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WITNESS: DONALD E. GAINES

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY, INC.,** **Respondent.**	**Docket No. UE-04____** **Docket No. UG-04____**

FIFTH EXHIBIT TO PREFILED DIRECT TESTIMONY OF DONALD E. GAINES (NONCONFIDENTIAL) ON BEHALF OF PUGET SOUND ENERGY, INC.

APRIL 5, 2004

REGULATORY FINANCE:

UTILITIES' COST OF CAPITAL

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Chapter 19
Optimal Capital Structure

19.1 Introduction

The existence of an optimal capital structure for a public utility has been a controversial issue in corporate finance and utility regulation. The issue resurfaces periodically, particularly when the equity ratios become inflated in relation to historical standards. For example, when electric utilities enter a cash generation mode following the termination of base load construction programs and/or decrease in load growth, their equity ratios thicken. Or when a utility's equity ratio must be solidified in response to heightened business risk, regulators' concerns on the appropriate capital structure intensify as a result.

The correct proportion of debt and equity capital for a utility to employ is particularly relevant for utility ratepayers, since equity costs exceed debt costs owing to the tax deductibility of interest payments on debt. The debt ratio that minimizes capital costs, or conversely, the credit rating that is most cost effective, is the major concern of this chapter. Specifically, does maintaining a high or upper medium-grade credit rating, for example AA as opposed to A, or A as opposed to BBB, cause a company's overall capital costs, inclusive of taxes, to be minimized? This chapter is the empirical counterpart of Chapter 17 and provides an empirical resolution to the optimal capital structure issue by means of a simulation model. At what level of leverage is the low-cost advantage of debt financing offset by the rising risks? Conversely, given the intimate connection between bond rating and debt ratio, what is the optimal bond rating?

For expository convenience, a hypothetical utility company labeled as the Southeastern Electric Company or "Southeastern" is referenced throughout the chapter. The case example developed in this chapter is to be regarded as illustrative only, and not as a precise formula for finding the optimal capital structure.

In the way of background to the case, a management audit report alleges that Southeastern's capital structure plan for the next five years is not supported by a detailed analysis of the alternatives, and that the company should evaluate the feasibility of reducing equity ratio targets. More specifically, the report shows that increasing the debt ratio targets reduces capital costs. The report suggests that the costs of maintaining a given bond rating and the underlying costs to the ratepayer are not minimized by the current debt ratio. In contrast, the simulation model described in this chapter shows that electric utilities whose bonds are rated a strong A to AA enjoy lower capital costs and provide lower rates than BBB utilities, especially in adverse capital market conditions. The results of the model indicate that it is in Southeastern's interest and that of its ratepayers to maintain a strong A to AA bond rating over the next several years and to maintain a maximum debt ratio consistent with that target.

The chapter is divided into three sections. Section 19.1 outlines the basics of the methodology. Section 19.2 presents a simulation model designed to identify Southeastern's optimal bond rating from the ratepayers' viewpoint. Section 19.3 summarizes the chapter and offers conclusions and policy implications.

It should be pointed out that the general approach employed in this chapter is pragmatic rather than theoretical. The optimal capital structure issue is addressed from the point of view of investors or from the point of view of someone who is in close contact with investor concerns.

19.2 Model Fundamentals

As was evident from Chapter 17, capital structure theory provides limited quantitative guidance on where or whether there is, in fact, an optimal debt ratio or an optimal bond rating. The classic Modigliani-Miller argument asserts that a company's cost of capital is constant regardless of the debt ratio, but since interest payments are tax deductible, debt financing has a large cost advantage. Miller's introduction of personal taxes in the picture palliates the corporate tax advantage of debt. Since then, numerous theoreticians have debated the theory of capital structure, trading off the tax advantage of debt and the costs of distress and information signaling. Empirical investigations have generated controversy as well, although it is clear that there is a tax benefit from leverage and that leverage decreases overall cost of capital, at least over low levels of leverage. It is equally clear from these studies that the cost of equity increases with leverage.

Given the unsettled nature of financial theory, it is imperative that an empirical approach be implemented. The simulation model in the next section will investigate empirically the existence of an optimal bond rating, using current data and current industry realities.

In order to isolate the issues clearly and to facilitate comprehension of the full capital structure simulation model presented in Section 19.2, a simplified illustration is presented. The basic idea of the method along with the crucial variables and assumptions driving the model will emerge. [1]

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[1] The simulation model presented in this chapter builds upon and extends the foundation laid by Hadaway (1986).

