The Effective Tax Ratio and the Undertaxation of Intangibles

By Calvin H. Johnson

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"Effective tax rate" in economics measures how much tax reduces internal rate of return. The report proves an "effective tax rate ratio" that can be estimated from available published accounting data, which is that the firm-wide effective tax rate is the marginal tax rate multiplied by a ratio equal to the adjusted basis for the firm's assets divided by the fair market value of the assets in absence of tax. The ratio shows that the effective corporate tax rate is very modest for products like Google, Kent and Newport cigarettes, and for games like Grand Theft Auto IV, Doom III, and Guitar Hero. The effective tax rate is above statutory tax rates, however, for example, for Macy's. The report calls either for fixing the problem of intangibles by aggressively capitalizing intangible investments or for abandoning accounting-based definitions of income as a tax base.

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The effective tax rate for a corporation can be measured by an effective tax ratio (ET ratio) that depends on how much of a corporation's investments are reflected in its adjusted basis. An income tax that perfectly identified the internal rate of return from the corporation's investments and reduced it by the statutory tax rate would leave the corporation with an adjusted basis equal to the net present value of its investments.[1] An income tax that gives corporations a zero basis in its investments does not reduce the corporation's pretax internal rate of return at all.[2] So a mixture of full basis and zero basis investments yields an effective tax that satisfies the following equation:

$$\text{Effective tax rate} = \text{Statutory tax rate} * \frac{\text{Adjusted basis of corporation's assets}}{\text{Investment value in absence of tax}}$$

According to the equation, the effective tax rate depends on what proportion of a taxpayer's total investments in absence of tax are capitalized in tax basis.

"Effective tax rate" as used here refers to the tax-caused reduction in the corporation's pretax internal rate of return (IRR_{pretax}) from its investments. Effective tax rate = (IRR_{pretax} - $IRR_{posttax}$) / IRR_{pretax}. The numerator (IRR_{pretax} - $IRR_{posttax}$) is the reduction in IRR or compound annual interest caused by tax. Tax rates are conventionally cited as reduction caused by tax as a fraction of pretax position, so the denominator is pretax IRR.[3] The internal rate of return is a compound annual interest rate like the interest rate that would be advertised on a bank account or a bond.[4] Internal rate of return is a universal yardstick used to compare investments of diverse terms, risks, tangibility, stripes, and colors. Effective tax rate measures how much tax

[1]This argument originates in Paul Samuelson, "Tax Deductibility of Economic Depreciation to Insure Invariant Valuations," 72 *J. Pol. Econ.* 604 (1964). The discount rate for net present value would be the internal rate of return of the investment. If the internal rate of return and the discount rate used by the market are identical, and the market makes the same assessment of future cash flows, the adjusted basis will also equal fair market value.

[2]The seminal piece is Cary Brown, "Business-Income Taxation and Investment Incentives," in *Income, Employment and Public Policy: Essays in Honor of Alvin H. Hanson* 300 (1948).

[3]*See generally,* Donald Fullerton, "Marginal Effective Tax Rates," *available at* http://www.taxpolicycenter.org/taxtopics/encyclopedia/Marginal-tax.cfm (2007).

[4]*See, e.g.,* Richard Brealey and Stewart Myers, *Principles of Corporate Finance 99-108* (6th ed. 2000), for a discussion, including limitations of internal rate of return.

reduces internal rate of return. There are other definitions of effective tax rate used in accounting that have no relationship to the internal-rate-of-return reduction measure used here.[5]

The ET ratio serves well as a yardstick for the impact of tax because it can be workably estimated from published financial statements, now available online at the Securities and Exchange Commission's ''Edgar'' Web site.[6] The published financial data do not allow calculation of either the pretax or posttax internal rates of return, but the ratio gives an indirect measure of effective tax rate. The ET ratio relies on available data that are sometimes ambiguous or in error on key points, but it is illuminating and within tolerable error margins.

The ET ratio depends on the firm's adjusted basis in its assets and the fair market value of its investments in the absence of tax. The adjusted basis of the firm's assets is approximately equal to the firm's nontax balance sheet assets, but reducing the assets by the base amounts represented by the deferred tax account. The posttax value of the firm is available because a smart public stock market values a public corporation's total assets every business day, with the best information and most sophisticated tools at hand. A workable approximation of the fair market value of the firm's investments in the absence of tax can be derived from market capitalization in the presence of tax.

Unfortunately, permanent tax advantages are not included in this study. The published financial statements for the corporations under examination were not transparent enough to make it feasible to incorporate permanent items into the ET ratio or this analysis. The ET ratio thus does not take into account reductions in tax, for instance, from energy, oil, or research and development tax credits, from exclusions for municipal bond interest or corporate-owned life insurance, from exemptions for overseas investment, and from any other tax shelters. The ET ratio, in assuming that all stated income bears a marginal tax rate of 35 percent, overstates the tax paid by corporations, but it is useful in measuring the relative advantage of deducting investment costs that still have continuing value.

The ET ratio derived from financial statements bears a resemblance to Tobin's q — that is, the ratio of the value of the firm to the replacement costs of its assets. Tobin's q was used originally to indicate whether the corporation should increase its investment, and it has been used for other, diverse purposes.[7] High Tobin's q values are associated with a small reduction in the internal rate of return. A simplified Tobin's q is the ratio of market capitalization — the market's evaluation of the value of stocks and bonds — to accounting book assets, and this version is highly correlated with the original Tobin's q ratio that looks to the replacement value of the assets instead of market capitalization.[8] The ET ratio discussed here differs from the simplified Tobin's q in that it uses adjusted basis, which is the tax-system parallel to book assets, and it determines what investment would be in the absence of tax, rather than looking to real market capitalization in a taxed world.

The ET ratio is then used to conclude that the corporate income tax has a very different impact on the pretax returns of different corporations. Some corporations, like Macy's Inc. and JetBlue Airways, have a high basis in their investments, and they accordingly pay tax that reduces their pretax internal rates of return by approximately the 35 percent corporate statutory tax rate.[9] Other corporations, like Google Inc. and Lorillard Tobacco Co., however, have a modest tax basis in their investments, and they accordingly pay tax that reduces their pretax internal rates of return by quite modest amounts, under 10 percent. The companies that make computer video games such as Grand Theft Auto IV and Doom III pay tax at just over 10 percent. Corporations like Dell Inc. and Wal-Mart Stores Inc. have both intangible advantages and capitalized inventory, and according to the ET ratio, their real tax is near the midpoint between 35 percent and 0 percent.

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[5]Effective tax rate often refers to total tax divided by total income. Accounting also has a definition of effective tax rate that attributes future payments of tax as a cost properly matched to current accounting-defined income. Donald Kieso, Jerry Weygandt, and Terry Warfied, *2 Intermediate Accounting 1070* (10th ed. 2001). Neither alternative definition of effective tax rate is of any help to the analysis here.

[6]*See* http://www.sec.gov/edgar/searchedgar/webusers.htm (provides a portal to annual reports, including financial statements).

[7]The seminal article, James Tobin, ''A General Equilibrium Approach to Monetary Theory,'' 1 *J. of Money Credit and Banking* 15, 23 1969, uses the q (short for quotient) to argue that firms will increase investments if value exceeds reproduction costs of assets. Lawrence H. Summers, ''Taxation and Corporate Investment: A q-Theory Approach,'' 1981-1 *Brookings Papers on Economic Activity* 67, 80 (1981), uses the assumption that firms will invest when value equals cost of reproduction of assets to argue for tax cuts on capital investment to counteract inflation. Summers assumes homogeneous capital and thus is not looking at the divergent impact of tax on different firms and industries. Tobin's q is used in nontax questions in, e.g., H.P. Lang, René M. Stulz, and Ralph A. Walkling, ''Managerial Performance, Tobin's Q, and the Gains From Successful Tender Offers,'' 24 *J. Fin. Econ.* 137 (1989) (using Tobin's q to measure target vulnerability to, and shareholder gains from, tender offers); and Craig Dodge, G. Andrew Karolyi, and René M. Stulz, ''Why Are Foreign Firms Listed in the U.S. Worth More?'' 71 *J. Fin. Econ.* 205 (2004) (using Tobin's q to measure extra value that foreign firms achieve by listing on U.S. exchange).

(Footnote continued in next column.)

[8]Kee H. Chung and Stephen W. Pruitt, in ''A Simple Approximation of Tobin's q,'' 23 *Financial Management* 70 (1994), argue that ratio of market capitalization to book assets is highly correlated with the ratio of market capitalization to replacement value in the original Tobin's q and that the former ratio is far easier to calculate.

[9]Data from John Laitner and Dmitriy Stolyarov, ''Technological Change and the Stock Market,'' 93 *Amer. Econ. Rev.* 1240 (2003), are some evidence that the average corporation in the stock market has a basis in its asset, that is higher than its market capitalization value. Lainter and Stolyarov work with nontax asset accounts, rather than tax adjusted basis accounts, but the deferred tax accounts are typically insignificant and the study is some indication that Macy's and JetBlue are not atypical.

