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The Capital Structure Puzzle: The Evidence Revisited

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Is there a way of dividing a company's capital base between debt and equity that can be expected to maximize firm value? And, if so, what are the critical factors in determining the target leverage ratio for a given company?

Although corporate finance has been taught in business schools for more than a century, the academic finance profession has found it difficult to come up with definitive answers to these questions. Part of the difficulty stems from how the discipline has evolved. For much of the last century, finance education was a glorified apprenticeship system designed to pass on to students the accepted wisdom—often codified in the form of rules of thumb—of successful practitioners. However effective in certain circumstances, such rules tend to harden into dogma and lose their relevance when circumstances change. A good example is Eastman Kodak's complete avoidance of debt financing until the 1980s, a policy that can be traced back to George Eastman's brush with insolvency at the turn of the 20th century.

Over the past several decades, financial economists have worked to transform corporate finance into a more scientific undertaking, with a body of formal theories that can be tested by empirical studies of corporate and stock market behavior. But this brings us to the most important obstacle to developing a definitive theory of capital structure: designing empirical tests that are powerful enough to provide a basis for choosing among the various theories.

What makes the capital structure debate especially intriguing is that the theories lead to such different, and in some ways diametrically opposed, decisions and outcomes. For example, some finance scholars have followed Miller and Modigliani in arguing that both capital structure and dividend policy are largely "irrelevant" in the sense that they have no predictable material effects on corporate market values. Another school of thought holds that corporate financing choices reflect an attempt by corporate managers to balance the tax shields of greater debt against potentially large costs of financial distress, including those arising from corporate underinvestment. But if too much debt can destroy value by causing financial distress and underinvestment, others have argued that *too little* debt—especially in large, mature companies—can lead to *over*investment and low returns on capital.

Still others argue that corporate managers making financing decisions are concerned primarily about the "signaling" effects of such decisions—the tendency of stock prices to fall significantly in response to announcements of common stock offerings (which can make such offerings quite expensive for existing shareholders) and to rise in response to leverage-increasing recapitalizations. Building on this signaling argument, MIT professor Stewart Myers has suggested that corporate capital structures are the largely unplanned outcomes of individual financing decisions in which managers follow a financial *pecking order*—a financing rule in which retained earnings are systematically preferred to outside financing, and debt is preferred to equity when outside funding is required. According to Myers, corporate managers making financing decisions are not really thinking about a long-run target debt-to-equity ratio. Instead, they take the path of least resistance and choose what at the time appears to be the lowest-cost financing vehicle—generally debt—with little thought about the future consequences of these choices.

In his 1984 President's address to the American Finance Association in which he first presented this pecking order theory, Professor Myers referred to this conflict among the different theories as the "capital structure puzzle." The greatest barrier to progress in solving this puzzle, as already noted, has been the difficulty of coming up with conclusive tests of the competing theories. Over 30 years ago, researchers in the capital markets branch of finance, with its focus on portfolio theory and asset pricing, began to develop models that predict the values of traded financial assets as a function of a handful of (mainly) observable variables. The predictions generated by such models, after continuous testing and refinement, have turned out to be remarkably accurate and useful to practitioners in a wide range of applications, from portfolio management to option pricing to the valuation of strategic investments.

* This article is an updated version of "The Capital Structure Puzzle: Another Look at the Evidence," which was published in this journal in the spring of 1999 (Vol. 12, No. 1).

But empirical methods in corporate finance have lagged behind those in capital markets, and for several reasons. First, our models of capital structure decisions are less precise than asset pricing models. Models of capital structure typically provide only "qualitative" or directional predictions. For example, the tax-based theory of capital structure suggests that companies with more non-interest tax shields (like foreign tax credits) should have less debt in their capital structure, but the theory does not tell us *how much less*.

Second, most of the theories of optimal capital structure are not mutually exclusive. Evidence consistent with one theory—for example, the tax-based explanation—generally does not allow us to conclude that another factor—say, the role of debt in reducing overinvestment by mature companies—is unimportant. In fact, it seems clear that taxes, bankruptcy costs (including underinvestment), and information costs *all* play some role in determining a firm's optimal capital structure.

Third, many of the variables that we think affect optimal capital structure are difficult to measure. For example, signaling theory suggests that managers' private information about the company's prospects plays an important role both in their financing choices and in how the market responds to such choices. But since it is difficult to identify when managers have such proprietary information, it is not easy to test this proposition.

For all of these reasons and others, the state of the art in corporate finance is less developed than in asset pricing. But there has been considerable progress. Although we may never be able to pinpoint with certainty a company's value-maximizing capital structure, we have learned a good deal about the nature of the tradeoffs between debt and equity, and between the different kinds of debt (short-term vs. long, senior vs. subordinated, private vs. public)—tradeoffs that every CFO must consider in making financing decisions.

The Theories[1]

Current theories of corporate financial policy can be grouped into three broad categories: (1) taxes, (2) contracting costs, and (3) information costs. As suggested above, these theories are not mutually exclusive, but each can help us understand particular aspects of financing decisions.

Taxes

Because the basic corporate profits tax allows companies to deduct interest payments but not dividends in their calculation of taxable income, adding debt to a firm's capital structure lowers its expected tax liability and thereby increases its after-tax cash flow. If there were only a corporate profits tax and no individual taxes on the returns from corporate securities, the value of a debt-financed company would equal that of an identical all-equity firm plus the present value of its interest tax shields. That present value, which represents the contribution of debt financing to the market value of the firm, could be estimated simply by multiplying the company's 35% marginal tax rate (plus state rates) by the principal amount of outstanding debt (provided the firm expects to maintain its current debt level).

