Marginal effective tax rate

Don Fullerton
University of Texas

Designed to measure incentives for investment, a calculation that takes into account effects of measurement and timing of income in determining the impact of a tax applied to an additional dollar of capital income.

The marginal effective tax rate on capital income is the expected pretax rate of return minus the expected after-tax rate of return on a new marginal investment, divided by the pretax rate of return. It typically accounts for an investment tax credit, a statutory tax rate, accelerated depreciation allowances, and historical cost depreciation that falls in real value with inflation. It may include just corporate income taxes, or it may also include personal taxes and local property taxes. It may account for nominal interest deductions, inventory accounting, the alternative minimum tax, and other detailed provisions of the tax law. Several studies have estimated effective marginal tax rates for different assets under different laws (see Jorgenson and Yun 1991 for a time series in the United States and Jorgenson and Landau 1993 for nine different countries).

The marginal effective tax rate is a forward-looking measure that summarizes the incentives to invest in a particular asset as provided by complicated tax laws. It may bear little relation to an industry's "average effective tax rate," defined as the actual tax paid in a particular year divided by the actual capital income in that year, because that measure averages over taxes on income from all past investment (minus credits on that year's new investment).

Any particular estimate of a marginal effective tax rate will depend on particular assumptions about equilibrium in capital markets, the rate of discount, the rate of inflation, expectations of investors, churning, financing, the treatment of risk, and even the choice between the "old view" (where dividend taxes matter) and the "new view" (where they do not). For the simplest example, consider a perfectly competitive firm contemplating a new investment with outlay q that has return c in a world with no uncertainty. Assume that the firm has sufficient tax liability to take associated credits and deductions and that it does not resell the asset. An investment tax credit at rate k reduces the asset's net cost to $(1 - k)q$. The return c grows with inflation at constant rate π, but the asset depreciates at exponential rate δ. The corporate income tax is levied at statutory rate u, and local property tax at rate w is deductible against it. Net returns are discounted at the firm's nominal after-tax discount rate r, and the present value of depreciation allowances per dollar of investment is z. The particular value for z will reflect the discount rate, the tax lifetime for the asset, the depreciation schedule, and whether allowances are based on historical or replacement cost. In equilibrium, the net outlay must be exactly matched by the present value of new returns:

$$(1-k)q = \int_0^\infty (1-u) \bullet (c - wq)e^{(\pi-\delta)t} e^{-rt} dt + uzq \quad \textbf{(1)}$$

This condition can be used to solve for the Hall and Jorgenson (1967) "cost of capital" formula providing ρ^c, the real social rate of return in the corporate sector, gross of tax but net of depreciation:

$$\rho^c = \frac{c}{q} - \delta = \frac{r - \pi + \delta}{(1 - u)}(1 - k - uz) + w - \delta \quad \textbf{(2)}$$

In calculations below, common values are used for r, π, and u, but each asset has a specific value for δ, k, z, and w. (If u and the corporate discount rate are replaced by the noncorporate entrepreneur's personal marginal tax rate and corresponding discount rate, then equation (2) gives an analogous expression for ρ^{nc}, the social rate of return in the noncorporate sector.)

The "marginal effective corporate tax rate" t can be found by setting the property tax w to zero and then taking the gross-of-tax return (ρ^c) minus the net-of-tax return ($r - \pi$), all divided by the gross-of-tax return. Simple algebra can then be used to demonstrate several important conceptual results. First, this effective rate t is equal to the statutory rate u if the investment tax credit is zero and depreciation allowances are based on replacement cost [because z is then $\delta/(\delta + r - \pi)$]. Second, this effective rate still equals the statutory rate if the investor receives only an immediate deduction equal to the purchase price times the fraction $z = \delta/(\delta + r - \pi)$, the first-year recovery proposal of Auerbach and Jorgenson (1980). Third, the effective tax rate is equal to zero with expensing of new investment (because z is then one). Thus uniform effective taxation of all assets can be achieved either with economic depreciation (all $t = u$) or expensing (all $t = 0$). Fourth, uniform effective tax rates can be achieved at any rate between zero and u, if all assets receive an investment tax credit that is proportional to $(1 - z)$. That is, replace k in equation (1) with $k(1 - z)$, where z is based on economic depreciation at replacement cost, and the resulting effective tax rate is $(u - k)$ on all assets.