The beneficiaries of the low tax, as determined using the ratio, look strange. Lorillard makes cigarettes, including the Kent and Newport brands. Grand Theft Auto IV is a video game played from the side of gangsters and auto thieves, and Doom III is a science fiction horror computer game.[10] Making video games is a low-tax activity because software development is not considered a capitalized investment for tax purposes. If actions speak louder than words, then video games and tobacco must represent a highly valued activity of our civilization, because the tax system treats them so well. Shopping (at Macy's, for example) is considered by our tax system to be a low-value activity because the effective tax rate is so high.

The advantages and handicaps are not engineered. They arise primarily because the tax law capitalizes investments in tangible items and financial instruments, but not in intangibles. The divergence in effective tax rates arises primarily because of decisions within the accounting profession followed by tax. Those accounting decisions have been brought into the income tax without any apparent consideration of the wisdom of a low or zero effective tax rate. Accounting has been reluctant to allow nonfinancial intangible investments to be capitalized as an asset on the balance sheet, because of the difficulties in determining what continuing value an intangible investment adds to the firm and how long it will last.[11] Under current accounting standards, investments in the development of computer software, pharmaceuticals, customer goodwill, and advertising are treated as current expenses and not as assets.[12] Research and development costs are considered too speculative or intangible to be considered a balance sheet asset.[13] The internal development of goodwill is never an asset to the company that built up the goodwill.[14] "Goodwill" in accounting is the value of the business in excess of any property or thing that accounting is willing to recognize as an asset. Even costs that could be identified with legally protected brand names, patents, copyrights, pharmaceutical research, and workforce are not treated as assets or investments because of accounting's reluctance to tolerate difficulties in associating costs with future benefits. High values for Tobin's q for companies with intangible investments arise because the accounting data are used to measure assets in the ratio, and accounting refuses to treat most new-economy investments as investments. The accounting profession has withdrawn entirely from any attempt to measure income from the new economy, by assuming that all investments for software, goodwill, intellectual property, and the like are worthless when made.

Tax has become just as conservative as accounting in expensing intangibles, if not more so. When software development was a young and experimental enterprise, the tax law allowed the immediate deduction of development costs.[15] The expensing of software development is consistent with a more general refusal to capitalize intangible costs. Tax law will now allow expensing of costs not associated with a specific potentially salable property, because it considers those expenses too intangible to capitalize.[16]

The usual defense of immediate expensing of intangible investments is the administrative convenience of expensing. Sometimes the benefit from a better accounting description of intangibles is "so small as to make accounting for it unreasonable or administratively impracticable,"[17] but there is no indication of a reasoned balance between convenience and a level economic playing field was ever under consideration. The expensing of intangible investments is not part of a deliberate decision to punish the disfavored tangible investments (like shopping) or to subsidize intangible investments (like cigarettes and video games). Given the pattern of reward and punishment, it would be difficult to imagine a principle that could have engineered the results. The impact of punishing tangible investment and subsidizing intangibles seems to arise entirely out of consideration of the difficulty of capturing the investment value of an investment when it does not attach to a specific property.

The differential tax impact increases the damage caused by corporate taxation, even apart from the strangeness of who is advantaged. Pretax profit in general by presumption captures the price consumers are willing to pay because of the utility they derive from a project. When tax imposes different burdens on different products, it sends capital into inferior investments. A 36

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[10]Doom III, Wikipedia, *available at* http://en.wikipedia.org/wiki/Doom_3 (accessed Sept 8, 2008).

[11]Baruch Lev, "Intangibles: Management, Measurement, and Reporting" (2001), and Leandro Cañibano, et al., "Shortcomings in the Measurement of Innovation: Implications for Accounting Standard Setting," 4 *J. of Mngment & Governance* 319 (2000) advocate expanded capitalization of costs of intangibles. Douglas J. Skinner, in "Accounting for Intangibles — A Critical Review of Policy Recommendations," University of Chicago — Graduate School of Business Working Paper Series (Dec. 2007), is skeptical that capitalization of intangibles would bring about more investment in companies with more intangibles, because the smart investors can see through the accounting.

[12]Statement of Financial Accounting Standards No. 86, "The Costs of Computer Software to Be Sold, Leased or Otherwise Marketed," para. 3-6 (1985) (requiring immediate expensing of research and development costs of software before technological feasibility and general capitalization of development costs after technological feasibility is established).

[13]SFAS No. 2, "Accounting for Research and Development Costs," para. 49 (1974) (requiring the immediate expensing of research and development costs).

[14]Accounting Principles Board Opinion No. 17, "Intangible Assets," paras. 11, 24 (1970) (costs of developing intangible assets that are not specifically identifiable, have indeterminate lives, or are inherent in a continuing business as a whole are expensed when incurred).

[15]*See* Rev. Proc. 69-21, 1969-2 C.B. 303 (allowing expensing of costs of developing software).

[16]Reg. section 1.263(a)-4(b)(3) (2004) (defining separate and distinct asset as property capable by nature of being sold). Criticism of the regulations includes Ethan Yale, "When Are Capitalization Exceptions Justified?" 57 *Tax Law Review* 549 (2004); Calvin H. Johnson, "Destroying Tax Base: The Proposed INDOPCO Capitalization Regulations," *Tax Notes*, June 2, 2003, p. 1381, *Doc 2003-13382*, *2003 TNT 106-32*.

[17]Section 132(e).

percent tax on Macy's and a 10 percent tax on video games will mean we will have less shopping and more video games than we would have had without the differential tax rate. One might make a second-best argument that a high tax on Macy's and a low tax on Doom III are correcting distortions that exist in the market from the factors,[18] but it is difficult to see what those distortions might be. It is plausible that a system should tax low-elasticity goods at a high rate and high-elasticity goods at a low rate,[19] but it is difficult to see whether shopping or video games have the higher elasticity. The divergent tax rates seem to have no legitimacy and do not seem to spring from any logical goals.

The divergent effective tax rates as a result of capitalization are disturbing. Previous articles, including some of mine, have suggested that the Treasury regulations on intangibles should have decided in favor of capitalizing costs on several discrete issues.[20] Investments in intangibles such as computer games, software, and pharmaceuticals are not as different from investments in tangible products as current accounting and tax rules make them out to be. Many intangibles now expensed are sufficiently salable and identifiable that they should meet conventional definitions of assets. I am willing to suggest that the development of Grand Theft Auto IV, Doom III, or Guitar Hero II should not be getting an effective tax rate advantage. Development of a product and product design might well be capitalized so as to reach a full tax on the investment. None of the suggestions, however, have gone as far as suggesting capitalization of self-developed goodwill attached only to the business as a whole. Moving to a universal consumption tax would give all investments and industries the chance to catch up with the advantages that low-basis corporations now have. I have previously suggested that we need to replace the corporate income tax with a modest-rate tax on market capitalization.[21] The incorrect taxation of intangibles is serious enough that we should correct it or abandon accounting-based definitions of income in the corporate tax. This report, however, is primarily about defining the problem through a ratio between capitalized investments and total investments that identifies the effective tax rate.

I. Proof and Illustrations of the Effective Tax Ratio

A corporation's effective tax rate depends on the ratio of costs that are capitalized (and not yet deducted) for tax purposes to the pretax value of the corporation's investments:

$$\text{Effective tax rate} = \text{Statutory tax rate} * \frac{\text{Adjusted basis of corporation's assets}}{\text{Investment in absence of tax}}$$

The ET ratio above is first verified by algebra for a single period investment or a perpetuity. An appendix then illustrates the ET ratio with spreadsheets for a depreciating investment and for an appreciating investment. Some readers might find the spreadsheet illustrations to be clearer, and they should refer to the algebra only to generalize their understanding. Some readers will find that the algebra is a better means of communication. Skeptics need to work through either the algebra or the spreadsheets.

This section develops an algebraic description of a capitalized investment in which there is full tax on the internal rate of return, then a description of an expensed investment in which there is no tax reduction of the internal rate of return.

A. Full Tax on Return

Assume R is the annual rate of return from an investment of capital C. The return for one year is C*R. The investment can be either a one-year investment only, or it can be a perpetuity in which the annual after-tax profit is withdrawn every year. If we assume a statutory tax rate of T, the tax on C*R is T*C*R and the after-tax profit is

$$C*R - T * C * R = CR * (1-T)$$

The effective tax rate measures the drop in return as a fraction of the pretax return:

$$\text{Effective tax rate} = \frac{\text{Pretax rate of return - post tax rate of return}}{\text{pretax tax rate of return}}$$

or here:

$$\frac{C * R - C * R*(1-T)}{C * R}$$

which equals:

$$1 - 1 * (1-T) = T.$$

For example, if C of $100 is invested at R of 10 percent, the taxpayer would receive $10 after a year in absence of tax. Tax at assumed T of 35 percent would be $3.50 on the $10, and the effective tax would be equal to the statutory tax rate:

$$\text{Effective tax} = \frac{C*R - C*R*(1-T)}{C*R} = \frac{\$100*10\% - \$100*10\%*(1 - 35\%)}{\$100*10\%} = \frac{\$10 - \$6.50}{\$10} = \frac{\$3.50}{\$10} = 35\%$$

The model assumes that the capital C has been taxed before or with investment, which is called hard money investment, or "H" here. The model ignores the double

[18]The second-best argument is that one cannot be confident that a move in the first best direction would actually improve welfare, given other distortions, and that a move against the best solution might offset other distortions. *See, e.g.*, R.G. Lipsey and Kelvin Lancaster, "The General Theory of Second Best," 24 *Rev of Econ. Studies*, 11 (1956).