The problem with this analysis, however, is that it overstates the tax advantage of debt by considering only corporate taxes. Many investors who receive interest income must pay taxes on that income. But those same investors who receive equity income in the form of dividends and capital gains are taxed at a lower rate, and they can defer any tax on capital gains just by not realizing the gains. Thus, although higher leverage lowers the firm's corporate taxes, it increases the taxes paid by its investors. And because investors care about their after-tax returns, they require compensation for the increased taxes in the form of higher yields on corporate debt—higher than the yields on, say, comparably risky tax-exempt municipal bonds.

These higher yields effectively reduce the tax advantage of debt over equity. In this sense, the company's shareholders ultimately bear all of the tax consequences of its operations, whether the company pays those taxes directly in the form of corporate income tax or indirectly in the form of higher required returns on the securities it sells. For this reason alone, the tax advantage of corporate debt is almost certainly not 35 cents for every dollar of debt.[2] But nor is it likely to be zero—and so a consistently profitable company that volunteers to pay more taxes by having substantial unused debt capacity is likely to be leaving value on the table.

Contracting Costs

Whatever the tax benefits of higher leverage, they must be set against the greater probability and higher expected costs of financial distress. In this view, the optimal capital structure is one in which the next dollar of debt is expected to provide an additional tax subsidy that just offsets the resulting increase in the expected costs of financial distress.

Costs of Financial Distress (or the Underinvestment Problem). Although the direct expenses associated with the bankruptcy process appear small in relation to corporate

1. This section draws on the discussion of capital structure theory in Michael J. Barclay, Clifford W. Smith, Jr., and Ross L. Watts, "The Determinants of Corporate Leverage and Dividend Policies," *Journal of Applied Corporate Finance*, Vol. 7, No. 4 (Winter 1995).

2. The extent to which a company benefits from interest tax shields also depends on whether it has other tax shields. For example, holding all else equal, companies with more investment tax credits or tax loss carryforwards should have lower leverage ratios to reflect the lower value of their debt tax shields. See Harry DeAngelo and Ronald Masulis, "Optimal Capital Structure under Corporate and Personal Taxation," *Journal of Financial Economics*, Vol. 8, No. 1 (1980), pp. 3-29.

market values,[3] the indirect costs can be substantial. For many companies, the most important indirect cost is the loss in value that results from cutbacks in promising investment when the firm gets into financial trouble.

When a company files for bankruptcy, the bankruptcy judge effectively assumes control of corporate investment policy—and it's not hard to imagine circumstances in which judges fail to maximize value. But even in conditions less extreme than bankruptcy, highly leveraged companies are more likely than their low-debt counterparts to pass up valuable investment opportunities, especially when faced with the prospect of default. In such cases, corporate managers are likely not only to postpone major capital projects, but to make cutbacks in R&D, maintenance, advertising, travel, or training that end up reducing future profits.

This tendency of companies to underinvest when facing financial difficulty is accentuated by conflicts that can arise among the firm's different claimholders. To illustrate this conflict, consider what might happen to a high-growth company that is having trouble servicing its debt. Since the value of such a firm will depend heavily on its ability to carry out its long-term investment plan, what this company needs is an infusion of equity. But there is a problem. As Stew Myers pointed out in his classic 1977 paper called "Determinants of Corporate Borrowing,"[4] the investors who would be asked to provide the new equity in such cases recognize that much of the value created (or preserved) by their investment would go to restoring the creditors' position. In this situation, the cost of the new equity could be so high that managers might rationally forgo both the capital and the investment opportunities.

Myers referred to this as "the underinvestment problem." And he went on to argue that companies whose value consists primarily of intangible investment opportunities—or "growth options," as he called them—will generally avoid debt to limit their greater potential loss in value from underinvestment. By contrast, mature companies with few profitable investment opportunities—firms where most of the value reflects current cash flows from tangible "assets in place"—have lower expected costs associated with financial distress. Such companies, all else equal, should have significantly higher leverage ratios than high-growth firms.

It's also important to keep in mind, however, that it's not just growth companies that are prone to this underinvestment problem. Most old-line manufacturing companies need to invest heavily to maintain their existing capital stock (that is, gross investment is often substantial even if net investment is near zero). And, like growth companies, many manufacturers also need to invest in their relationships with non-investor "stakeholders"—customers, suppliers, and employees—to maintain their competitive advantage. In such cases, limiting the use of debt, or resorting to other forms of risk management, could be an important means of reassuring those stakeholders of the company's staying power and commitment to these relationships. Such assurance can serve to increase value by building loyalty among stakeholders and, in the process, reducing the firm's costs of transacting with them. For example, by maintaining a strong balance sheet, companies often will find their suppliers willing to provide goods, services, and even capital on more favorable terms.

The Benefits of Debt in Controlling Overinvestment. But if too much debt can lead to underinvestment (and more demanding stakeholders), too little can lead to overinvestment. As Michael Jensen has argued, large, mature public companies generate substantial "free cash flow"—that is, operating cash flow that cannot be reinvested profitably within the firm.[5] The natural inclination of corporate managers is to use excess cash to sustain growth at the expense of profitability, either by overinvesting in their core businesses or, perhaps worse, diversifying through acquisition into unfamiliar ones. And unless management finds another way to assure investors that it will resist this tendency, companies that aim to maximize firm value should distribute their free cash flow to investors.