To account for personal taxes and deductibility of interest, assume that the firm can arbitrage between debt and real capital, as in Bradford and Fullerton (1981). If i is the nominal interest rate, then the corporation can save $i(1 - u)$ by retiring a unit of debt, so any marginal real investment must earn the same rate of return in equilibrium. All nominal net returns are then discounted at the rate $r = i(1 - u)$, whatever the source of finance.

A fraction c_d of corporate investment is financed by debt, and the personal marginal rate of debt holders is τ_d. The net return to debt holders is thus $i(1 - \tau_d)$. A fraction c_{re} of corporate investment is financed by retained earnings, and the return after corporate taxes $i(1 - u)$ results in share appreciation that is taxed at the effective accrued personal capital gains rate τ_{re}. The net return to the shareholder is then $i(1 - u)(1 - \tau_{re})$. The remaining fraction c_{ns} of corporate investment is financed by new shares, subject to personal taxes at rate τ_{ns}, so the net return is $i(1 - u)(1 - \tau_{ns})$. In combination, the real net return in the corporate sector is:

$$s^c = c_d\left[i\left(1 - \tau_d\right)\right] + c_{re}\left[i\left(1 - u\right)\left(1 - \tau_{re}\right)\right] + c_{ns}\left[i\left(1 - u\right)\left(1 - \tau_{ns}\right)\right] - \pi \qquad \textbf{(3)}$$

The "marginal effective total tax rate" in the corporate sector, including all corporate, personal, and property taxes, is $t = (\rho^c - s^c)/\rho^c$, the tax wedge as a fraction of the pretax return. Similar expressions for the noncorporate sector and owner-occupied housing are detailed in Fullerton (1987).

This inclusion of personal taxes, and more simple algebra, can be used to demonstrate additional important conceptual results. Consider a tax-exempt investor such as a university endowment or a pension fund ($\tau^d = 0$), and suppose that the marginal investment is entirely financed by debt ($c_d = 1$). Then with economic depreciation at replacement cost, the marginal effective total tax rate is now zero. The corporate income tax may collect plenty of revenue on past equity-financed investment, but at the margin the corporate income tax is entirely nondistorting (Stiglitz 1973). The reason is that the normal return to the asset is paid out as interest—which is deductible against the corporate income tax. Thus we get a zero marginal effective tax rate either with expensing *or* with debt finance. As a consequence, we get a negative effective tax rate with expensing *and* debt finance. Thus, to maintain neutrality, proposals for expensing must also disallow interest deductions.

Under actual laws, the marginal effective tax rate can be large for an asset with no investment tax credit and slow depreciation allowances based on historical cost with high inflation, especially if the weight on debt is low and the weights on equity are high. It can be negative for an asset with an investment tax credit and accelerated depreciation allowances, especially if the weight on debt is high. Differences in effective tax rates among assets can be used to measure the welfare cost of resource misallocations.

Actual estimates of effective tax rates depend on numerical assumptions about parameters. For example, Fullerton (1987) calculates marginal effective total tax rates for 36 assets in 18 industries, using 4 percent inflation, 5 percent real net return, actual depreciation based on historical cost, one-third debt financing, and weighted-average personal tax rates on interest, dividends, and capital gains. Before the Tax Reform Act of 1986, that paper finds corporate-sector effective rates equal to −0.18 for equipment, 0.37 for structures, 0.29 for public utility assets, 0.42 for inventories, 0.45 for land, and 0.29 overall. Equipment is subsidized by the combination of investment tax credit, accelerated depreciation, and interest deductions at the high 46 percent statutory corporate tax rate. After the Tax Reform Act of 1986, these rates become 0.37, 0.44, 0.44, 0.41, 0.44, and 0.41, respectively. The overall rate rises from 0.29 to 0.41, suggesting less overall incentive to invest, but the different assets are treated much more uniformly. The subsidy to equipment is eliminated with the repeal of the investment tax credit and with the reduction of the statutory corporate tax rate to 34 percent.

We now turn to a discussion of some caveats. These calculations assume that the asset is held forever, but Gordon et al. (1987) show that investors could sell a building, pay the capital gains tax, increase the basis for the new owner's depreciation, and pay less total tax. Churning can reduce the effective tax rate, narrow the difference between structures and equipment, and thus decrease the efficiency gain from a more level playing field. However, Gravelle (1987) indicates that the net effects on the cost of capital are small and depend on transaction costs. Second, the model assumes that firms can use all credits and deductions. Effects of uncertainty and imperfect loss offsets are discussed in

Auerbach (1986). Third, it excludes intangible capital that arises from advertising, research, and development. Summers (1987) suggests that the inclusion of these tax-favored assets would reduce the gain from removing the tax-favored status of equipment, but Fullerton and Lyon (1988) show that the 1986 act still provides efficiency gains by reducing the effective tax rate on other assets such as structures, land, and inventories.

