carnival time.26

Appendix:
Spreadsheet Model Showing Effective Tax Rate of 10 Percent

Assume that Project Z is a typical investment in general industrial equipment for $100 or some multiple of that. Project Z will be purchased by a large corporation bearing tax at 35 percent.27 With the 50 percent bonus depreciation, just passed in the 2003 Act, the effective tax rate on Project Z is 8.2 percent.

1. Pretax Cash Flow Given Typical Depreciation
The first step in calculating the effective tax rate on equipment is to create a reasonable hypothetical for the pretax cash flow or revenue from the typical Project Z, which is done in Table 1, above. Financial economics measures all investments as if they were interest-earning bank accounts. The cash received from Project Z (column (4) of Table 1) consists of interest on the outstanding balance (column 2) plus a withdrawal of the outstanding balance (column 3). The withdrawal of the outstanding balance marks the decline or recovery of capital and it is called “depreciation” for investments in tangible equipment. An investor would insist in making fair market value interest, here assumed at 5 percent, of the outstanding balance of the investment, plus enough cash to cover the decline or withdrawal of that outstanding balance, that is, the depreciation on the Project Z machine.

The Hulten and Wykoff studies of depreciation, which are widely cited and respected, found that “general industrial equipment” declined at a constant rate of 12.25 percent per year.28 Constant-rate-of-decline models assume that decline or depreciation depends upon how much value of the investment or outstanding balance remains exposed. Thus a termite mound will lose more of its material to a strong wind when it is tall than when it has been reduced to a stub. A block of dry ice loses a lot of its carbon dioxide when the block is large, but loses less when the lump that remains leaves less area exposed to the air. An old clunker of a car loses less value per year than a new one. Constant percentage depreciation has been found to be a reasonable model from empirical study of the market price of equipment, especially when measured ignoring unforeseeable changes in interest, supply, or demand.29 The Hulten and Wykoff rates are widely used and supported by subsequent studies.30 “General industrial equipment” was picked from the Hulten and Wykoff list as a middle value for depreciation and because Project Z is to be of “general” application.

The decline in column (3) of Table (1) reduces the outstanding balance in column (1). Both subsequent

<table>
<thead>
<tr>
<th>Year</th>
<th>Outstanding Balance (“Basis”)</th>
<th>Interest @ 5 Percent Prior (1)</th>
<th>Decline @ 12.25 Percent Prior (1)</th>
<th>Revenue @ (2) + (3)</th>
<th>With Final Sale</th>
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<td></td>
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<td>$2.28</td>
<td>$1.54</td>
<td></td>
</tr>
</tbody>
</table>

26The political knowledge of how to behave during Carnival may be called “Carnival Knowledge.”
27Section 11 setting 35 percent as the rate for taxable income that exceeds $10 million.
interest at 5 percent and subsequent decline at 12.25 percent will go down in later years because both are calculated as a percentage of the outstanding balance. Both the drop of interest and decline in investment using a constant percentage of lower balance are reflected in Table 1.

Constant percentage depreciation can make the outstanding balance approach zero but never reach zero. The decline in the outstanding value shrinks as the 12.25 percent decline is applied to an ever less balance, and that means that even if we look at an infinite stream of cash flows, the outstanding balance will not reach zero. An investor, however, would insist on expectations of getting all his money back in full, as a part of what 5 percent interest or any rate of interest means. Table 1 solves the never-zero problem of declining balance models by having a sale of the Project Z equipment at 10 years for the final outstanding balance, cutting off the cash flows estimates at 10 years. The final outstanding balance represents the value of the Project Z equipment at that year-10 point.

It is assumed here that the equipment is sold to a tax-indifferent buyer at year 10 for the discounted present value of the pretax cash flows that come after the 10th year. Sale to a tax indifferent party at the point is not quite optimal. The investor would be better off by holding on to the property to avoid the tax on sale, which is at ordinary income rates given depreciation recapture. Moreover, if bonus depreciation and negative tax from debt financing are still available in 10 years, a taxable buyer, who still faces high tax, could pay more for the property than a tax exempt buyer would, and by enough to overcome the disadvantage of giving up delaying depreciation recapture. Because sale is 10 years off, we can be confident that the tax system will change in some way. The assumption of sale for discounted present value of pretax cash flows ($27) is intended as a reasonable midpoint assumption, amid a brier patch of possible assumptions about how much future buyers will pay. Because the sale is 10 years off and for a relatively modest fraction of the whole, the sale price assumptions do not change the results by much. The final sale price of $27 is included in the pretax cash flows.