Raising the dividend is one way of promising to distribute excess capital—and, thanks in part to the recent dividend tax cut, many U.S. companies appear to be taking that route.[6] But substituting debt for equity (for example, in the form of leveraged stock repurchases) may provide an even more effective solution to overinvestment—one in which contractually obligated payments of interest and principal perform the role of dividend payments in squeezing out excess capital. Thus, in industries generating substantial cash flow but facing few growth opportunities, debt financing can add value simply by forcing managers to be more critical in evaluating capital spending plans. More generally, the use of debt rather than equity reduces what economists call

3. Perhaps the best evidence to date on the size of direct bankruptcy costs comes from Jerold Warner's study of 11 railroads that declared bankruptcy over the period 1930-1955; see "Bankruptcy Costs: Some Evidence," *Journal of Finance*, Vol. 32 (1977), pp. 337-347. The study reported that out-of-pocket expenses associated with the administration of the bankruptcy process were quite small relative to the market value of the firm—less than 1% for the larger railroads in the sample. For smaller companies, it's true, direct bankruptcy costs are a considerably larger fraction of firm value (about five times larger than in Warner's sample). Thus there are "scale economies" with respect to direct bankruptcy costs that imply that larger companies should have higher leverage ratios, all else equal, than smaller firms. But even these higher estimates of direct bankruptcy costs, when weighted by the probability of getting into bankruptcy in the first place, produce expected costs that appear far too low to make them an important factor in corporate financing decisions.

4. Stewart C. Myers, "Determinants of Corporate Borrowing," *Journal of Financial Economics*, Vol. 5 (1977), pp. 147-175.

5. See Michael C. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review*, Vol. 76 (1986), pp. 323-329.

6. See Brandon Julio and David Ikenberry, "Reappearing Dividends," *Journal of Applied Corporate Finance*, Vol. 16, No. 4 (2004), pp. 89-100.

the agency costs of equity—loosely speaking, the reduction in firm value that arises from the separation of ownership and control in large, public companies with widely dispersed shareholders. In high-growth firms, the risk-sharing benefits of the corporate form are likely to outweigh these agency costs. But in mature industries with limited capital requirements, heavy debt financing has the added benefit of facilitating the concentration of equity ownership.[7]

Information Costs

Corporate executives often have better information about the value of their companies than outside investors. Recognition of this information "gap" between managers and investors has led to the formulation of three distinct, but related, theories of financing decisions—one known as *market timing*, a second as *signaling*, and the last as the *pecking order*.

Market Timing. Since the promised payments to bondholders are fixed, and stockholders are entitled to what's left over after the fixed payments, stock prices are more sensitive than bond prices to any proprietary information about the firm's future performance. If management has favorable information that is not yet reflected in market prices, the release of such information will cause a larger increase in stock than in bond prices, and so the current stock price will appear more undervalued to managers than current bond prices. To avoid diluting the value of existing stockholders' (including managers') claims, companies that have profitable uses for more capital but believe their shares to be undervalued will generally choose to issue debt rather than equity. Conversely, managers who think their companies are overvalued are more likely to issue equity and, what amounts to the same thing, to make stock-for-stock acquisitions. Some companies may be tempted to issue overvalued securities, debt or equity, even if they have no current profitable uses for the capital (though, because of the "free cash flow" problem discussed earlier, this kind of stockpiling of capital is likely to be a double-edged sword).

Investors, of course, know that managers know more than they do, and they also understand management's incentives to issue overpriced securities and to avoid issuing undervalued ones. This well-known propensity of companies to "time" their stock offerings helps explain the market's systematically negative response to announcements of such offerings. A considerable body of studies has shown that investors mark down the share prices of issuing firms by about 3%, on average. By contrast, the average market reaction to new debt offerings, though also negative, is not significantly different from zero.[8]

What's important for management to recognize here is that most companies issuing new equity—those that are undervalued as well as those that are overvalued—should expect a drop in their stock prices when they announce the offering (although a recent study shows that the market response is considerably less negative for companies with promising growth opportunities).[9] For those companies that management believes are overvalued by 3% (or more) at the time of the announcement, a 3% drop in the stock prior to the offering does not represent a real cost to the existing stockholders; after all, the stock price would sooner or later have fallen anyway. But for firms that are fairly valued or even undervalued prior to the announcement of the offering, this expected drop in value represents a material economic dilution of the existing shareholders' interest. Throughout the rest of this paper, we refer to this dilution as part of the "information costs" of raising outside capital.

Signaling. Like the market timing explanation, signaling theory is premised on the idea that managers have better information than investors. But in contrast to market timing, where securities offerings are viewed as attempts to raise "cheap" capital, the signaling model assumes that corporate financing decisions are designed primarily to communicate managers' confidence in the firm's prospects and, in cases where management thinks the firm is undervalued, to increase the value of the shares.

With better information about their companies than outside investors, managers who think their firms are undervalued might attempt to raise their share prices just by communicating this information to the market. But this task is not, of course, as easy as it sounds. Management is often reluctant to issue forecasts or release strategic information, and announcing that its company is undervalued generally isn't enough. The challenge for managers is to find a credible signaling mechanism.

Economic theory suggests that information disclosed by an obviously biased source (like management, in this case) will be credible only if there are significant consequences associated with misleading the market. Increasing leverage has been suggested as one potentially effective signaling device.

7. To illustrate this potential role of debt, assume that an investor group identifies an all-equity company with $100 million of assets that could in fact support $90 million of debt. The use of leverage to reduce the firm's equity from $100 million to $10 million greatly increases the ability of small investor groups (including management) to control large asset holdings. This, of course, is the logic behind the leveraged going-private and management buyout transactions that are part of what is today a booming market for private equity. The concentration of ownership made possible by leverage appears to have been a major part of the value gains achieved by the LBO movement of the '80s, and which has been resurrected in the 1990s. And, to the extent there are gains from having more concentrated ownership (and, again, these are likely to be greatest for mature industries with assets in place), companies should have higher leverage ratios.