[19]The argument that tax rates should be inverse to elasticity is called the Ramsey tax argument, after F.P. Ramsey, "A Contribution to the Theory of Taxation," 37 *Econ. J.* 47-61 (1927).

[20]Yale, *supra* note 16; Johnson, *supra* note 16.

[21]Johnson, "Replace the Corporate Tax With a Market Capitalization Tax," *Tax Notes*, Dec. 10, 2007, p. 1082, *Doc 2007-26347*, *2006 TNT 238-36*.

tax of income under which both capital and the return to capital are taxed. The statutory tax rate, conventionally stated as a T, ignores the double tax, and the models here are consistent with the effective tax rate T being the full statutory tax. Using T as the base line for full taxation of income also simplifies the algebra.[22] To reach an effective tax rate of T equal to the statutory tax rate, the investment of C must be hard money H, and it must be capitalized.

By contrast, if capital can be excluded or exempted, called soft money investment here or S, the effective tax rate is zero.

B. No Effective Tax

Now assume that capital can be expensed or excluded so the full investment is soft money or "S" here. Deductible amounts will give the investor a tax savings that is like a government's reimbursing or sharing in the cost of the investment at its start at a fraction of the investment equal to T. The government is sometimes described as a partner of the investor when an investment can be expensed or excluded when made. In turn, an investor can increase or "gross up" the investment, counting on the reimbursement. If amount S is the budget constraint on the amount the taxpayer can invest, then there is a greater investment, X, that will have a net cost of S after the tax savings of T*X.

X - T*X = S

X * (1-T) = S

X = S/(1-T)

If S/(1-T) is invested, consistent with the S budget constraint, the profit per year is [S/(1-T)]*R. Tax at the presumed constant statutory tax rate T reduces the return to

$$\frac{S}{(1-T)} * R * (1-T)$$

which is equal to S*R. S*R is the return in absence of tax.

The government was a fair partner that contributed an amount of T at the start and also took out T at the end. The taxpayer gets the same rate of return R on the amount it has invested, that is, S, as it would get from investing S at rate R in a world totally without tax. The investment went from S*R before tax to S*R after tax, which is a zero effective tax.

To replace the algebra with numbers, assume, for example, an investment of $100 can be grossed up to $100/(1-T) = $100/1-35% = $154 relying on the ability to deduct the $154 investment. The after-tax cost of the $154 is $154 (1-35%) = $100, which is the budget constraint. Investment of $154 yields a profit of $15.40 per year. Tax at 35 percent of $15.40 takes out $5.40, which reduces the return to $10. The $10 is the same amount as would occur from a 10 percent return on $100 investment in the absence of tax.

The zero effective rate conclusion assumes that the T rate of tax in the year of the investment and the year(s) the S*R is received is constant. The model, with minor adjustments, allows both the benefit of the tax reimbursement and the detriment of the tax on return to be delayed, as long as the delays are consistent. With a delay in tax reimbursement on investment or a delay in tax on return, the tax rate T should be thought of as a discounted T_1 rate that is T discounted by a few months' interest. To be a pure zero effective tax rate, the discounting has to be the same for the investing and the return. Differences in the statutory tax rate or in the delay of savings or tax will mean the effective tax rate is higher or lower than zero, but the departure is not necessarily material.

The model assumes that the amount invested is sensitive to tax and that S will be the budget constraint and the amount invested after tax.[23] Other models that assume that early tax will be paid without reducing the investment by borrowing or by liquidating other investments will still give an advantage to soft money investing, but not at a level equal to the exemption of R from tax.

Stating the return at S*R necessarily presumes that the taxpayer is getting capital of S back in addition to the profit of S*R. The taxpayer invests S/(1-T), given the upfront tax savings. Deduction of S/(1-T) leaves the taxpayer with no basis. The definition of R assumes that the full S/(1-T) capital invested must be returned — if it is not, we need to restate the return R. The full S/(1-T) is subject to tax because there is no basis, so tax is T*S/(1-T), and the after-tax return is S/(1-T) - T*S/(1-T), which is equal to [S/(1-T)] * (1-T) or just to S, the taxpayer's

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[22]It is possible to include the tax on capital in the model as double tax, but the algebra is messy and not consistent with the conventional understanding of statutory tax rate T. If capital C is reduced by income before investment and R is also taxed, the effective tax rate formula becomes:

[C * R - C * (1-T) * R*(1-T)]/(C * R), which simplifies to effective tax rate of 1 - $(1-T)^2$ rather than to T.

The double tax model yields an effective tax of 1-65%^{2} or 57.75 percent for a statutory tax rate of 35 percent. With C of $100, R of $10, the tax of $5.78 reduces the after-tax return to $4.225. Using 1-$(1-T)^2$ instead of T in the calculation of the impact of soft money and the ET ratio is possible, but the formulas are unwieldy to work with. The "exemption" of return or the expensing of capital becomes [C * R - C*(1-T) * R*(1-T)]/C*R or just T. If the capital invested is partially expensed (S for soft money) and partially capitalized (H for hard money), the effective tax rate overall is {(H+S)*R - [H*$(1-T)^2$*R + S*R*(1-T)]}/(H+S)*R, which "simplifies" to an unwieldy [1 - [H*$(1-T)^2$ + S*(1-T)]}/(H+S). The model in the text uses the conventional effective tax rate of T for full tax, and the zero effective tax and ET ratio are calculated consistent with T — rather than with 1 - $(1-T)^2$ — being the statutory tax rate for full tax.

[23]Soft money investing is like exemption of return R even if the investor does not expand the investment to S/(1-T), as long as the investment is sensitive to tax. Assume, for instance, that income H will be invested in a capitalized-investment-producing basis, not deductions, and thus H must be reduced by tax to H*(1-T) before investment. The return would be H*(1-T) * R, and assume, by some miracle or legislation, that the return is exempted from tax. A soft money investment S does not have to be reduced by tax at the outset, and thus earns S*R. When tax is imposed on the full S*R — basis having been used up — the taxpayer has S*R (1-T) after tax. When S and H are equal, the after-tax returns, H*(1-T)*R = S*R (1-T). The proof assumes that H must drop by tax, which S does not pay.

original capital. The taxpayer has gotten his capital back, even while the return is subject to a zero effective tax rate.

C. Mixed Soft and Hard: The Effective Tax Ratio

Assume now that the corporation invests amount H, which is not deducted, but creates basis, and amount S, which is deducted immediately and thus may be grossed up to account for the tax reimbursement of the gross investment cost. Both H and S/(1-T) earn R. After tax at T, the return is [H + S/(1-t)] * R * (1-T). The effective tax is again pretax results less post tax results as a fraction of pretax results:

$$\frac{(H + S)*R - [H + S/(1 - T)] * R * (1-T)}{(H + S) * R} =$$

$$1 - \frac{H * (1-T) + S}{H + S} = 1 - \frac{H - H*T + S}{H + S}$$

$$= 1 - \frac{H + S - H*T}{H + S} = 1 - 1 + HT/H + S =$$

$$H/(H + S)*T$$

Therefore, the effective tax rate is equal to the statutory tax rate times the ratio of the hard money H to the total investment in absence of tax (H+S). This is the ET ratio.

To turn the algebra into specific numbers, assume a corporation in which half the cost of an investment is expensed and half is basis. Assume the investment in absence of tax is $200 and that $100 of it must be capitalized and produces basis and $100 may be expensed immediately. The ability to deduct means the taxpayer may invest $100/(1-T) = $100/65% or $154 within the $100 budget constraint, relying on tax savings of 35%*$154 or $54 to bring down the $154 investment to a $100 net cost. The return at 10 percent gives $10 on the hard money investment and $15.38 to the soft for a total pretax return of $25.38. Tax at 35%*$25.39 or $8.88 brings the return down to $16.50. The pretax return at 10 percent of pretax $200 was $20, so the reduction by tax was $20-$16.51 or $3.50. The effective tax rate is calculated as the $3.50 reduction by tax over $20 pretax, which is 17.5 percent of the pretax return. The effective tax rate is half the statutory tax rate, which is consistent with the ET ratio when half of pretax investment was hard money.[24]

Assume now that only one-fifth of the pretax investment is hard money. The ET ratio says the effective tax rate should be 35%/5 or 7 percent. Assume an investment in absence of tax of $500, of which $100 must be capitalized and produce basis and $400 may be expensed immediately. The ability to deduct means the taxpayer may invest $400/(1-T) = $400/65% or $615. The return at 10 percent gives $10 on the hard money investment and $61.54 on the soft for a total pretax return of $71.54. Tax at 35%*$71.54 or $25.04 brings the return down to $46.50. The pretax return at 10 percent of pretax $500 was $50, so the reduction by tax was $50-$46.50 or $3.50. The effective tax rate is calculated as the $3.50 reduction by tax over $50 pretax, which is 7 percent of the pretax return. The effective tax rate is one-fifth of the statutory tax rate, which is consistent with the ET ratio when one-fifth of the half of pretax investment was hard money.