2. Calculation of Effective Tax Rate on Project Z

The real or effective tax rate measures how far interest goes down because of tax. Once again, bank account interest is the yardstick used to measure impact for all investments, so all investments including Project Z are translated into bank account-like investments to allow the uniform yardstick to be used. The internal rate of return is the interest rate on a bank account that is exactly like the investment, Project Z, under examination. The effective tax rate is the decline in internal rate of return (from pretax cash flows to post tax cash flows) measured as a percentage of the pretax internal rate of return.

Table 2, below, calculates the after-tax internal rate of return from the Project Z investment in general industrial equipment. Column (1) of Table 2 just pulls over column (4) and (5) from Table 1, which assumed the 5 percent pretax interest.

Column (3) of Table 2 shows tax depreciation after enactment of bonus depreciation. As soon as Project Z is placed in service, the corporate taxpayer gets a deduction equal to 50 percent of basis. Depreciation deductions then are calculated as under the MACRS (modified accelerated cost recovery system) of prior law on an adjusted basis reduced by the bonus 50 percent deduction. “General industrial equipment,” according to the Treasury staff, has a seven-year tax life. Under MACRS salvage value is zero. The pattern of depreciation across the years is set by double declining balance. All declining balance methods find a fixed percentage and apply that fixed percentage to an ever smaller adjusted basis. The percentage for “double” declining balance is 1/n, where n is the tax life, then doubled to 2/n. With a tax life of seven years, 2/n is 28.6 percent and that yields $14.30 (28.6 percent of $50) in year 1, and then $10.20 (28.6 percent of $50-$14.30) in the second year. The declining balance method will yield adjusted basis that never reaches zero. To allow taxpayer full recovery of basis, the taxpayer may switch to amortization of the remaining basis over remaining years whenever that is better, which happens after 1/28.6 percent or 3½ years remain. The last three years are just straight-line amortization of the remaining basis.

Column (4) describes a half-year nearer-in-time shift for the column (3) depreciation. Section 168(d)(4) treats all property purchased during the year as if it had been purchased on July 1, so that the taxpayer gets a half year of column (3) depreciation, including all the bonus depreciation, as soon as the property is placed in service. A minute of holding at year-end can suffice. There are limitations on stuffing all investments into the last quarter, but the immediate deductions simultaneous with purchase are more advantageous, so that the worst investments within a mix of equipment purchased during the year can be entered into only at year-end.

Column (5) represents taxable income, computed as pretax cash flow less depreciation. The sale price reflected in the final year $32.39 cash flow is all ordinary income under the recapture rules, since the taxpayer has no more basis to use. Tax shown in Column (6) is just 35 percent of taxable income for the large
The negative tax in year zero reflects taxes saved on other outside income and that tax savings assumes as a condition of the analysis that the corporation investing in Project Z has at least enough taxable income otherwise subject to tax at 35 percent, absent Project Z, so that the net losses for the year save tax at 35 percent. Column (7) just represents the pretax cash flow from column (1) less the tax (or tax saved) from column (6).

Column (8) demonstrates that Project Z has a 4.59 percent internal rate of return after tax, that is, that Project Z is like a bank account with an advertised compound interest rate of 4.59 percent after tax. Each row in column (8) represents the present value of the after tax cash flows in column (7) discounted by (that is divided by) the growth rate \((1 + 4.59)^n\) where \(n\) is the year applicable to the row. The 4.59 percent was computed by the computer by trial and error. The program keeps trying a high and low interest until the present value of all the figures of column (7) had a present value of zero. That the discounted figures shown in column (8) sums to zero means that the present value of net investment ($80) is equal to the present value of all returns discounted at 4.59 percent. That in turn means that an investor could put $80 in a bank account just like Project Z, withdraw the dollars shown rows of column (7) for each appropriate year and be left with nothing in the bank at the end of the 10 years. Tax shown in Table 2 has reduced the real interest from Project Z from 5 percent before tax to 4.59 percent after tax.