8. More generally, the evidence suggests that leverage-increasing transactions are associated with positive stock price reactions while leverage-reducing transactions are associated with negative reactions. In reaction to large debt-for-stock exchanges, for example, stock prices go up by 14% on average. The market also reacts in a predictably negative way to leverage-reducing transactions, with prices falling by 9.9% in response to common-for-debt exchanges and by 7.7% in preferred-for-debt exchanges. For a review of this evidence, see Clifford Smith, "Investment Banking and the Capital Acquisition Process," *Journal of Financial Economics*, Vol. 15 (1986), pp. 3-29.

9. K. Jung, Y. Kim, and R. M. Stulz, "Timing, Investment Opportunities, Managerial Discretion, and the Security Issue Decision," *Journal of Financial Economics*, Vol. 42 (1996), pp. 159-185.

Debt obligates the firm to make a fixed set of cash payments over the term of the debt security; if these payments are missed, there are potentially serious consequences, including bankruptcy. Equity is more forgiving. Although stockholders also typically expect cash payouts, managers have more discretion over these payments and can reduce or omit them in times of financial distress. For this reason, adding more debt to the company's capital structure can serve as a credible signal of higher expected future cash flows.[10]

The Pecking Order. The pecking order theory takes the information-cost argument in a somewhat different direction, suggesting that the dilution associated with issuing securities is so large that it dominates all other considerations. According to this theory, companies maximize value by systematically choosing to finance new investments with the "cheapest available" source of funds. Managers prefer internally generated funds (retained earnings) to external funding and, if outside funds are necessary, they prefer debt to equity because of the lower information costs associated with debt issues. Companies are said to issue equity only as a last resort when their debt capacity has been exhausted.[11]

The pecking order theory would thus predict that companies with few investment opportunities and substantial free cash flow will have low (or even negative) debt ratios because the cash will be used to pay down the debt. It also suggests that high-growth firms with lower operating cash flows will have high debt ratios because of their reluctance to raise new equity. In this sense, the pecking order leads to a set of predictions that are *precisely the opposite* of those offered by the tax and contracting cost arguments presented above.

The Evidence

Having presented the different theories of capital structure, we now review the available empirical evidence to assess the relative "explanatory power" of each.

Evidence on Contracting Costs

Much of the earliest research on capital structure supports the idea of an optimal capital structure. For example, a 1967 study by Eli Schwartz and Richard Aronson showed clear differences in the average debt to (book) asset ratios of companies in different industries, as well as a tendency for companies in the same industry to cluster around their industry average.[12] Moreover, such industry averages were negatively correlated with R&D spending and other proxies for corporate growth opportunities that the theory suggests are likely to limit debt financing. In a 1985 study, Michael Long and Ileen Malitz showed that the five most highly leveraged industries—cement, blast furnaces and steel, paper and allied products, textiles, and petroleum refining—were all mature and asset-intensive. At the other extreme, the five industries with the lowest debt ratios—cosmetics, drugs, photographic equipment, aircraft, and radio and TV receiving—were all growth industries with high advertising and R&D.[13]

Other studies have used "cross-sectional" regression techniques to test the extent to which the theoretical determinants of optimal capital structure appear to affect actual financing decisions. For example, in a 1984 study, Michael Bradley, Greg Jarrell, and Han Kim found that corporate debt to (book) asset ratios were negatively related both to the volatility of their annual operating earnings and to the level of their advertising and R&D expenses. This finding is again consistent with high costs of financial distress for growth companies, which tend to have more volatile earnings as well as higher spending on R&D.[14]

As described in a 1995 article in this journal, we (together with our colleague Ross Watts) attempted to add to the body of empirical work on capital structure by examining a much larger sample of companies that we tracked for over three decades.[15] For the present article, we updated this analysis by calculating "market" leverage ratios (measured as the book value of total debt divided by the book value of debt and preferred stock plus the market value of equity) for some 8,800 companies covered by Compustat over the period 1950-2003. Not surprisingly, we found considerable differences in leverage ratios, both across companies in any given year and, in some cases, for the same firm over time. The average market leverage ratio for the 8,800 companies over the entire 50-year period was approximately 21%. One quarter of the firms had market leverage ratios that were higher than 33.5%, and another quarter had leverage ratios less than 5.0%.

To test the contracting cost argument described earlier, we attempted to determine the extent to which corporate leverage and dividend choices could be explained by differences in companies' investment opportunities. As noted, the contracting cost hypothesis predicts that the greater these growth opportunities (relative to the size of the company), the greater is the potential underinvestment problem associated with debt financing and hence the lower will be the company's leverage ratio. Conversely, the more limited a company's growth opportunities, the greater is the potential overinvestment problem and thus the higher should be the company's leverage.

To test this prediction, we needed to come up with a measure of investment opportunities. Because stock prices

10. Stephen Ross, "The Determination of Financial Structure: The Incentive Signaling Approach," *Bell Journal of Economics*, Vol. 8 (1977), pp. 23-40.

11. See Stewart Myers, "The Capital Structure Puzzle," *Journal of Finance*, Vol. 39 (1984), pp. 575-592.

12. Eli Schwartz and J. Richard Aronson, "Some Surrogate Evidence in Support of Optimal Financial Structure," *Journal of Finance*, Vol. 22, No. 1 (1967).

13. Michael Long and Ileen Malitz, "The Investment-Financing Nexus: Some Empirical Evidence," *Midland Corporate Finance Journal*, Vol. 3, No. 3 (1985).

14. Michael Bradley, Greg Jarrell, and E. Han Kim, "The Existence of an Optimal Capital Structure: Theory and Evidence," *Journal of Finance*, Vol. 39, No. 3 (1984).