As shown by the spreadsheets in the appendix, the ET ratio holds true for both depreciating and appreciating investments.

II. The Effective Tax Ratio for Public Companies

The financial statements that publicly traded corporations must make public provide enough information to estimate the ET ratio for the corporation as a whole. The financial statements of publicly traded corporations are easily accessible online at the SEC Web site.[25] Spreadsheet 1 (next page) shows the ET ratio and effective tax rate for eight public companies. The sample is small, and it was selected to give a range of results with a decided bias toward well-known corporations. Companies with hard-to-assess preferred stock and other complexities were dropped out. The analysis assumed that all taxable income was taxed at 35 percent, because the data were not clear or reliable enough to use any other assumption; the analysis thus misses lower tax due to permanent items such as earnings in foreign subsidiaries, tax credits for subsidized activity, tax-exempt municipal bonds, corporate-owned life insurance, or any of myriad corporate tax shelters.

The sample does show a large variation in the effective tax rates that corporations pay. The expensing of investments in intangibles explains most of this divergence.

The overall logic of Spreadsheet 1 is that the effective rate of tax depends on the ratio of capitalized investment to total investment of the corporation. The ET ratio is H/(H+S), and the effective tax rate is [H/(H+S)]*T where T is the 35 percent statutory tax rate, H is the capitalized or hard money investment, and S is the nonbasis or soft money investment.

The market capitalization of the corporation is the estimate of the total value of the corporation's investments. The estimate is made by the market investors who set price. Market capitalization can be expected to be a better estimate of real investment value than any accounting-based figures.[26] Market capitalization is share price (row 1 of Spreadsheet 1) times the number of shares outstanding (row 2) to yield equity value (row 3). Equity value (row 3) is added to total liabilities (row 4) to reach market capitalization (row 5). No attempt was made to value liabilities other than at their accounting credit.

[24]The statement of return at rate R assumes capital must be returned. The $100 hard money is basis at the end of the investment and not taxed. The $100 soft money was grossed up to $154 at the outset of the investment, and the deduction of $154 left the taxpayer without basis, so that the full $154 is taxed at the liquidation of the investment. Tax at 35%*$154 or $54 reduces the liquidation proceeds to $100.

[25]*Supra* note 6.

[26]*See, e.g.*, Burton Malkiel, "Is the Stock Market Efficient?" *Science* 1313, 1317 (Mar. 10, 1989) (answering largely yes); Kenneth Froot and André Perold, "New Trading Practices and Short-Run Market Efficiency," NBER Working Paper No. 3498 (Oct. 1990) (arguing that stock prices react fully to news within 15 minutes of the time the news becomes available).

Spreadsheet 1: Effective Tax Rate [H/(S+H)]*T For Eight Companies (in millions, except for share price and percentages)

	Google	Lorillard	Activision	Take-Two	Dell	Wal-Mart	JetBlue	Macy's
1. Share Price[a]	$533.44	$68.55	$25.00	$24.95	$24.37	$59.06	$4.07	$18.55
2. Shares Outstanding	313	174	283	74	2060	3973	182	420
3. Equity Value (row 1 * row 2)	$166,922	$11,928	$7,075	$1,853	$50,202	$234,645	$739	$7,785
4. Total Liabilities	$2,136	1,433	$382	$360	$23,732	$88,253	$3,844	$14,447
5. Market Capitalization (row 3 + row 4)	$169,058	$13,361	$7,457	$2,213	$73,934	$322,898	$5,598	$22,232
6. Balance Sheet Assets	$25,336	$2,350	$1,794	$831	$27,561	$163,514	$6,050	$27,789
7. Deferred Tax	$478					$5,111	$192	$1,446
8. Deferred Tax Adjustment (row 7 divided by .35)	$1,367					$14,603	$549	$4,131
9. Adjusted Basis (row 6 - row 8)	$23,969	$2,350	$1,720	$831	$27,561	$148,911	$5,501	$23,658
10. Effective Tax Ratio: H/[Cap*(1-T) +H*T]	20.3%	24.7%	31.6%	33.2%	47.76%	56.8%	98.9%	104.1%
11. Effective Tax Rate	7.1%	8.7%	11.0%	11.6%	16.72%	19.9%	34.6%	36.4%

[a]The stock prices for Google, Activision, Take-Two, Dell, Walmart, JetBlue, and Macy's as of July 17, 2008. The stock price for Lorillard Tobacco as of Aug. 6, 2008.

H is the adjusted basis of the corporation's total assets. Total assets (row 6) are found on each corporation's financial statement balance sheet. Adjusted basis is the tax term parallel to the accounting term assets. Tax and accounting have different rules for capitalizing costs and for depreciation. This leads to different figures for assets and adjusted basis. Accounting standards, however, require the corporation to identify when the tax depreciation or expensing of assets has exceeded the accounting standards depreciation or expensing. The deferred tax liability (row 7) is the accounting record of current tax saved that would not have been saved had the accounting standards rules for expensing and depreciation been used. The deferred tax liability account, however, records tax rather than tax base, so that to get to the tax-base adjustment to book assets, one must divide the tax amounts of the deferred tax liability accounts by the tax rate to reach row 8, the deferred tax liability adjustment. here at 35 percent. Subtracting the deferred tax adjustment (row 7) from corporate assets (row 6) yields an approximation of the corporation's total adjusted basis in its investments (row 9). Both tax and book accounting generally provide for expensing of the costs of intangible investments, so the adjustments for deferred tax liability have no effect in moving from book assets to tax adjusted basis. Permanent tax advantages are also not part of the deferred tax liability, so the figures do not pick up on the tax advantages to the corporation from such permanent tax advantages as tax-exempt municipal bonds, corporate-owned life insurance, and tax credits for oil and research. Permanent differences can be expected to be significant, but they are beyond the scope of this study.

The corporation's total investments (H+S) in the ET ratio are pretax figures, whereas the market appraisal of the investment's value that is market capitalization "CAP" is in a posttax world. The pretax H+S can be derived from the after-tax CAP with an assumed tax rate T. Assume first that soft money investments will be grossed up to S/(1-T). Hard money investments H are not deducted and cannot be grossed up. Thus

(1) CAP = H + S/(1-T)

and so

(2) S = (CAP-H) * (1-T)

and substituting (2) for S in the ET ratio H/(H+S) yields

(3) H/[(H + (CAP-H) * (1-T)] =

(4) H/[CAP*(1-T) + HT]

which is computed in row 10.

Row 10 and the underlying algebraic expression (4) above were calculated on the assumption that hard money and capitalized investments are unaffected by tax on income used for investment, and that expensed or soft money investments would be grossed up. The same expression can be derived from the assumption that capitalized investments shrink because of gateway tax and that soft money or expensed investments are unaffected by a gateway tax.[27]

Multiplying the ET ratio of row 10 by the statutory tax rate shows the estimated effective rate for the corporation (row 11).

[27]It does not matter whether it is assumed that soft money investments are grossed up or that hard money investments shrink. If we start from a "double tax" assumption that hard money investments shrink from a pretax situation, but expensed soft money investments do not, the tax makes pretax H shrink to an observed adjusted basis ("B") = H*(1-T) and H = B/(1-T). If observed market capitalization CAP = H*(1-T) + S, because pretax H shrinks but not S, then S = CAP-B. Substituting for S and H in the ET ratio of pretax H/(H+S) gives B/(1-T)/[B/(1-T)+ CAP-B] = B/[CAP (1-T) + TB] (multiplying both numerator and denominator by (1-T)). Because both H in expression (4) in the text and B represent the observed adjusted basis given tax, B/[CAP (1-T) + TB] = expression (4).

