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In this article, Hackbarth and Zhou predict how the Tax Cuts and Jobs Act will affect companies' funding costs and leverage ratios, and they discuss the analytical and economic determinants involved in longer-term forecasts.

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A company's cost of capital (COC) is a major input to many corporate decisions and transactions and its financial reporting. The estimation of COC is an empirical matter based on the market data on the cost of equity, the cost of debt, capital structure or financial leverage, and the tax rate. Because of the fundamental changes introduced by the Tax Cuts and Jobs Act (P.L. 115-97) and near-term uncertainties around its interpretations and implementations, it will take time for companies and individuals to adjust investment, consumption, and financing decisions, and, in particular, for the full effects on the capital structure and COC to become observable.

Still, valuation and credit analyses are required for mergers and acquisitions, investment, and financial reporting in the interim. The immediate and most straightforward effect of a decrease in the federal corporate income tax rate from 35 percent to 21 percent is an increase of the after-tax cost of debt, hence the after-tax weighted average COC: At 5 percent cost of debt and 40 percent debt ratio, the increase in COC is about 0.3 percent.[1] However, the TCJA could also influence the COC through its effects on financial leverage ratios. Conceptually, a cut in the tax rate reduces the tax advantage of debt relative to equity. Therefore, one naively would expect a higher equity ratio under the lower tax rate.

Is this a reasonable prediction, and what is the effect of a change in leverage ratio on COC? This article discusses analytical and economic forces that affect companies' financing decisions and hence financial leverage ratios. Perhaps surprisingly, although a decrease in interest deductibility reduces incentives for debt financing, our review of broad empirical evidence from previous tax law changes and corporate finance theories suggests that corporate debt ratios are unlikely to decline quickly, if at all. Further, we argue that even if debt ratios decline — say, as a result of more binding interest deduction limitations after 2021 — the cost of equity adjustment as a result of the capital structure change will still limit the TCJA's effect on

[1] 5 percent x 40 percent x (35 percent - 21 percent) = 0.28 percent.

COC to primarily an after-tax cost of debt increase.

Sweeping Changes in the U.S. Tax System

More than three decades after the Tax Reform Act of 1986, the TCJA brings another wave of fundamental changes to the U.S. tax system. The changes include a substantial reduction in the federal corporate income tax rate from 35 percent to 21 percent, a transition from worldwide tax to territorial tax, and immediate expensing of qualified investments for the next five years. Further, the TCJA repeals the corporate alternative minimum tax and imposes a new limit on the deductibility of interest expenses. The interest deduction limitation is set at 30 percent of adjusted taxable income, which is defined as a measure similar to earnings before interest, taxes, depreciation, and amortization (EBITDA) between 2018 and 2021, and earnings before interest and taxes (EBIT) after 2021.[2] Because EBIT is smaller than EBITDA, the limitation based on EBIT is more binding, especially for companies with large depreciation and amortization expenses.

It is inevitable that businesses and individuals will adjust investment, consumption, and financing decisions as a result of these major changes in the tax code.[3] The primary effect of the TCJA will be an increase in a company's or an individual's after-tax earnings and cash flows. The stock market rally at the end of 2017 and announcements by many large corporations to increase stock buybacks, repatriate foreign earnings, and pass on some tax savings to employees are all evidence of this expectation of higher after-tax cash flows. Besides macroeconomic implications, such as the international competitiveness of U.S. companies and the U.S. economy, the cash flow changes depend on a company's competitive position within its industry, and for multinational companies, they depend on a restructuring of the international supply chain.

On the other hand, the effect on the COC is more nuanced. In practice, it is calculated as E/V x cost of equity + D/V x cost of debt x (1 - effective tax rate), where E/V and D/V are ideally market-value capital structure ratios (market value equals the sum of debt and equity values, V = D + E). These inputs are either directly observable (such as the cost of debt and the effective tax rate), can be estimated from capital market data (the cost of equity), or result from corporate decision-making (capital structure ratios). For example, continue the numerical example in the introduction with 5 percent cost of debt and 40 percent debt ratio. Further, assume a 10 percent cost equity and ignore state income tax for simplicity. The pre-TCJA COC is 7.3 percent.[4]

Among these inputs, the TCJA's effect on the COC is primarily complicated by the fact that changes in cost of equity and capital structure ratios can be observed only over time. First, the capital structure ratios used in the COC are usually some industry average or a company's targeted leverage ratio, if it can be estimated reliably. Plenty of empirical studies and anecdotal stories have established that companies adjust capital structure only gradually, even if they have a clear target level. This implies that the full effect of the TCJA on capital structure can be seen only slowly. Second, the cost of equity depends both on the company's business risks as well as financial leverage (for example, a highly leveraged company will have a higher beta and a higher cost of equity). As mentioned above, the interest deduction limitation beginning in 2022 will be based on a more binding EBIT-like measure. For companies with high depreciation and amortization expenses and for highly leveraged companies, debt ratios will be more likely to decrease.