15. Barclay, Smith, and Watts (1995), cited earlier.

reflect growth opportunities and other intangible assets but corporate balance sheets do not, we reasoned that the larger a company's "growth options" relative to its "assets in place," the higher on average will be its market value in relation to its book value.

We accordingly used a company's market-to-book ratio as our proxy for its investment opportunity set, and ran a regression designed to capture the relation between corporate leverage and market-to-book ratios. (More specifically, we used a "cross-sectional" regression technique in which separate regressions were run and coefficients calculated for each of the 54 years—and then the annual coefficients were averaged.[16]) As reported in Table 1, the results of our regression analysis provide strong support for the contracting-cost hypothesis. Companies with high market-to-book ratios had significantly lower leverage ratios than companies with low market-to-book ratios. (The t-statistic was 15.42, indicating a high degree of statistical significance.) To make these findings a little more concrete, our results suggest that, as one moves from companies at the bottom 10th percentile of market-to-book ratios (with a ratio of 0.78) to the 90th percentile (ratio of 2.87), the predicted leverage market ratio falls by 14 percentage points—which is 65% of the average leverage ratio of 21%.[17]

Table 1 **Determinants of Corporate Leverage Policy**

	Independent Variables								
	Intercept	Market-to-Book Ratio	Regulation Dummy	Log of Real Sales	Tax Loss Carryforwards	ITC Dummy	Abnormal Earnings	Adjusted R^2	Number of Observations
Coeffiicient	0.20	-0.07	0.16	0.004	0.08	0.01	-0.08	0.28	102,844
T-statistic	(10.35)	(15.42)	(19.86)	(4.37)	(9.14)	(3.04)	(4.42)		
Economic impact*		[65.48]	[77.21]	[9.77]	[36.39]	[6.16]	[8.52]		

* Economic impact is the effect on leverage of moving from the 10th to the 90th percentile of a variable, expressed as a percentage of the mean value of leverage.

Robustness Checks

Because the market value of the firm appears on both the left- and right-hand sides of our regression (in the denominator of the leverage ratio and in the numerator of the market-to-book ratio), some researchers have suggested that the strong negative relation between these variables is simply the "artificial" result of large variations in stock prices. In response to this objection, we began by identifying and testing other proxies for corporate investment opportunities that do not rely on market values. For example, when we substituted a company's R&D and advertising as a percentage of sales for its market-to-book ratio, our results were consistent with the contracting cost hypothesis. The coefficients on both of our alternative proxies for the firm's investment opportunities had the correct sign, and the t-statistics were all highly significant.

Next we ran another series of regressions using a different proxy for leverage (the dependent variable): the interest coverage ratio (EBIT over interest). This regression was expected to produce less significant results since the benefits of intangible growth opportunities (in the form of higher expected future cash flow) are not reflected in current earnings when we use the coverage ratio as our proxy for leverage. But here again the results provided strong support for our argument: companies with higher market-to-book values tended to have significantly higher interest coverage ratios.

16. This statistical method solves potential statistical problems that arise in a simple "pooled" regression. It was proposed by Eugene Fama and J. D. MacBeth in their article "Tests of the Multi-Period Two-Parameter Model," *Journal of Financial Economics*, Vol. 1 (1974), pp. 43-66. To calculate correct t-statistics with this method, it still is necessary to account for the time-series correlation in the coefficient estimates, which we do with a statistical procedure known as the Newey-West procedure.

17. The negative relation between corporate leverage and market-to-book ratios also appears to hold outside the U.S. A 1995 study examined capital structure using data from Japan, Germany, France, Italy, the U.K., Canada, and the U.S. and found that, in each of these seven countries, leverage was lower for companies with higher market-to-book ratios and higher for firms with higher ratios of fixed to total assets; see Raghuram Rajan and Luigi Zingales, "What Do We Know About Capital Structure? Some Evidence from International Data," *Journal of Finance*, Vol. 50, No. 5 (1995). These relations are statistically significant for each country for the coefficient on growth options and for every country but France and Canada for the coefficient on assets in place.

Evidence on Debt Maturity and Priority

Most academic discussions of capital structure focus just on leverage ratios. In so doing, they effectively assume that all debt financing is the same. In practice, of course, debt differs in several important respects, including maturity, priority, convertibility, call provisions, covenant restrictions, and whether the debt is privately placed or held by public investors. Each of these features is potentially important in determining the extent to which debt financing can cause, or exacerbate, a potential underinvestment problem. For example, debt-financed companies with more investment opportunities would prefer to have debt with shorter maturities (or at least call provisions, to ensure greater financing and strategic flexibility[18]), less restrictive covenants, more convertibility provisions (which reduce required coupon payments and provide for conversion into equity following an increase in stock prices and perhaps investment opportunities[19]), and a smaller group of private investors rather than public bondholders (making it easier to reorganize in the event of trouble).

Consistent with this argument, our tests showed that growth companies (again as identified by high market-to-book ratios) tended to have significantly less long-term debt (defined as having a maturity greater than three years) as a percentage of total debt than companies with limited investment opportunities. Our regressions suggested that moving from companies at the 10th to the 90th percentile of market-to-book ratios reduced the ratio of long-term debt to total debt by 18 percentage points (a significant reduction, given our sample average ratio of 46%).[20]

Also consistent with the contracting-cost hypothesis, we found that the debt issued by growth firms was significantly more concentrated among high-priority classes. Companies with high market-to-book ratios had higher proportions of secured and ordinary senior debt and little subordinated debt. Our explanation for the avoidance of subordinated debt by growth firms is as follows: When companies get into financial difficulty, complicated capital structures with claims of different priorities can generate serious conflicts among creditors, thus exacerbating the underinvestment problem described earlier. And because such conflicts and the resulting underinvestment have the greatest potential to destroy value in growth firms, those growth firms that do issue fixed claims will choose mainly high-priority ones.