Spreadsheet 1 shows a wide range in the effective tax rates on the eight corporations in the sample. Google Inc. (7 percent effective tax rate) created the leading Web search engine, and all the investment costs of creating the search engine were expensed. Lorillard Tobacco Co. (9 percent effective tax rate) is the maker and distributor of cigarettes including Kent and Newport, and it, like Google, has a value, assessed by the market, well in excess of its stated accounting assets. Both Activision (11 percent effective tax rate) and Take-Two (12 percent effective tax rate) create and market computer video games, including Doom III, Guitar Hero II, and Grand Theft Auto IV. The costs of creating the games were treated as expenses rather than investments by accounting and tax rules. Both have a tax basis in their investments that is under a third of the value of their investments in absence of tax as appraised by the market. For Google, Lorillard, Activision, and Take-Two, the sources of the value for the companies are captured neither by the book assets listed on the balance sheet nor by the tax analogue, adjusted basis. The adjusted basis accounts are not describing the corporation's remaining investments.

Dell Inc. (17 percent effective tax rate) and Wal-Mart Stores Inc. (20 percent effective tax rate) both have large costs for inventory that they are selling, and both have significant intangible assets as well. Dell grew with intangible advantages, including direct sales that bypassed retailers, online customer service, assembly to order, just-in-time inventory controls, and a sales network inside corporate customers. Wal-Mart's intangible advantages include large stores, globalization to minimize costs, and satellite tracking of inventory. Its adjusted basis represents about half the value of its investments. Both Dell and Walmart also have significant inventory costs and hard assets where capitalization captures the value of their investments.

JetBlue Airways and Macy's Inc. have adjusted basis values very near to the market assessment of the fair market value of their investments. While JetBlue and Macy's undoubtedly have intangible values from a trained workforce, effective methods of business, and the like, the market is also skeptical that they can meet going returns on their investments, and so it values the investments near or below the adjusted basis.

The statutory tax rate for all of the companies in the sample is 35 percent, but the companies bear very different tax burdens in terms of the effect on their internal rates of return. The primary explanation of the differences is how well the adjusted basis accounts describe the value of the corporation's investments. Corporations with large intangibles have relatively low basis, because neither tax nor book accounting rules capitalize intangibles.

III. Conclusion

Corporations have widely divergent effective tax rates because they have widely different fractions of their investments that are capitalized. The effective tax rate measures the reduction in the internal rate of return a corporation makes. The effective tax ratio is the ratio of the corporation's adjusted basis in its assets to the fair market value of its investments, measured on a pretax basis. The effective tax ratio times the statutory tax rate measures the effective tax rate of the corporation.

The wide divergence in effective tax rates means the corporate tax is damaging the allocation of capital. Investors look to the situation after tax, and the differential tax rates are distorting investor decisions by channeling their capital into the low-taxed corporations and away from the high-tax corporations. There is no engineering behind the results. No one would favor Lorillard Tobacco Co., Activision, or Take-Two above others if the choice was the result of thoughtful policy. The full statutory tax rate on JetBlue and Macy's is not because they are unpopular or disliked by comparison with Lorillard or Activision, but because they make tangible investments that are capitalized.

The divergence in effective tax rates is serious enough that we should either capitalize intangible costs to bring the adjusted basis up to fair market value of the corporation's basis, or we should abandon accounting-based taxes on income and impose taxes on market capitalization instead.

Appendix: Effective Tax Ratio in Spreadsheets

The effective tax ratio argument is that the corporation's reduction in its internal rate of return is the fraction of the statutory tax rate that adjusted basis bears to the fair market value of the corporation's investments in the absence of tax:

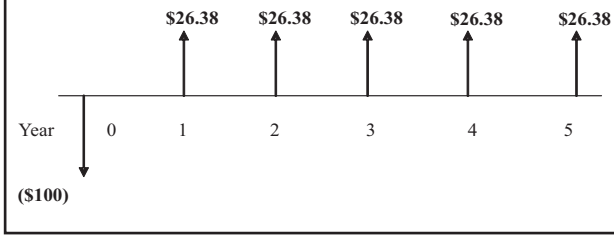
$$\text{Effective tax rate} = \text{Statutory tax rate} * \frac{\text{Adjusted basis of corporation's assets}}{\text{Investment value in absence of tax}}$$

The effective tax ratio for a depreciating and an appreciating asset is shown in this appendix with spreadsheets. The spreadsheets supplement the text, which relied on algebra to derive the effective tax ratio.

A. Description of the Investment as a Bank Account

To show the ratio, assume first an investment of $100 that will return $26.38 at the end of each year for the next five years. The investment might be a contract for purchase of rentable machinery, or a lease or royalties, or a debt or bank account. In a financial analysis, the nature of the investment is abstracted out, leaving just the cash flows, shown as follows:

Cash Flow Chart 1. Five-Year 10% Return Investment



The example was set up to generate a 10 percent annual return, such that the net present value of $26.38 is

Spreadsheet 1A: Declining Asset — Five-Year Annuity						
Year	**1**	**2**	**3**	**4**	**5**	**6**
1. Bank account balance at start of year (then reduced by row 4)	$100.00	$83.62	$65.60	$45.78	$23.98	$0.00
2. Interest at 10% of prior balance	$10.00	$8.36	$6.56	$4.58	$2.40	
3. Withdrawal at year end	$26.38	$26.38	$26.38	$26.38	$26.38	
4. Withdrawal in excess of interest earned (row 3 less row 2)	$16.38	$18.02	$19.82	$21.80	$23.98	

$100 using a discount rate of 10 percent under the standard formula for calculation of the present value of an annuity.[28] Spreadsheet 1A, above, in some sense validates the present value calculation, or at least presents it in another format.

In a financial analysis, we need to view the investment as if it were a bank account in which $100 is deposited and the $26.38 is withdrawn at the end of each year, no matter what the real nature of the underlying investment is.

Row 1 of Spreadsheet 1A is the bank account balance that is like the investment under examination. In tax terminology, it is the adjusted basis of the investment, when the tax system identifies the interest from the bank account as the taxable income. Row 2 is the interest on the bank account in row 1. The rate remains at 10 percent, but the amount shrinks as the bank account shrinks. Row 3 is the amount withdrawn every year, that is, the $26.38 positive cash flow. The $26.38 exceeds the amount earned by the depositor as interest at 10 percent, shown in row 2, so that the bank account balance shrinks by the amount of the excess withdrawals each year. Row 4 is the withdrawal ($26.38) that exceeds the interest of row 1, and it reduces the bank account balance in row 1 for the following year. Row 4 is a recovery of the $100 investment, and it is not subject to an income tax. Row 4 can be called depreciation, amortization, or recovery of basis or recovery of capital in tax terminology. Reducing the basis or bank account balance by the depreciation under the row 4 amounts yields a new bank account balance in the following year of row 1. Each year interest is earned on a reduced bank account, the interest amount is lower at the constant 10 percent, and withdrawals in excess of interest reduce the bank account again. At the end of the term, the bank account has been reduced from $100 to zero.

The figures of Spreadsheet 1A are tied together. One can identify the 10 percent interest in row 2 only by subtracting the depreciation of row 4 from the cash flow withdrawals in line 2. One can identify the interest in row 2 if and only if the bank account balance is set as indicated by row 1. In tax terminology, the bank account balance in row 1 is the adjusted basis of the investment.

The adjusted basis of row 1 is equal to the present values of the cash flows yet to come. Thus after a year, there are only four $26.38 withdrawals or cash flows yet to come, and they have a present value of 10 percent of $83.62. After two years, there are only three $26.38 cash flows yet to come, and they have a present value of $65.60. So after three years, the remaining cash flows have a net present value of $45.78, after four years $23.98, and after five years there is nothing left in the account and no future cash flows to come. The relationships of adjusted basis to net present value and to the interest on the hypothetical bank account are all inherent in the mathematics that the present value of a $26.38 five-year annuity is $100. One can identify the 10 percent interest from the bank account only if the adjusted basis of row 1 is kept equal to the net present value of the future investments.

The amounts in row 4 of Spreadsheet 1A constitute economic depreciation with respect to the five-year, 10 percent return declining value investment. The depreciation deductions in row 4 and the resulting schedule of adjusted basis in row 1 of the spreadsheet are the necessary tax results to identify and tax the 10 percent internal rate of return from the investments and make the effective rate of tax equal to the statutory tax rate, as explained next.

B. Full Taxation of 10 Percent Interest

When the interest (row 2 of Spreadsheet 1A) is subjected to tax, tax will reduce the IRR from the investment by 35 percent. A 35 percent tax on interest can be expected to reduce the 10 percent interest return down to (1-T) or 65 percent of the interest, and 65 percent of 10 percent is 6.5 percent. Spreadsheet 1B (next page), continues the example in Spreadsheet 1A and shows that the internal rate of return goes down as expected by 35 percent. Spreadsheet 1B shows the after-tax IRR by showing that discounted present value of the after-tax cash flows from the investment is equal to the $100 investment when 6.5 percent is used as the discount rate.

The definition of IRR is the discount rate ''i'' that will reduce the net present value to zero:

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[28]$PV = A[1 - 1/(1+i)^n]/i$, where PV is present value, i is discount rate, and n is number of periods in which cash flow of A is paid. Therefore, $A = PV/\{[1 - 1/(1+i)^n]/i\}$ and $23.10 = \$100/\{[1 - 1/(1+5\%)^5]/5\%\}$ for n is five years and i is 5 percent.