Because a company's cost of equity and cost of debt depend on its capital structure ratios, a prediction of the TCJA's effect on COC will depend critically on how the tax rate reduction affects corporations' capital structure ratios. Mechanically, at a lower tax rate, the after-tax cost of debt will increase. With a reduction in the tax advantage of debt, one could also naively predict

[2] Utilities and real estate industries are exempted from the limitation.

[3] The TCJA also lowers tax rates and eliminates exemptions at the individual level. However, those changes are much smaller than the federal corporate tax rate reduction.

[4] 7.30 percent = 5 percent x 40 percent x (1 - 35 percent) + 10 percent x 60 percent.

a shift to more equity financing or lower financial leverage ratios, thus further increasing the tax reform's effect on COC. If one naively assumes that contrary to the theories and empirical evidence, the cost of equity would stay the same and financial leverage ratios are immediately reduced (see below), lower debt ratios combined with a higher after-tax cost of debt imply a larger rise in the COC. For example, if the equity ratio increases to 65 percent but the cost of equity remains at 10 percent, the post-TCJA COC would be calculated as 7.88 percent.[5]

Empirically, how much will any given company's capital structure adjust as a result of (1) the reduction in the corporate tax rate and (2) the interest deduction limitation? To answer the first question, we turn to the financial economics literature examining capital structure decisions in response to changes in tax rates in "natural experiments,"[6] such as the reduction in the federal corporate income tax rate from 46 percent to 36 percent under TRA 1986, as well as numerous state-level corporate income tax rate changes (both increases and decreases).[7] The answer to the second question is related to the first one in that companies facing the binding interest deduction limitation in four years will anticipate lower tax savings and hence may be more likely to reduce financial leverage, especially if tax savings tended to be the primary reason for past financing decisions that led to higher leverage ratios.

Capital Structure — Empirical Evidence

Researchers have made progress, both theoretically and empirically, in isolating the effect of tax rate changes on capital structure from U.S. historical experience.[8] The earliest research focused on the effect of a single event — TRA 1986 — on capital structure. According to the textbook (static) trade-off model of capital structure, the optimal debt level is the point at which the marginal benefit of the interest tax shield equals the marginal cost of financial distress.[9] Under that theory, the federal corporate tax rate reduction under TRA 1986 should have led to a noticeable reduction in capital structure.[10] However, as Roger H. Gordon and Jeffrey MacKie-Mason reported in 1990, "the actual change in debt-to-value ratios has been substantially smaller than the models predict."[11]

More recent papers examine tax law changes over a much longer period. For example, John R. Graham, Mark T. Leary, and Michael R. Roberts have investigated determinants of the century-long capital structure of U.S. publicly traded companies.[12] They report that "corporate taxes underwent 30 revisions over the past century and increased from 10 percent to 52 percent between 1920 and 1950," yet they found "no significant time-series relation between taxes and the margin between debt usage and common equity." Similarly, Harry DeAngelo and Richard Roll have presented time series evidence on the capital structure of 24 Dow Jones Industrial Average (DJIA) companies over the last century.[13] None of the changes in capital structure ratios that they observed appear to be directly related to TRA 1986. In fact, around 1986, DJIA companies' debt ratios moved in different directions. Thus, there are nontax capital structure determinants (see below). Notably, financing decisions depend on investment policy, whose value added can easily exceed tax shields.[14]

It might be tempting to assume, as a few authors do, a linear, symmetric relationship between financial leverage and tax rate changes:

[5] 7.88 percent = 5 percent x 35 percent x (1 - 21 percent) + 10 percent x 65 percent.

[6] These legislative decisions are quasi experimental because they are largely out of the companies' control. Under these circumstances, researchers can more reliably infer the causal, instead of purely statistical, effect of corporate income tax rate changes on capital structure.

[7] Researchers often study increases in the effective tax rate.

[8] There are also collaborations using international evidence. We mostly focus our review on the United States.

[9] *See, e.g.*, Richard Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, ch. 19 (2008).