The Evidence on Information Costs

The market timing and signaling explanations, as we saw earlier, say that companies are more likely to issue debt than equity when they are undervalued, because of the large information costs (in the form of expected dilution) associated with an equity offering. The pecking order model goes even farther, suggesting that the information costs associated with riskier securities are so large that most companies will not issue equity until they have completely exhausted their debt capacity. Both the market timing and signaling theories suggest that a company's specific financing decisions (to the extent they can be separated from its overall capital structure) will be influenced by whether the company is perceived by management to be undervalued or overvalued. The pecking order model is more extreme; it implies that a company does not have a target capital structure, and that its leverage ratio will be determined by the gap between its operating cash flow and its investment requirements over time. Thus, the pecking order predicts that companies with consistently high profits or modest financing requirements are likely to have low debt ratios—mainly because they don't need outside capital. Less profitable companies, and those with large financing requirements, will end up with high leverage ratios because of managers' reluctance to issue equity.

There is convincing evidence of managers' efforts to time equity offerings. As noted earlier, the stock prices of companies announcing equity offerings fall by about 3%, on average. Consistent with this overvaluation story, a number of studies have reported a tendency of companies to issue equity after significant stock price increases. At the same time, leverage-increasing transactions such as debt-financed stock repurchases generally receive a positive market response.

In our 1995 paper with Ross Watts, we devised a test of the signaling theory. According to the signaling explanation, undervalued companies should have higher leverage ratios, all else equal, than overvalued firms because of managers' reluctance to issue undervalued equity. We classified companies as undervalued in any year in which their earnings (excluding extraordinary items and adjusted for any changes in shares outstanding) increased in the following year. We designated as overvalued all firms whose ordinary earnings decreased in the next year. To the extent signaling theory has explanatory power, we would expect to see a significantly positive correlation between a company's leverage ratio and its unexpected earnings. What we found, however (as

18. In his 1977 article ("Determinants of Corporate Borrowing," cited earlier), Stewart Myers pointed out that a company whose value consists mainly of growth opportunities could severely reduce its future financing and strategic flexibility—and in the process destroy much of its value—by issuing long-term debt. Not only would the interest rate have to be high enough to compensate lenders for their greater risk, but the burden of servicing the debt could cause the company to defer strategic investments if operating cash flow turns down. By contrast, shorter-term debt, besides carrying lower interest rates in such cases, would also be less of a threat to future strategic investment because, as the firm's current investments begin to pay off, it will be able over time to raise capital on more favorable terms. If the firm's debt matures before a company's growth options must be exercised, the investment distortions created by the debt is eliminated. Since these investment distortions are most severe, and most costly, for firms with significant growth options, high-growth firms should use more short-term debt.

19. See David Mayers, "Convertible Bonds: Matching Real Options with Financial Options," *Journal of Applied Corporate Finance*, Vol. 13, No.1 (Spring 2000).

20. Michael J. Barclay and Clifford W. Smith, Jr., "On Financial Architecture: Leverage, Maturity, and Priority," *Journal of Applied Corporate Finance*, Vol. 8, No. 4 (1996).

reported earlier in Table 1), was a small (though statistically significant) *negative* relation.

The findings of our 1996 study on debt priority are also inconsistent with the signaling hypothesis. Whereas the theory predicts more senior debt for firms about to experience earnings increases, the ratio of senior debt to total debt was in fact lower for such firms. Thus, the results of our tests of managers' use of financing choices to signal their superior information to the market provide little support for the hypothesis, and the economic effect of any such signaling on overall corporate capital structures appears minimal.

We find the evidence used to support the pecking order theory even less persuasive. A number of studies have demonstrated a strong negative relation between past profitability and leverage. That is, higher profits and operating cash flows tend to be associated with lower rather than higher leverage ratios.[21] This finding has generally been interpreted as confirmation that managers do not set target leverage ratios—or at least do not work very hard to achieve them.

But this is not the only interpretation of the data. Even if managers set target leverage ratios, unexpected increases or shortfalls in profitability, along with occasional attempts to exploit financing "windows of opportunity," can cause companies to deviate from their targets. In such cases, there will be what amounts to an *optimal deviation* from those targets—one that depends on the transactions costs associated with adjusting back to the target relative to the (opportunity) costs of deviating from the target. For example, to the extent there are fixed costs and scale economies in issuing securities, companies with capital structure targets will make infrequent adjustments and often will deliberately overshoot their targets. A complete theory of capital structure must take account of these adjustment costs and how they affect expected deviations from the target.

Moreover, some of the findings from our 1996 study of the different kinds of debt are clearly inconsistent with the pecking order theory. According to that theory, a company should issue as much as possible of the security with the lowest information costs. Thus, companies should issue as much secured debt or capitalized leases as possible before issuing any unsecured debt, and they should exhaust their capacity for taking on short-term debt before issuing any long-term debt. But these predictions are clearly rejected by the data (not to mention casual observation). For example, when we examined the capital structures of over 7,000 companies between 1980 and 1997 (representing almost 57,000 firm-year observations), we found that 23% of these observations had no secured debt, 54% had no capital leases, and 50% had no debt that was originally issued with less than one year to maturity.