The present value for an annuity can be derived by series analysis from the longer version, discounting cash flow separately:

(1) $PV = A/(1+i) + A/(1+i)^2 + A/(1+i)^3$. $A/(1+i)^{n-1} + A/(1+i)^n$. Multiplying and dividing each term of series (1) by 1-(1+i) will not change the value of (1). The multiplication by 1 will replicate series (1), and the multiplication by - (1+i) will set up a parallel series that will cancel out most of the terms:

(2) $PV = A/(1+i) + A/(1+i)^2 + A/(1+i)^3 \ldots A/(1+i)^{n-1} + A/(1+i)^n$

$- A - A/(1+i) - A/(1+i)^2 - A/(1+i)^{n-2} - A/(1+i)^{n-1}$

The two lines of series (2) largely cancel each other out and leave

(3) $PV = -A + A/(1+i)^n$

To preserve the quality in (1), (3) must also be divided by 1-(1+i), which simplifies to -i.

(4) $PV = \{-A + A/(1+i)^n\} /-i$

If we factor out A, and divide both numerator and denominator of (4) by -1, (4) becomes

(5) $PV= A [1- 1/(1+i)^n] /i$,

which is the standard for the present value of an annuity.

Spreadsheet 1B: After-Tax Value of Spreadsheet 1 Investment (Continues 1A)					
Year	**1**	**2**	**3**	**4**	**5**
5. Tax on interest (35% * row 2)	$3.50	$2.93	$2.30	$1.60	$0.84
6. Withdrawal less tax (row 3 less row 5)	$22.88	$23.45	$24.08	$24.78	$25.54
7. Discounting row 6 @ 6.5%	/ (1+6.5%)	/ $(1+6.5\%)^2$	/ $(1+6.5\%)^3$	/ $(1+6.5\%)^4$	/ $(1+6.5\%)^5$
8. Present value	$21.48	$20.68	$19.94	$19.26	$18.64
9. Sum of row 8	$100.00				

Spreadsheet 1C: After-Tax Returns Are Like a 6.5% Bank Account						
Year	**1**	**2**	**3**	**4**	**5**	**6**
1. Bank account balance at start of year (reduced by prior year's row 4)	$100	$81.90	$62.90	$42.95	$22.00	$0
2. Interest on row 1 at IRR, found to be 6.5%	$6.50	$5.44	$4.26	$2.98	$1.56	
3. Withdrawal at year-end. Row 6 of Spreadsheet 1B	$22.88	$23.45	$24.08	$24.78	$25.54	
4. Withdrawal in excess of interest earned (row 3 less row 2)	$16.38	$18.02	$19.82	$21.80	$23.98	

Spreadsheet 1D: Made-Up 67.25% Tax Rate; Purchaser Will Pay $100						
Year	**1**	**2**	**3**	**4**	**5**	**6**
1. Bank account balance at start (reduced by row 4)	$100.00	$83.62	$65.60	$45.78	$23.98	$0
2. Interest at 10% of prior balance	$10.00	$8.36	$6.56	$4.58	$2.40	
3. Withdrawal at year-end	$26.38	$26.38	$26.38	$26.38	$26.38	
4. Withdrawal in excess of interest earned (row 3 less row 2)	$16.38	$18.02	$19.82	$21.80	$23.98	
5. Tax on interest (67.25% * row 2)	$6.73	$5.62	$4.41	$3.08	$1.61	
6. Withdrawal less tax (row 3 less row 5)	$19.65	$20.76	$21.97	$23.30	$24.77	
7. Discounting row 6 at 3.275%	$19.03	$19.46	$19.94	$20.48	$21.08	
8. Sum of row 7	$100.00					

(1) $0 = -100 + 21.48/(1+i) + 20.68/(1+i)^2 + 19.94/(1+i)^3 + 19.26/(1+i)^4 + 18.64/(1+i)^5$

In other words, the present value of the future cash flows is equal to the present value of investment:

(2) $100 = 21.48/(1+i) + 20.68/(1+i)^2 + 19.94/(1+i)^3 + 19.26/(1+i)^4 + 18.64/(1+i)^5$

There is a unique answer that will satisfy the ''i'' in equations (1) and (2), but the ''i'' cannot be isolated from all the differing exponents simultaneously, so the equations cannot be solved by algebra. The solution must be found by trial and error, or by computers with algorithms that home in on a solution by trial and error. The 6.5 percent discount rate in Spreadsheet 1B was found by Excel's Goalseek function. Once the rate is found, it can be validated by testing it in equations (1) or (2).

The 6.5 percent discount rate is the IRR because it makes the present value of the investment equal zero (equation (1)), but 6.5 percent is also the interest rate on the bank account that matches the investment after-tax, as shown by Spreadsheet 1C. Spreadsheet 1C validates the equation (1) and (2) solution, or at least presents it in a different format. Spreadsheet 1C says that if a bank advertised 6.5 percent on its accounts, a depositor could withdraw the amounts available after tax and end up with a zero bank balance at the end of the five years. The example investment is like a 6.5 percent investment after tax to a 35 percent tax rate investor.

C. Tax Rate Indifference

When a buyer's discount rate is set by rates of interest after tax, then an advantage of identifying the IRR as the taxable amount is that the tax rate of the purchaser drops out of the calculation of the purchase price. Assume, for example, that the discount rate of the 35 percent bracket taxpayer is 6.5 percent. The after-tax cost of the interest on borrowing at 10 percent for a 35 percent taxpayer is 10%*(1-35%) or 6.5 percent, provided the interest is deductible. The 35 percent bracket taxpayer would expand purchases of investments like this as long as the investment gave enough to pay the interest on borrowing so that the 6.5 percent sets the constraint on the debt-financed investment. With a 6.5 percent discount rate, the 35 percent bracket taxpayer will pay $100 for the cash flow shown in row 3, because if 6.5 percent is substituted in the present value formula of equation (2), then $100 is the present value.

Taxpayers in other tax brackets whose discount rate is set by borrowing would also pay $100 for the investment. A tax-exempt investor — a pension fund or a charitable endowment, for example — pays no tax on the $26.38. The discount rate of the tax-exempt investor is also the pretax borrowing cost of 10 percent, because there is no tax savings to be had by deducting the 10 percent

Spreadsheet 1E: Expensing of Five-Year 10% Return Asset						
	1	2	3	4	5	6
1. Bank account balance at start of year (reduced by prior row 4)	$154.00	$123.08	$92.31	$61.54	$30.77	$0.00
2. Interest rate on row 1 at 10%	$15.38	$12.31	$9.23	$6.15	$3.08	
3. Withdrawal (positive cash flow)	$30.77	$30.77	$30.77	$30.77	$30.77	
4. Withdrawal in excess of interest (row 3 less row 2)	$15.38	$18.46	$21.54	$24.62	$27.69	

interest. As shown by Spreadsheet 1A and by the formula for the present value annuity, the present value of $26.38 at 10 percent is $100.[29]

We can, moreover, make up any outlandish tax rate. In a 67.25 percent tax bracket, 10 percent interest is at a cost of 10%*(1 - 67.25%) or 3.275 percent. As shown by Spreadsheet 1D (previous page), a 67.25 percent bracket taxpayer with a 3.275 percent discount rate would also pay $100 for the after-tax proceeds of the investment:

In a normal income tax system that reduces internal rates of return by the statutory tax rate (for example, 35 percent) or allows borrowing with tax-deductible interest, the purchase price of the asset is the same to all purchasers without regard to tax bracket only if depreciation deductions follow economic declines in value and if the adjusted basis is equal to the net present value of the remaining investment.

That the purchase price is independent of the tax rate, when discount is set by borrowing, is one attractive aspect of identifying the IRR as the taxable interest.[30] Identifying the IRR as taxable income will make the purchase price equal for all investors, without regard to their tax bracket, only if we can assume that both the interest and the discount rate are reduced by tax at the same rate T, and result is i*(1-T) after tax. The discount rate does not have to be fixed by a taxpayer's tax-deductible borrowing, but if the discount rate is set by some alternative investment, the return from the investment has to come into equilibrium with fully taxed interest or tax-deductible interest. If the taxpayer gets a return better than i*(1-T) after tax and after competition among investments, the tax rate will determine purchase price. For example, if all three taxpayers have access to a 10 percent untaxed discount rate, the tax-exempt taxpayer will pay $100 for the property, the 35 percent tax bracket taxpayer will pay $91.06, and the 67.25 percent tax bracket taxpayer will pay $82.82 for the investment.[31]

Identifying interest (row 2 of spreadsheets 1A and 1D) is possible only if the adjusted basis of the investment is kept at the amounts of row 1 or net present value of future cash flows. When basis drops below the bank account balance, taxable income does not describe the interest return and the IRR does not drop by the statutory tax rate. Indeed, as explained next, when the full $100 investment is deducted at once, tax does not reduce the pretax IRR at all. When half the investment is deducted at once, so adjusted basis drops to $50, the IRR is only half the statutory tax rates.