The tax shown in Table 2 has reduced the real interest (internal rate of return) from Project Z from 5 percent before tax for column (1) to 4.59 percent after tax for Column (7). That is not a reduction of 35 percent of the pretax interest, as implied by the statutory rates of section 11, but only a reduction of 8.2 percent of the pretax interest. The effective tax rate measures how much internal rate of return has dropped because of tax. The drop is from 5 percent to 4.59 percent or 0.41 percent. Drops are measured as a percentage of pretax income, and 0.41 percent is 8.2 percent of 5 percent. The effective tax rate is, in general

\[
\frac{\text{pretax IRR}}{\text{post-tax IRR}} - \frac{\text{pretax IRR}}{\text{pretax IRR}}
\]

where IRR is internal rate of return. For Project Z, the effective tax rate is only 8.2 percent, which is 8/35th of the statutory tax rate.

3. Drop in Pretax Return to 3.5 Percent

When Project Z is financed with debt, the discount rate is \(i^*\) or 5 percent. Interest on equipment is deductible in full at a 35 percent tax rate, which leaves 3.25 percent as the after-tax cost of 5 percent interest paid. If 3.25 percent is the discount rate or hurdle rate that projects will have to surpass to be justified, then other projects with pretax internal rate of return lower than Z's will become viable. Since the real or effective tax rate on Project Z is only 8.2 percent, the next project, Project ZZ, can have a lower return than 5 percent before tax. The next

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Table 2: Project Z From 5 Percent Pretax to 4.59 Percent Post-Tax

<table>
<thead>
<tr>
<th></th>
<th>(1) Pretax Cash Flow</th>
<th>(2) Basis</th>
<th>(3) Depre: 50 Percent, Then DDB, Then SL</th>
<th>(4) 1/2 Yr. Shift (1/2 Next Row Up)</th>
<th>(5) Taxable Y ((1)-(4))</th>
<th>(6) Tax @ 35 Percent* (5)</th>
<th>(7) After Tax @ (1)-(6)</th>
<th>(8) Present Value at 4.59 Percent</th>
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<tr>
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<td>$50</td>
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<td>($20.00)</td>
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</table>

Sum = 0

---

39Specifically the Excel Goal Seek function.

40A discussion of calculation of internal rate of return and its pitfalls is found, e.g., at Richard A. Brealey and Stewart Myers, Principles of Corporate Finance 98-108 (6th ed. 2000)
Project ZZ will have to return a rate that satisfies the following equation:

(1) \( ZZ\text{rate} - 8.2\text{ percent} \times ZZ\text{ rate} = 3.25\text{ percent} \)

From equation 1 it follows that:

(2) \( ZZ\text{ rate} = \frac{3.25\text{ percent}}{1 - 8.2\text{ percent}} = \frac{3.25\text{ percent}}{92\text{ percent}} = 3.48\text{ percent} \)

A project ZZ giving 3.48 percent should be able to be financed with 5 percent tax deductible interest. Project ZZ should also be able to beat out other investment giving 5 percent, but be fully subject to both a statutory and effective tax rate of 35 percent, in the competition for precious capital.

Table 3 looks at Project ZZ and shows that a project with a return of only 3.48 percent before tax can meet the 5 percent tax-deductible interest threshold. Column (1) of Table (3) was computed from a constant percentage depreciation schedule, just like Table (1)’s — except that the interest rate on the project was 3.48 percent, not 5 percent. A double-check is that the internal rate of return of the figures in column (1) is 3.48 percent.

Table 3 is identical to Table 2 in logic. The $100 purchase price, and hence the depreciation deductions of column (3) and (4), are the same. The difference between Table 2, columns (6) and (7) and Table 3, columns (6) and (7) arises entirely from the lower cash flows in Table 2, column (1). Column (8) has the same logic as in Table 2, and the only difference is that present value is calculated using the after-tax cost of 5 percent interest, that is 3.25 percent in Table 3. Because the present values sum is zero in column (8), that proves that column (1) cash flows could meet the required after-tax interest of 3.25 percent. The break even return from Project ZZ is only 70 percent of assumed prevailing interest rates.

Table 3 is showing that a pretax return of 3.5 percent will be adequate to carry a tax-deductible interest burden of 5 percent.