These calculations also assume the same financing for all assets. Gordon et al. (1987) note that structures might use more debt and thus have an effective tax rate that does not exceed equipment, but they provide no evidence on actual financing. Results in Gravelle (1987) support the assumption of equal financing for all assets.

The model includes all major tax provisions as well as considerable disaggregation and detail, such as the half-year convention, the half-basis adjustment, LIFO (last in, first out) inventory accounting, and noncorporate taxes. It ignores some specific provisions, however, such as the minimum tax, passive loss rules, and accounting changes in 1986. Lyon (1990) provides a full discussion of the minimum tax, and Fullerton et al. (1987) show that some of these other provisions have a very small effect on the cost of capital even though they raised noticeable revenue in the five-year budget period.

Results from the Tax Reform Act of 1986 are particularly sensitive to the assumption about the importance of dividend taxes. Calculations reported above correspond to the "new view" because they use observed financing of new investment, where most equity is financed from retained earnings subject to the low capital gains rate, and little equity is financed by new share issues subject to the high personal tax rate on dividends. Thus, the 1986 act's reduction of personal tax rates receives low weight, and the repeal of the investment tax credit helps ensure that the overall effective tax rate rises. In contrast, the "old view" would use observed dividend payout rates of about 50 percent and thus assign a higher 50 percent share to the equity income subjected to high personal taxes on dividends. In this case, the reduction of personal income tax rates is more important, and some estimates find that the Tax Reform Act of 1986 actually lowered overall marginal effective tax rates on income from capital.

Additional readings

Auerbach, Alan J. "The Dynamic Effects of Tax Law Asymmetries." *Review of Economic Studies* 53 (April 1986): 205–25.

Auerbach, Alan J., and Dale W. Jorgenson. "Inflation-Proof Depreciation of Assets." *Harvard Business Review* 58 (September–October 1980): 113–18.

Bradford, David F., and Don Fullerton. "Pitfalls in the Construction and Use of Effective Tax Rates." In *Depreciation, Inflation and the Taxation of Income from Capital*, edited by Charles R. Hulten. Washington, D.C.: The Urban Institute Press, 1981.

Fullerton, Don. "The Indexation of Interest, Depreciation, and Capital Gains and Tax Reform in the United States." *Journal of Public Economics* 32 (February 1987): 25–51.

Fullerton, Don, and Andrew B. Lyon. "Tax Neutrality and Intangible Capital." In *Tax Policy and the Economy* 2, edited by Laurence H. Summers. Cambridge, Mass.: MIT Press, 1988.

Fullerton, Don, Robert Gillette, and James Mackie. "Investment Incentives under the Tax Reform Act of 1986." In *Compendium of Tax Research 1987*. Washington, D.C.: U.S. Treasury Department, 1987.

Gordon, Roger H., James R. Hines, and Lawrence H. Summers. "Notes on the Tax Treatment of Structures." In *The Effects of Taxation on Capital Accumulation*, edited by Martin Feldstein. Chicago: University of Chicago Press, 1987.

Gravelle, Jane G. "Tax Policy and Rental Housing: An Economic Analysis." Congressional Research Service Report No. 87-536 E. Washington, D.C.: Library of Congress, 1987.

Hall, Robert, and Dale W. Jorgenson. "Tax Policy and Investment Behavior." *American Economic Review* 57 (June 1967): 391–414.

Jorgenson, Dale W., and Ralph Landau, editors. *Tax Reform and the Cost of Capital: An International Comparison*. Washington, D.C.: The Brookings Institution, 1993.

Jorgenson, Dale W., and Kun-Young Yun. *Tax Reform and the Cost of Capital*. Oxford: Clarendon Press, 1991.

Lyon, Andrew B. "Investing Incentives under the Alternative Minimum Tax." *National Tax Journal* 43 (December 1990): 451–65.

Stiglitz, Joseph E. "Taxation, Corporate Financial Policy, and the Cost of Capital." *Journal of Public Economics* 2 (February 1973): 1–34.

Summers, Lawrence H. "Should Tax Reform Level the Playing Field?" *Proceedings of the National Tax Association–Tax Institute of America*, meeting of November 1986 (1987): 119–25.

Cross references: average effective tax rate; capital cost recovery; expensing; income tax, corporate.