The Evidence on Taxes

Theoretical models of optimal capital structure predict that companies with more taxable income and fewer non-debt tax shields should have higher leverage ratios. But studies that examine the effect of non-debt tax shields (depreciation, tax-loss carryforwards, and investment tax credits) on corporate leverage have found that companies with more non-debt tax shields appear to have, if anything, more debt in their capital structures.[22]

Before we conclude that taxes are unimportant in the capital structure decision, however, it is important to recognize that the tax variables in these studies are at best crude proxies for a company's effective marginal tax rate. Companies with investment tax credits, high levels of depreciation, and other non-debt tax shields tend to have mainly tangible fixed assets. Since fixed assets generally represent good collateral, the non-debt tax shields may not be a proxy for a low marginal tax rate, but rather for low contracting costs associated with debt financing. By the same token, companies with tax-loss carryforwards are often in financial distress; and since equity values typically are lower in such circumstances, financial distress itself causes leverage ratios to increase. Thus, it is not clear whether tax-loss carryforwards proxy for low tax benefits of debt or for financial distress (or whether we are measuring variation in target leverage or deviations from target leverage).

In an attempt to avoid the difficulties stemming from crude proxy variables, a fairly recent study by John Graham used a sophisticated simulation method to provide a more accurate measure of companies' *effective* marginal tax rates. After simulating such rates for thousands of companies over the period 1980-1999, Graham reported a positive association between corporate debt and tax rates. He also estimated that, for the average U.S. company during the 1980s and 1990s, the tax benefits of debt accounted for 5-10% of firm value.[23] On balance, then, the evidence appears to suggest that taxes play a least a modest role in corporate financing and capital structure decisions.

Implications for Dividends and Other Corporate Policies

Besides explaining leverage targets and aspects of debt such as maturity and priority, a useful theory of capital structure

21. See, for example, Carl Kester, "Capital and Ownership Structure: A Comparison of Unites States and Japanese Manufacturing Corporations," *Financial Management*, Vol. 15 (1986); Rajan and Zingales (1995), cited earlier; and Sheridan Titman and Roberto Wessels, "The Determinants of Capital Structure Choice," *Journal of Finance*, Vol. 43 (1988), pp. 1-19. Moreover, a 1998 article by Myers and an MIT colleague added to this series of studies by showing that past profitability explains more of the time-series variation of debt ratios than a target-adjustment model of capital structure that is consistent with the contracting cost hypothesis; see Lakshmi Shyam-Sunder and Stewart Myers, "Testing Static Tradeoff Against Pecking Order Models of Capital Structure," *Journal of Financial Economics*, Vol. 51, No. 2 (1998).

22. See, for example, Bradley, Jarrell, and Kim (1984); Titman and Wessels (1988); and Barclay, Smith, and Watts (1995), all of which are cited earlier.

23. John Graham, "Estimating the Tax Benefits of Debt," *Journal of Applied Corporate Finance*, Vol. 14, No. 1 (2001). See also John Graham, "Debt and the Marginal Tax Rate," *Journal of Financial Economics*, Vol. 41 (1996), pp. 41-73.

could also help explain an even broader array of corporate financial policies. Take the case of dividends. Our 1995 study with Ross Watts showed an economically as well as statistically significant negative relation between our proxy for corporate investment opportunities and dividend yields (as well as leverage). Our regression analysis suggested that, as one moves from companies at the 10th to the 90th percentile of market-to-book ratios, the dividend yield drops by almost 80% (in relation to an average yield of 2.4%).

When viewed with our findings on leverage, this result suggests that high dividends and high leverage tend to be complementary strategies driven by common factors and considerations. The same appears to be true of corporate compensation policy, and perhaps hedging and leasing policies as well. What evidence we have suggests that companies choose coherent packages of these financial policies. For example, smaller, high-growth firms tend to have not only low leverage ratios and simple capital structures, with predominantly short-maturity and senior private (bank) debt, but also low dividend payouts and considerable stock-based incentive compensation for senior executives. By contrast, large mature companies tend to have high leverage, more long-term debt, more complicated capital structures with a broader range of debt priorities, higher dividends, and less incentive compensation (or, more precisely, greater use of earnings-based bonuses than stock-based compensation plans).[24] Thus, corporate financing, dividend, and compensation policies, besides being correlated with each other, all appear to be driven by the same fundamental considerations: a company's investment opportunities and (to a lesser extent) its size. And this consistent pattern of corporate decision-making suggests that we now have the rudiments of a unified framework for explaining most, if not all, financial policy choices.

Proponents of the pecking order theory argue that the information costs associated with issuing new securities dominate all other costs in determining capital structure. But the logic and predictions of this theory are at odds with most other financial policy choices. For example, in suggesting that companies will always use the cheapest source of funds, the model offers no reason why companies would simultaneously pay dividends and access external capital markets. In practice, of course—and with the exception of a few extraordinarily successful high-tech companies—most large, publicly traded companies pay dividends while at the same time regularly rolling over existing debt with new public issues. And as already discussed, although the pecking order predicts that mature companies that generate lots of free cash flow should eventually become debt-free, they are among the most highly leveraged firms in our sample. Conversely, the pecking order theory implies that high-tech startup firms will have high leverage ratios because they often have negative free cash flow and incur the largest information costs when issuing equity. In fact, such firms tend to be financed almost entirely with equity.

Toward a Solution: Integration of Stocks and Flows

Although the pecking order theory is incapable of explaining the full array of financial policy choices, this does not mean that information costs are unimportant in corporate decision-making. On the contrary, such costs will influence corporate financing choices and, along with other costs and benefits, must be part of a unified theory of corporate financial policy.

As we wrote in this journal five years ago, the key to reconciling the different theories—and thus to resolving the capital structure puzzle—lies in achieving a better understanding of the relation between corporate financing *stocks* and *flows*. The existing theories of capital structure generally focus either on the stocks (that is, on the levels of debt and equity in relation to the target) or on the flows (the decision regarding which security to issue at a particular time). Until recently, for example, the primary focus of contracting-cost theory has been leverage ratios, which are measures of the stocks of debt and equity. By contrast, information-based theories like the pecking order model tend to focus more on flows—for example, on the information costs associated with a given choice of debt or equity. But, since both stocks and flows are likely to play important roles in such decisions, neither of these theoretical approaches alone is likely to offer a reliable guide to optimal capital structure.