Consider an A-rated utility with the following capital structure before a change is contemplated: the rate base of $100 is financed 50% by debt and 50% by common equity, with cost rates of 10% and 14%, respectively. Note that the cost rates imply a risk premium of 4% of common equity returns over bond yields. The corporate tax rate is 34%, so that the tax conversion factor is 1/(1-.34) = 1.52. Referring to Table 19-1 below, the tax-inclusive cost of capital is 15.61%. That is, on a rate base of $1,000, $156.10 of revenue requirements are needed to service the capital contributed by investors.

TABLE 19-1
TAX-INCLUSIVE COMPOSITE COST OF CAPITAL BEFORE CHANGE

Type Of Capital	Amount	Weight	Cost	Weighted Cost	Tax Factor	Weighted Return
Debt	$50	50.00%	10.00%	5.00%	1.00	5.00%
Equity	$50	50.00%	14.00%	7.00%	1.52	10.61%
	$100			12.00%		15.61%
Coverage = 3.12						

The coverage ratio measures the ability of the utility's earnings to meet its fixed obligations, and is an important determinant of creditworthiness scrutinized by bond rating agencies and by the investment community. In this example, the pre-tax operating revenues of $15.61 can be divided by the interest charges of $5 to find the coverage ratio of 3.12 that results from the allowed return. Conversely, had the target coverage of 3.12 been given, the implied debt ratio of 50% required to produce the coverage of 3.12 could be computed. This is an important pillar of the simulation model in the next section. Given the target coverage ratio, the required debt and equity ratios to produce that coverage can be computed.[2]

2 The formula for accomplishing the transition from the required coverage to the debt ratio is derived as follows: Interest coverage *COV* is defined as the pre-tax, pre-interest earnings available to service the interest charges, or *WACC*/interest. *WACC* is equal to $K = K_d W_d + K_e W_e$, where K_d and K_e are the cost of debt and equity, W_d and W_e are the percent weights of debt and equity. The interest burden is $K_d W_d$. It can easily be shown that coverage equals:

$$COV = \frac{K_e(1 - W_d)}{K_d W_d (1 - T)} + 1$$

Of course, given the interest coverage ratio, K_e, K_d, and T, and given that the weights W_d and W_e must add up to 1, the above equation can be solved for the debt ratio W_d consistent with that coverage:

$$W_d = \frac{K_e}{K_d(COV - 1)(1 - T) + K_e}$$

The utility now alters its capital structure from 50% debt to 60% debt, as shown in Table 19-2 below. The company's bonds are downgraded from A to BBB in response to the higher financial risk borne by investors.

TABLE 19-2
TAX-INCLUSIVE COMPOSITE COST OF CAPITAL AFTER CHANGE

Type Of Capital	Amount	Weight	Cost	Weighted Cost	Tax Factor	Weighted Return
Debt	$60	60.00%	11.00%	6.60%	1.00	6.60%
Equity	$40	40.00%	15.00%	6.00%	1.52	9.09%
	$100			12.60%		15.69%

Coverage = 2.38

What happens to total capital costs depends on the impact of higher financial leverage on debt costs and equity costs. In the example, it is arbitrarily assumed that debt costs rise from 10% to 11% in response to the higher risk represented by the higher debt ratio. Given the stock-bond risk premium of 4%, equity costs rise to 15%. Overall capital costs rise to 15.69% as a result of the change in capital structure, and the coverage ratio deteriorates from 3.12 to 2.38. The crucial variables that determine the precise impact on overall capital costs are the revised debt and equity costs in response to the higher financial risks of the company. In the example, the utility is downgraded from A to BBB because of its higher debt ratio, and it is arbitrarily assumed in the example that the yield spread between A-rated and BBB-rated securities is 1%.

The example shows that the crucial determinants of eventual capital costs include the debt ratio (or coverage) benchmarks assigned by credit rating agencies for various bond rating classes, the yield spreads between bond rating categories, and the reaction of equity costs to increased leverage. The simulation model presented in the next section is predicated on these fundamental determinants, and proceeds directly from the example discussed here with a few more embellishments and refinements included. For example, Southeastern utilizes preferred stock financing and has approximately 90% of its assets as earning assets. Preferred stock financing and non-earning CWIP assets are therefore introduced in the model.