[10] A complete analysis should also incorporate the changes in personal taxes. For TRA 1986, the combined effect was to increase the tax advantage of debt. *See* Roger H. Gordon and Jeffrey MacKie-Mason, "Effects of the Tax Reform Act of 1986 on Corporate Financial Policy and Organization Form," National Bureau of Economic Research working paper 3222, at 7 (1990).

[11] *Id.* at 2. Their theoretical model suggests a 15.5 percent increase in debt-value ratio, but the observed increase was only 4.1 percent. *Id.* at 16.

[12] Graham, Leary, and Roberts, "A Century of Capital Structure: The Leveraging of Corporate America," 118 *J. Fin. Econ.* 658 (2015).

[13] DeAngelo and Roll, "How Stable Are Corporate Capital Structures?" 70 *J. Fin.* 373 (2015).

[14] *See, e.g.*, Dirk Hackbarth and David Mauer, "Optimal Priority Structure, Capital Structure, and Investment," 25 *Rev. Fin. Stud.* 747 (2012).

Debt ratios increase after tax rate increases, and similarly, debt ratios decrease after tax rate reductions. Florian Heider and Alexander Ljungqvist, however, have hypothesized and established an asymmetric relationship for U.S. companies from a large sample of 121 state-level corporate tax rate increases or decreases between 1989 and 2011.[15] They find that companies increase financial leverage by 0.4 percent for every 1 percent tax increase, especially for more profitable and higher-rated companies, but that leverage does not respond to tax cuts. The large sample of tax rate changes in multiple states over a long period allows the authors to design multiple empirical tests to confirm that their finding of an asymmetric effect of tax rates is strong and statistically significant.[16]

Capital Structure — Theoretical Rationales

The asymmetric and much-muted effect of tax rate changes on capital structure is not only empirically confirmed but also theoretically justified.

First, the symmetric relationship between effective tax rates and debt ratios is based on an outdated static trade-off theory. Importantly, recent studies of dynamic trade-off models[17] predict an asymmetric relationship, as confirmed by Heider and Ljungqvist.[18] Intuitively, a rise in the tax rate will increase the tax benefit of debt and give the shareholders an incentive to borrow more. With a decrease in the tax rate, however, a reduction in borrowing will lower shareholders' option to default. That will benefit debt holders at shareholders' expense and hence imply a wealth transfer from shareholders to debt holders. Thus, shareholders have no incentive to reduce debt in the case of a tax rate reduction because buying back debt with equity implies that equity holders pay the entire cost of deleveraging but that remaining debt holders gain from less risky (more valuable) debt.[19] Relatedly, protective covenants, dispersed ownership structures, and transaction costs limit potential debt reductions (except perhaps in chapter 11 bankruptcy proceedings, when they are needed), and companies always have an option to issue additional debt in the future without recalling outstanding debt, which makes the asymmetric relationship stronger.[20] Consistent with this observation, most U.S. companies renegotiate more than 90 percent of their long-term debt contracts at least once before their stated maturity, but almost all those renegotiations are because of good performance, so debt ratios are increased.[21]

Second, as shown above, there are many nontax determinants of capital structure ratios. In particular, information asymmetry between managers and outside shareholders strengthens an asymmetric response to tax rate cuts. Since managers generally know more about their companies' prospects or values than do outside investors, raising external funds exposes shareholders to potential value dilution. When insiders have better information than investors on the value of their company's assets, companies of better-than-average quality may find that the market price of their securities is below the fundamental value perceived by the insiders, exposing existing shareholders to dilution. This

[15] Heider and Ljungqvist, "As Certain as Debt and Taxes: Estimating the Tax Sensitivity of Leverage From State Tax Changes," 118 *J. Fin. Econ.* 684 (2015).

[16] Similarly, Frédéric Panier, Francisco Perez-Gonzalez, and Pablo Villanueva document that following a significant reduction in the effective corporate tax rate in Belgium in 2006, companies add less debt over time but do not proactively pay down debt. Panier, Pérez-González, and Villanueva, "Capital Structure and Taxes: What Happens When You (Also) Subsidize Equity?" McKinsey & Co. working paper (Dec. 2015).