In a study published in 2000, two academics working with an investment banker came up with an interesting two-step approach, one that examines first stocks and then flows. Using a model similar to our own, the study began by estimating optimal (or "target") debt ratios for some 5,000 U.S. companies in each year over the 19-year period 1979-1997. As proponents of the pecking order would have predicted, the study found that past profitability had a significant influence on the observed debt ratios in any given year, with the result that many companies appeared to be deviating sharply from their estimated targets. But consistent with the tax and contracting explanations, the subsequent (debt vs. equity) financing and stock repurchase decisions of such companies appeared designed to move them back toward the targets. For example, if a highly profitable company seemed clearly underleveraged in a given year, in the following year it was more likely to buy back stock than a firm judged to be

24. See Clifford W. Smith and Ross L. Watts, "The Investment Opportunity Set and Corporate Financing, Dividend and Compensation Policies," *Journal of Financial Economics*, Vol. 32 (1992), pp. 263-292.

near its leverage target. Conversely, companies that appeared overleveraged were more likely to raise equity and perhaps use it to retire debt.[25]

Reinforcing these findings, a more recent study by Mark Flannery and Kasturi Rangan also reports that companies often deviate significantly from their target capital structures and then work their way back toward their targets. In tracking the financing decisions of such companies over the period 1966-2001, the study concluded that the typical rate of adjustment toward the target is about 30% a year.[26]

What does all this have to say to corporate treasurers and CFOs? In developing a sensible approach to capital structure strategy, the CFO should start by thinking about the company's target capital structure in terms of a ratio of debt to total capital that is expected to minimize taxes and contracting costs (while paying some attention to information costs). The target ratio should take into consideration factors such as the company's projected investment requirements; the level and stability of its operating cash flows; its tax status; the expected loss in value from being forced to defer investment because of financial distress; and the firm's ability to raise equity capital on short notice (without excessive dilution).

If the company is not currently at or near its optimal capital structure, the CFO should come up with a plan to achieve the target debt ratio. For example, if the firm has too much equity (or too much capital in general), it can increase leverage by borrowing (or using excess cash) to buy back shares. The fact that U.S. corporate stock repurchases grew at almost 30% per year during the 1990s is by itself perhaps the single most compelling piece of evidence that corporate managers think in terms of optimal capital structure. But if a company needs more capital, then managers choosing between equity and various forms of debt must consider not only the benefits of moving toward the target, but also the associated adjustment costs. For example, a company with too much debt may choose to delay an equity offering—or issue convertibles or PERCS instead[27]—in order to reduce or avoid the cost of issuing securities that it perceives to be undervalued.

As a more general principle, the CFO should adjust the firm's capital structure whenever the costs of adjustment—including information costs as well as out-of-pocket transactions costs—are less than the costs of deviating from the target. But based on the existing research, including Flannery and Rangan's finding that companies adjust at a rate of 30% per year, what can we say about such adjustment costs?

The available evidence on the size and variation of such costs suggests that there is a major fixed component—one that again includes information costs as well as out-of-pocket costs.[28] Since average adjustment costs fall with increases in transaction size, the scale economies in issuing new securities suggest that small firms, all else equal, are likely to deviate farther from their capital structure targets than larger companies. Nevertheless, the amount of such fixed costs varies considerably among different types of securities. Equity issues have both the largest out-of-pocket transactions costs and the largest information costs. Long-term public debt issues, particularly for below-investment-grade companies, are the next most costly.[29] Short-term private debt or bank loans are the least costly. Because CFOs are likely to weigh these adjustment costs against the expected benefits from moving closer to their leverage target, it is not surprising that seasoned equity offerings are rare events, long-term debt issues are more common, and private debt offerings or bank loans occur with almost predictable regularity. Moreover, because of such adjustment costs, most companies—particularly smaller firms that face higher costs in both raising new equity and retiring debt—are also likely to spend considerable time away from their target capital structures.

The bottom line, then, is that larger adjustment costs will lead to larger deviations from the target before the firm readjusts. To make sensible decisions about capital structure, CFOs must understand both the costs associated with deviating from the target capital structure and the costs of adjusting back toward the target. The next major step forward in solving the capital structure puzzle is almost certain to involve a more formal weighing of these two sets of costs.

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25. Armen Hovakimian, Tim Opler, and Sheridan Titman, "The Capital Structure Choice: New Evidence for a Dynamic Trade-Off Model," *Journal of Applied Corporate Finance*, Vol. 15, No. 1 (Spring 2002).

26. Mark Flannery and Kasturi Rangan, "Partial Adjustment Toward Target Capital Structures," Working paper, University of Florida (2004).

27. See Enrique Arzac, "PERCS, DECS, and Other Mandatory Convertibles," *Journal of Applied Corporate Finance*, Vol. 10, No. 1 (Spring 1997).

28. See, for example, David Blackwell and David Kidwell, "An Investigation of Cost Differences between Private Placements and Public Sales of Debt," *Journal of Financial Economics*, Vol. 22 (1988), pp. 253-278; and Clifford Smith, "Alternative Methods for Raising Capital: Rights vs. Underwritten Offerings," *Journal of Financial Economics*, Vol. 5 (1977), pp. 273-307.

29. See Sudip Datta, Mai Iskandar-Datta, and Ajay Patel, "The Pricing of Debt IPOs," *Journal of Applied Corporate Finance*, Vol. 12, No. 1 (Spring 1999).

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