19.3 Capital Structure Simulation Model

Table 19-3 below presents the capital costs calculations and assumptions for an AAA-rated electric utility, the highest bond rating accorded by the bond rating agency Standard & Poor's (S&P). The input data should be representative of current capital market conditions.

TABLE 19-3
"AAA" UTILITY

Assumptions: AAA Bond Rating

Coverage	= 5.00
Cost of debt	= 9.50%
Cost of preferred	= 8.75%
Cost of equity	= 13.50%
Tax rate	= 38.00%
Equity tax factor	= 1.61

Component		Weighted Cost	Cost	Tax Factor	Overall Return
Debt	32.29%	9.50%	3.07%	1.00	3.07%
Preferred	10.00%	8.75%	0.88%	1.61	1.41%
Equity	57.71%	13.50%	7.79%	1.61	12.56%
Total	100.00%		11.73%		17.04%

Coverage = 5.00

The key initial input is the coverage requirement for a AAA electric utility. Given that the S&P coverage AAA guideline for electric utilities as of early 1993 is "greater than 4.5" and that the AA guideline is "3.5 - 5.0," a coverage requirement of 5.00 is assumed.

The second step is to translate the coverage requirement into a debt/equity ratio that will produce that coverage. For a coverage requirement of 5.00, a debt ratio of 32.29% is implied. The third step is to verify that the implied debt ratio is consistent with the S&P guidelines. It is imperative that both the coverage and debt ratio benchmarks be internally consistent. The implied ratio of 32.29% is consistent with the S&P guidelines. A preferred stock ratio of 10% is assumed throughout the analysis. The results of the study are not sensitive to this assumption. Given the debt ratio of 32.29% and the preferred ratio of 10%, the common equity ratio must be 57.71%, that is 100% - 42.29%.

The cost of debt for a AAA electric is assumed to be 9.5%. The cost of preferred stock is assumed to be 75 basis points less than the cost of debt throughout the analysis. This is based on an examination of the yield spread history between preferred stock and long-term bonds of electric utilities for the last twelve years. A risk premium of 4% is assumed to prevail between utility AAA bonds and common stocks. The behavior of equity costs in response to increasing leverage is discussed more fully later. A combined federal and state tax rate of 38% is assumed throughout, which in turn produces a tax conversion factor of 1/(1-.38) = 1.61. With those plausible assumptions, the composite capital cost for a AAA electric is 17.04%, including taxes. As a check on the calculations, the coverage ratio is determined under these capital structure conditions and is indeed equal to 5.00, confirming the accuracy of the computation.

Table 19-4 presents the corresponding calculations for a AA utility instead of a AAA utility. The midpoint of the S&P coverage benchmark for a AA utility is 4.25, which translates into a debt ratio of 37% using the coverage-debt ratio relationship discussed earlier. The implied debt ratio lies outside the benchmark range, however. Lowering the coverage assumption to 3.75 produces a debt ratio of about 40%, which is now inside the target debt ratio range. The cost of debt has risen from 9.50% to 9.79% as a result of the higher risk. The increase in 29 basis points is based on a historical analysis of spreads between AAA- and AA-rated utility bond indices over the prior twelve years. Preferred costs are assumed to rise in corresponding fashion from 8.75% to 9.04% and common equity costs also rise from 13.5% to 13.79%. The composite capital cost for the AA utility decreases from 17.04% to 16.46%.

TABLE 19-4
"AA" UTILITY

Assumptions: AA Bond Rating

Coverage	= 3.75
Cost of debt	= 9.79%
Cost of preferred	= 9.04%
Cost of equity	= 13.79%
Tax rate	= 38.00%
Equity tax factor	= 1.61

Component		Weighted Cost	Cost	Tax Factor	Overall Return
Debt	40.33%	9.79%	3.95%	1.00	3.95%
Preferred	10.00%	9.04%	0.90%	1.61	1.46%
Equity	49.67%	13.79%	6.85%	1.61	11.05%
Total	100.00%		11.70%		16.46%

Coverage = 3.75

The same procedure is replicated for an A and BBB utility, using the appropriate coverage benchmarks and the historical yield spread average between A and BBB bonds over the past twelve years. For A-rated electric utilities, the midpoint of the coverage ratio range, 3.25, is used. This produces a debt ratio internally consistent with the benchmark range. For BBB-rated electrics, a coverage ratio of 2.8 is used, so as to produce a debt ratio consistent with the low end of the target range.