[17] *See, e.g.*, Hayne Leland, "Corporate Debt Value, Bond Covenants, and Optimal Capital Structure," 49 *J. Fin.* 157 (1994) ("Therefore, it will never be optimal for the firm's shareholders to restructure by retiring . . . debt via small open market repurchases financed by new equity."). Recently, Anat Admati et al., "The Leverage Ratchet Effect," 73 *J. Fin.* 143 (2018), notes: "Once debt is in place, shareholders will resist any form of leverage reduction no matter how much the leverage reduction may increase total firm value. At the same time, shareholders would generally choose to increase leverage even if any new debt must be junior to existing debt. The resistance to leverage reductions, together with the desire to increase leverage, creates asymmetric forces in leverage adjustments that we call the *leverage ratchet effect*" (emphasis added).

[18] Heider and Ljungqvist, *supra* note 15.

[19] That is, the asymmetric relationship is related to the debt overhang problem. *See, e.g.*, Myers, "Determinants of Corporate Borrowing," 5 *J. Fin. Econ.* 147 (1977).

[20] Similarly, the asymmetric response to changes in tax rates is related to upward restructuring being in practice more important, because equity prices tend to increase if there is a positive risk premium on average and because a typical maturity structure is short to medium term, which makes the option to issue additional debt (or replace expiring old debt with more new debt) a more important feature to account for than the option to repurchase outstanding debt. *See, e.g.*, Robert Goldstein, Nengjiu Ju, and Leland, "An EBIT-Based Model of Dynamic Capital Structure," 74 *J. Bus.* 483 (2001).

[21] *See, e.g.*, Michael Roberts and Amir Sufi, "Renegotiation of Financial Contracts: Evidence From Private Credit Agreements," 93 *J. Fin. Econ.* 159 (2009).

suggests that internal funds are used first. When they are depleted, debt is issued to grow. And when all debt capacity is used, equity is issued as a last resort.[22] The financing hierarchy or pecking order implies that companies prefer internal funds (retained earnings) to fund investments and that companies hoard liquidity for future opportunities to avoid potential value dilution. To the extent that debt is less dilutive than equity, companies are, on the margin, unlikely to lower leverage because of a tax rate reduction. Debt reductions again are unlikely, strengthening the asymmetric, nonlinear response to tax changes.

Third, the asymmetric or subtle response to tax reform can be further supported by the heterogeneity of the companies' use of financial leverage. Importantly, approximately a quarter of all nonfinancial, public companies in the United States have (book) leverage ratios of 5 percent or less.[23] Faster-growing and smaller companies are typically under-levered before the tax reform, so they cannot deleverage, even if they wanted to or were not facing any of the above frictions. Also, if they grow large enough and can access public debt markets, these companies have plenty of debt capacity. Relatedly, it has been argued that managers are often optimistic about the future prospects of their companies and hence tend to issue more (rather than less) debt.[24]

Finally, there has been a secular trend of increased cash holdings over the past decades.[25] The market-value capital structure ratio should reflect cash holdings. However, net leverage (debt less cash to assets) ratios of nonfinancial, public U.S. companies are already low (or negative) as a result of corporate cash locked up overseas. Because the repatriation of foreign cash is treated preferentially under the new tax code and because companies repatriate to fund investment internally, we would expect a gradual increase rather than decrease in observed debt ratios.

Taken together, these additional empirical and theoretical observations make debt reductions less likely than debt increases in response to changes in effective tax rates. Tax shields of debt are only one of many (and perhaps not even the most important) determinants of capital structure. Therefore, a more nuanced and case-by-case examination is required to determine a company's new target leverage ratio and, in particular, its most likely path toward reaching it.

Cost of Capital — Cost of Equity Adjustment

The previous discussions suggest that the TCJA's corporate tax rate reduction probably will have little or no effect on many companies' capital structures. In that case, the COC effect would be limited to a small increase in the after-tax cost of debt. However, some companies with higher leverage ratios than the industry averages have stronger incentives for debt reductions after 2021, when a more binding interest deduction limitation kicks in. How would this reduction in leverage incrementally affect companies' COC? Likely not much.

It is now widely accepted that all else equal, at a higher equity ratio, a company's cost of equity would fall. In the extreme case of no taxes, zero bankruptcy costs, and perfect information, the Nobel-Prize-winning Modigliani and Miller theorem shows that capital structure has no effect on the overall COC — that is, the cost of equity decrease will be exactly offset by the higher equity ratio. In more realistic situations with many real-world frictions such as taxes, bankruptcy costs, and imperfect or incomplete information, the adjustment in the cost of equity will not be exactly offsetting. When moving from zero to low leverage, the tax savings from interest tax shields dominate the cost of financial distress and other nontax costs. Decades of empirical and theoretical research in corporate finance suggests that tax plays a small role, if any, in a company's after-tax weighted average COC. As observed by one of the most popular graduate-level corporate finance textbooks, "the typical financial manager doesn't care much if his or her firm's debt ratio drifts up

[22] Myers and Nikolas Majluf, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," 13 *J. Fin. Econ.* 187 (1984).