D. Expensing of Investments

The IRR from the investment is unaffected by tax when the investment is deducted in full immediately. A zero basis in the asset implies a zero reduction in IRR, and zero effective tax rate.

Assume again the five-year, 10 percent return, constant cash flow return investment. In the absence of tax, the investment would be $100 in year zero and cash flows of $26.38 for pretax return of 10 percent, just as in Spreadsheet 1A. Assume now, however, that the taxpayer's investment can be expensed immediately, as, for example, investments in computer games or internal goodwill are expensed. The upfront deduction allows the taxpayer to expand the investment, relying on the reimbursement or tax savings from the immediate deduction. As noted, a $100 investment can be grossed to S/(1-T), or here $100/(1-35%) or $154. The savings at 35%*$154 or $54 reduce the cost of the $154 back down to the $100 budget constraint. Spreadsheet 1E assumes that the same 10 percent return will be available on a $154 investment as on the $100 investment. It shows that $30.77 for five years will be sufficient to give the 10 percent interest and recover the $154 investment by leaving the bank account at zero through withdrawals at the end of the five years. The $30.77 can be calculated under the standard formula for present value of an annuity,[32] or it can be found by trial and error with the Excel Goalseek program.

Once the $154 is expensed, there is no further basis to deduct. Row 1 no longer presents adjusted tax basis, and row 4 no longer represents the allowable depreciation. All the positive cash flow or withdrawal in row 3 is subject to tax, here at 35 percent, and the tax reduces the cash flows so that they have a 10 percent IRR after tax. Spreadsheet 1F (next page) continues the Spreadsheet 1B investment showing the after-tax 10 percent return.

Spreadsheet 1F shows the investment has a 10 percent IRR after tax because the discounted present value of the after-tax cash flows at 10 percent is equal to the $100 cost.

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[29]The present value of an annuity is $[1-1/(1+i)^n]/i$, therefore $\$100 = \$23.10*\{1 - 1/(1-10\%)^5\}/10\%$.

[30]Note the title of the seminal article, Paul Samuelson, *supra* note 1: ''Tax Deductibility of Economic Depreciation to Insure Invariant Valuations.''

[31]Row 6 of Spreadsheet 1B has a net present value of $91.06 at a 10 percent discount rate, and row 6 of Spreadsheet 1D has a net present value of $82.82 at a 10 percent discount rate.

[32]Amount A will satisfy the present value formula that net present value is equal to

$A * [1-1/(1+i)^n] /i$

with $154 equal to net present value, i to 10 percent and n to five years, amount A the constant cash flow for five years is equal to $30.77. Spreadsheet 1E shows the results in another format.

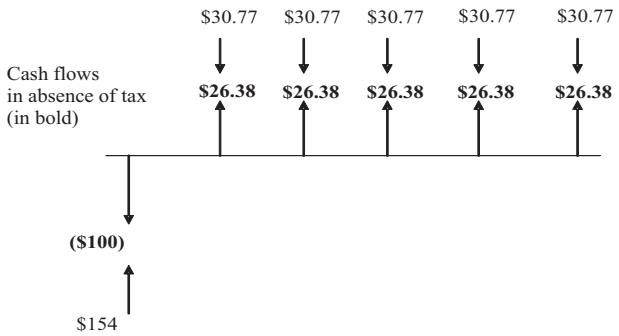
Spreadsheet 1F: Tax on the Expensed Five-Year Return					
	1	2	3	4	5
5 Tax on withdrawal (35% of row 3 of Spreadsheet 1E)	$14.20	$14.20	$14.20	$14.20	$14.20
6. After-tax cash flows (row 5 less row 5)	$26.38	$26.38	$26.38	$26.38	$26.38
7. After-tax cash flows discounted by $(1+10\%)^n$	$23.98	$21.80	$19.82	$18.02	$16.38
8. Sum of the discounted cash flows	$100.00				

Spreadsheet 1G: Half Soft, Half Hard Money						
	1	2	3	4	5	6
1. Basis from hard money (from row 1 of Spreadsheet 1A)	$100.00	$83.62	$65.60	$45.78	$23.98	$0.00
1A. Basis from soft money	0	0	0	0	0	
1B. Total basis	$100.00	$83.62	$65.60	$45.78	$23.98	$0.00
2A. After-tax cash flows from hard money (from row 6 of Spreadsheet 1B)	$22.88	$23.45	$24.08	$24.78	$25.54	
2B. After-tax cash flows from soft money (from row 6 of Spreadsheet 1F)	$26.38	$26.38	$26.38	$26.38	$26.38	
2C. Sum of the after-tax cash flows from both hard and soft (row 2A + 2B)	$49.26	$49.83	$50.46	$51.16	$51.92	
3. Discounted value of after-tax cash flows at 8.25%	$45.51	$42.52	$39.78	$37.26	$34.93	
4. Sum of the discounted values	$200.00					

The investment went from a 10 percent return pretax to a 10 percent return posttax, which means that tax did not reduce the IRR and that the effective tax rate was zero.

Expensing prevents tax from reducing the IRR from the investment because the value of the tax savings upfront is equal to the tax taken out of cash flows. The government becomes a fair partner at the fraction determined by the tax rate contributing 35 percent in reimbursement of the investment's cost as well as taking out 35 percent of the returns. Cash Flow Chart 2 superimposes the effect of tax on the original $100, five-year 10 percent investment. With tax, the investment could be $154, grossed up from $100, to yield cash flows of $30.77, rather than $26.33. Tax reduces the $35.77 down to $26.33. But at the center of the cash flow chart, marked in bold, is the taxpayer's (1-T) share of the investment that is identical to the pretax investment shown in Cash Flow Chart 1.

Cash Flow Chart 2. The Government as a Fair Partner: Pretax Investment at 10% Shown Inside Grossed-Up Expensed Investment



E. Mixed Soft and Hard: The ET Ratio

1. Half hard, half soft money. Assume now an investment of $200 in the same five-year, 10 percent return, constant cash flow investment. Assume, however, that $100 has to be capitalized and becomes basis. Assume that the other half of the investment is soft money of $100, or S, which can be expensed immediately. The ability to deduct the $100 allows the taxpayer to gross up the investment to S/(1-T), which with S of $100 and T of 35 percent becomes $154 in reliance on the tax savings or a reimbursement of 35%*$154 or $54. Half the investment is hard money, and half the investment is soft money.

The after-tax cash flow for each half of the in-absence-of-tax $200 investment has already been calculated. Spreadsheet 1G collects the information into one overall investment.

Spreadsheet 1G shows that the IRR from the $200 investment is 8.25 percent. Because the investment started as a 10 percent return in the absence of tax, tax is reduced from 10 percent to 8.25 percent or by 17.5 percent. The effective tax rate is accordingly 17.5 percent:

Effective tax rate = $(IRR_{pretax} - IRR_{posttax}) / IRR_{pretax}$ = (10% - 8.25%)/10% = 1.75%/10% =17.5%

The investment for Spreadsheet 1G was half hard money, which represented capitalized costs or basis. According to the effective tax ratio, the effective tax rate should be half of the statutory tax rate:

Effective tax rate = H/(H+S)* T = 100/200 * 35% = 17.5%

Spreadsheet 1H: One-Fifth Hard Money Basis						
Year	**1**	**2**	**3**	**4**	**5**	**6**
1. Basis from hard money (from row 1 of Spreadsheet 1A)	$100.00	$83.62	$65.60	$45.78	$23.98	$0.00
1A. Basis from soft money	0	0	0	0	0	
1B. Total basis (rows 1 and 1B)	$100.00	$83.62	$65.60	$45.78	$23.98	$0.00
2A. After-tax cash flows from hard money (from row 6 of Spreadsheet 1B)	$22.88	$23.45	$24.08	$24.78	$25.54	
2B. After-tax cash flows from soft money (four times row 6 of Spreadsheet 1F)	$105.52	$105.52	$105.52	$105.52	$105.52	
2C. Sum of the after-tax cash flows from both hard and soft (row 2A + 2B)	$128.40	$128.97	$129.60	$130.30	$131.06	$128.40
3. Discounted value of after-tax cash flows at 9.3%	$117.47	$107.96	$90.26	$91.30	$84.02	
4. Sum of the discounted values	$500.00					

The adjusted basis for this investment, shown in row 1B of Spreadsheet 1G, is also half of what the adjusted basis would be if the 10 percent rate of return was identified and taxed.

2. One-fifth hard money. One can also do the same exercise under the assumption that the hard money investment remains at $100, but the soft money investment is $400 (then grossed up by the tax reimbursement). Under the ET ratio, the effective tax rate should be one-fifth of 35 percent, for a 7 percent rate. The IRR from the investment after tax should drop by 7 percent, from a 10 percent IRR to an after-tax 9.3 percent. Spreadsheet 1H is exactly like Spreadsheet 1G except that the soft money investment is four times larger, so the after-tax return (row 2B) is four times larger. Spreadsheet 1H, above, shows that the ET ratio holds true for the constant five-year cash flow investment when hard money basis H is one-fifth of the total investment in the absence of tax.