[23] *See, e.g.*, Ilya Strebulaev and Baozhong Yang, "The Mystery of Zero-Leverage Firms," 109 *J. Fin. Econ.* 1 (2013).

[24] *See, e.g.*, Hackbarth, "Managerial Traits and Capital Structure Decisions," 43 *J. Fin. & Quant. Anal.* 843 (2008).

[25] Thomas. W. Bates, Kathleen M. Kahle, and Rene M. Stulz, "Why Do U.S. Firms Hold So Much More Cash Than They Used To?" 64 *J. Fin.* 1985 (2009).

Impact of Financial Leverage on Cost of Capital

	Pre-TOA (observed)	Post-TOA (same leverage)	D/V Reduced to 35 Percent	
			Constant Rebalancing	Fixed Debt Outstanding
[1] Cost of debt	5%	5%	5%	5%
[2] D/V	40%	40%	35%	35%
[3] Tax rate	35%	21%	21%	21%
[4] Cost of equity	10%	10%	9.62%	9.67%
[5] E/V	60%	60%	65%	65%
[6] Opportunity CoC			8%	8.28%
[7] After-tax weighted average cost of capital	7.3%	7.58%	7.63%	7.67%

or down within a reasonable range of moderate financial leverage. The typical financial manger acts as if a plot of [weighted average] COC against the debt ratio is 'flat' (constant) over this range."[26]

For mathematically inclined readers, the following table illustrates the incremental effect under two standard financial leverage assumptions: A company either maintains a constant percent leverage (constant rebalancing) as its business fortune fluctuates, or it assumes a fixed debt amount. The adjustment in the cost of equity to capital structure changes has been derived analytically, which is known as the Hamada formula.[27] The first two columns calculate the COC (row [7]) under assumptions [1] to [5], with the only difference being the tax rate in row [3]. As discussed above, when other inputs stay the same, the effect of a tax rate reduction is a COC increase of 0.28 percent.

Under a constant rebalancing assumption (third column), the cost of equity will drop to 9.62 percent when the company reduces its debt ratio from 40 percent to 35 percent.[28] The resulting COC is 7.63 percent, a 0.05 percent increase over the second column of a mere tax rate reduction. Under the fixed debt assumption, the effect of a 5 percent reduction in the debt ratio on COC is about 0.09 percent.[29]

Conclusion

Although the effect of the reform on after-tax cash flows seems to be unambiguous, we show in this article that financial research suggests that the TCJA is unlikely to have an immediate and material effect on leverage ratios and COC. However, other aspects of the TCJA could have a more fundamental effect on specific industries and the competitive landscape of some companies, and those changes could have an indirect effect on the capital structure and COC. Time will tell how those effects play out. ■

[26] Brealey, Myers, and Allen, *supra* note 9, at 545. The authors continue to say that "the financial manager is wise to focus on the firm's operating and investment decisions, rather than fine-tuning its debt ratio."

[27] For general discussion, see *id.* at ch. 20. According to Brealey, Myers, and Allen, the Hamada adjustment is "not a bad approximation for shorter-lived projects when debt is issued in a fixed amount." *Id.* at 545. Most financial managers use the constant rebalancing formula.

[28] Cost of equity corresponding to the 35 percent debt ratio is calculated in two steps. First, the "opportunity cost of capital" is calculated as 10 percent x 60 percent + 5 percent x 40 percent = 8 percent. Second, at 35 percent D/V ratio, the cost of equity is calculated as (8 percent - 5 percent x 35 percent) / 65 percent = 9.62 percent. As a result, the after-tax COC is 9.62 percent x 65 percent + 5 percent x 35 percent x (1 - 21 percent) = 7.63 percent.

[29] We use the post-TCJA (second) column as the starting point for de-levering under fixed debt. The mechanics are as follows: unlevered COC = (10 percent x 60 percent + 5 percent x 40 percent x (1 - 21 percent)) / (60 percent + 40 percent x (1 - 21 percent)) = 8.28 percent; re-levered COC = 8.28 percent + (8.28 percent - 5 percent) x (1 - 21 percent) x (35 percent / 65 percent) = 9.67 percent; therefore, the after-tax COC is 9.67 percent x 65 percent + 5 percent x 35 percent x (1 - 21 percent) = 7.67 percent.