Spreadsheet 1H shows that the after-tax IRR from a $500 investment is 9.3 percent. Because the investment started as a 10 percent return in the absence of tax, tax reduced the return from 10 percent to 9.3 percent or by 0.7 percent. The effective tax rate is accordingly 7 percent:

Effective tax rate = $(IRR_{pretax} - IRR_{posttax}) / IRR_{pretax}$ = (10% - 9.3%)/ 10% = 0.7%/10% = 7%

The investment for Spreadsheet 1G was one-fifth hard money, capitalized costs or basis, in comparison to the $500 investment in the absence of tax. According to the effective tax ratio, the effective tax rate should be one-fifth the statutory tax rate:

Effective tax ratio = H/(H+S)* T = 100/500 * 35% = 7%

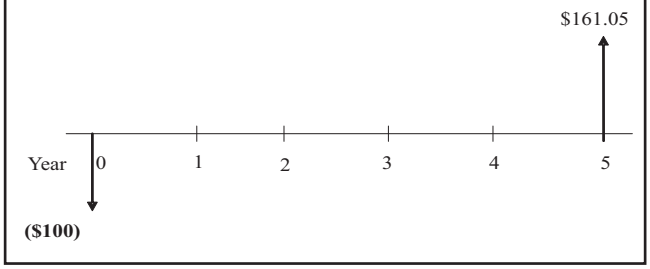
The basis in row 1B of Spreadsheet 1H is always exactly one-fifth of what it would be if the tax were to identify the IRR as the taxable income and reduce it by the statutory tax rate.

F. Appreciating Investment

The ET ratio works not just for a perpetuity and a depreciating asset, but also for an appreciating asset. Assume now that $100 invested in the absence of tax will grow at 10 percent compounded annually to 100 * $(1+10\%)^5$, which equals $161.05 after five years. In the absence of tax, the cash flow looks as shown in Cash Flow Chart 3.

Identification of interest. Spreadsheet 2A (next page) identifies the interest-like return on the investment in Chart 3 and reduces the IRR by the statutory tax rate. Spreadsheet 2A shows that tax on the 10 percent interest will reduce the IRR from the investment from 10 percent to 6.5 percent, which is consistent with the 35 percent statutory tax rate.

Cash Flow Chart 3. Compound Growth at 10%



The basis that will identify the IRR is the net present value of the future $161.05, and the basis rises by 10 percent as the final $161.05 payment gets closer. The pattern is the compound growth under which original issue discount is taxed as the discount expires as the final payment draws closer. The taxation of the interest requires taxation of unrealized appreciation, but the tax code commonly taxes expiration of the discount rate as interest, even though the interest is not received, but compounds.[33] The appreciating five-year, 10 percent investment will be worth $100 to all taxpayers, no matter what their tax bracket is, as long as their discount rate is determined by deductible interest or by alternative investments giving R*(1-T) return after tax.

If the $100 investment may be expensed and becomes soft money, the $100 may be grossed up by $100/(1-35%) = $154. The return at 10 percent compounded is then $154* $(1+10\%)^5$ or $247.77. When the basis is used at once, the entire $247.77 return is subject to the 35 percent tax, but the 35 percent tax does not reduce the IRR below 10 percent. Spreadsheet 2B (next page) shows the point.

[33] *See, e.g.,* section 1272 (current inclusion of original issue discount) and section 7872(b) (original issue discount found in low-interest loans between related parties).

Spreadsheet 2A: Investment Appreciating at 10% per Year. Tax Reduces 10% by Statutory Tax Rate						
Year	**0**	**1**	**2**	**3**	**4**	**5**
1. Basis when compound growth is taxed	$100.00	$110.00	$121.00	$133.10	$146.41	$161.05
2. Taxable income (10% of prior basis in row 1)		$10.00	$11.00	$12.10	$13.31	$14.64
3. Tax on row 2 at 35%		$3.50	$3.85	$4.24	$4.66	$5.12
4. After-tax cash flows	($100)	-$3.50	-$3.85	-$4.24	-$4.66	$155.93
5. Present value of row 4 at 6.5%	($100)	-$3.29	-$3.39	-$3.51	-$3.62	$113.81
6. Sum of the present values of row 5.	0					

Spreadsheet 2B: Expensed Investment, Growing at 10% per Year. Tax Does Not Reduce Internal Rate of Return						
Year	**0**	**1**	**2**	**3**	**4**	**5**
1. Pretax cash flow	($153.85)	0	0	0	0	$247.77
2. Tax on cash flow at 35% (parenthesis is tax savings)	($53.85)	0	0	0	0	$86.72
3. After-tax cash flows (row 1 minus row 2)	-$100.00					$161.05
4. Internal rate of return of row 3	10%					

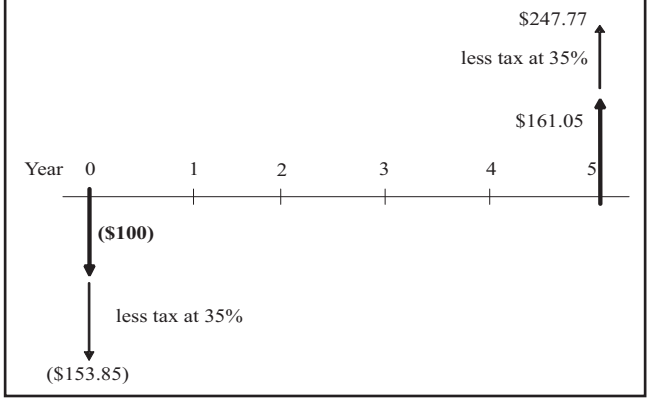
Spreadsheet 2C: Half Hard Money, Half Soft Money, and Tax Rate Is Half						
Year	**0**	**1**	**2**	**3**	**4**	**5**
1. After-tax cash flow from hard money investment (Spreadsheet 2A row 4)	($100.00)	-$3.50	-$3.85	-$4.24	-$4.66	$155.93
2. After-tax cash flow from expensed investment (Spreadsheet 2B row 3)	($100.00)					$161.05
3. Sum of rows 1 & 2	-$100.00	-$3.50	-$3.85	-$4.24	-$4.66	$316.98
4. Internal rate of return of row 3	8.25%					

Spreadsheet 2D: One-Fifth Hard Money, and Tax Is One-Fifth						
Year	**0**	**1**	**2**	**3**	**4**	**5**
1. After-tax cash flow from hard money investment (Spreadsheet 2A row 4)	($100.00)	-$3.50	-$3.85	-$4.24	-$4.66	$155.93
2. After-tax cash flow from expensed investment (Spreadsheet 2B row 3)	($400.00)					$644.20
3. Sum of rows 1 & 2	($500.00)	($3.50)	($3.85)	($4.24)	($4.66)	$800.13
4. Internal rate of return of row 3	9.3%					

Row 3 of Spreadsheet 2B, the after-tax cash flows, with expensing, is identical to the cash flows from the $100 investment in the absence of tax. The cash flows have a 10 percent return because $100*(1+10%)^5 will equal $161.05, and therefore 10 percent will make the net present value of the investment equal to zero. With expensing, the government has become a fair partner contributing the same 35 percent at the beginning of the investment by tax savings as it takes out at the end. The effective rate of tax is zero because tax did not reduce the 10 percent pretax return. The thicker arrows at the center of Cash Flow Chart 4 represent both the taxpayer's net cost and net return with expensing, and also the situation had there been no tax on the investment.

A $200 investment that is half-expensed soft money and half-hard money or basis will combine the cash flows from spreadsheets 2A and 2B and result in an effective tax that is half the statutory tax rate. Basis that is half the investment in the absence of tax drops the return from the investment to half the 35 percent statutory tax rate, or 17.5 percent. A 17.5 percent effective tax rate will drop the

Cash Flow Chart 4. The Government as a Fair Partner: Pretax Investment at 10% Shown Inside Grossed-Up Expensed Investment



10 percent return to 8.25 percent. The cash flows shown on row 3 of Spreadsheet 2C have an internal rate of return of 8.25 percent, because 8.25 percent is the discount rate that will make the cash flows have a zero net present value. The effective tax ratio says that:

Effective tax rate = H/ (H+S)*T = 100/200 * 35% = 17.5%

Finally, Spreadsheet 2D shows the after-tax returns from an investment that is one-fifth hard money, that is, $100 hard money and $400 soft. Spreadsheet 2D has the same logic as Spreadsheet 2C, except that row 2, the after-tax cash flows from the expensed investment, is four times larger. As expected under the ET ratio, the after-tax internal rate of return is 9.3 percent, and the effective tax rate is H/ (H+S)*T = 100/500 * 35% = 7%.