Tables 19-5 and 19-6 below show the results for A- and BBB-rated utilities, respectively. The composite capital cost decreases slightly to 16.40% for the A-rated utility and begins to increase below that rating, rising to 16.43% for a BBB utility.

TABLE 19-5
"A" UTILITY

Assumptions: AA Bond Rating

Coverage	= 3.25
Cost of debt	= 10.07%
Cost of preferred	= 9.32%
Cost of equity	= 14.32%
Tax rate	= 38.00%
Equity tax factor	= 1.61

Component		Weighted Cost	Cost	Tax Factor	Overall Return
Debt	45.13%	10.07%	4.54%	1.00	4.54%
Preferred	10.00%	9.32%	0.93%	1.61	1.50%
Equity	44.87%	14.32%	6.43%	1.61	10.36%
Total	100.00%		11.90%		16.40%

Coverage = 3.25

TABLE 19-6
"BBB" UTILITY

Assumptions: BBB Bond Rating

Coverage	= 2.80
Cost of debt	= 10.49%
Cost of preferred	= 9.74%
Cost of equity	= 14.99%
Tax rate	= 38.00%
Equity tax factor	= 1.61

Component		Weighted Cost	Cost	Tax Factor	Overall Return
Debt	50.37%	10.49%	5.28%	1.00	5.28%
Preferred	10.00%	9.74%	0.97%	1.61	1.57%
Equity	39.63%	14.99%	5.94%	1.61	9.58%
Total	100.00%		12.19%		16.43%

Coverage = 2.80

Assumptions and Results

The full set of assumptions along with a summary of the results are recapitulated in the tables below, taken directly from the electronic spreadsheet used to simulate capital structure conditions. Tables 19-7 and 19-8 present the detailed simulation results under normal and adverse economic conditions, respectively. As discussed later, the pattern of results is relatively insensitive to the majority of the quantitative assumptions over a wide range of reasonableness for those values.

TABLE 19-7
OPTIMAL CAPITAL STRUCTURE ANALYSIS, ASSUMPTIONS AND SUMMARY OF RESULTS: NORMAL ECONOMIC ENVIRONMENT

Assumptions:		Note
AAA Debt Cost	9.50%	assumed
AAA Equity Cost	13.50%	debt cost + risk premium
Debt-stock Risk Premium AAA	4.00%	assumed
Debt-stock Risk Premium AA	4.00%	"
Debt-stock Risk Premium A	4.25%	"
Debt-stock Risk Premium BBB	4.50%	"
Debt-preferred Risk Premium	0.75%	"
AAA Preferred Cost	8.75%	debt cost + risk premium
% Preferred Stock	10.00%	assumed
Tax Rate	38.00%	federal & state tax
Coverages		
AAA Coverage	5.00	S & P benchmarks
AA Coverage	3.75	"
A Coverage	3.25	"
BBB Coverage	2.80	"
Yield Spreads		
AAA-AA Spread	0.29%	1979-1990 yield spreads
AA-A Spread	0.28%	"
A-BBB Spread	0.42%	"
% Earning Assets In Rate Base	90.00%	assumed

SUMMARY OF RESULTS: NORMAL ECONOMIC ENVIRONMENT

Bond Rating	%Debt	%WACC	Rev Reqt's	Incremental Rev Reqt's
AAA	32.29%	17.04%	$170.44	$0.00
AA	40.33%	16.46%	$164.53	($5.91)
A	45.13%	16.40%	$164.11	($0.42)
BBB	50.37%	16.43%	$164.37	$0.26

TABLE 19-8
OPTIMAL CAPITAL STRUCTURE ANALYSIS, ASSUMPTIONS AND SUMMARY OF RESULTS: ADVERSE ECONOMIC ENVIRONMENT

Assumptions:		Note
AAA Debt Cost	9.50%	assumed
AAA Equity Cost	13.50%	debt cost + risk premium
Debt-Stock Risk Premium AAA	4.00%	assumed
Debt-Stock Risk Premium AA	4.00%	"
Debt-Stock Risk Premium A	4.25%	"
Debt-Stock Risk Premium BBB	4.50%	"
Debt-Preferred Risk Premium	0.75%	"
AAA Preferred Cost	8.75%	debt cost + premium
% Preferred Stock	10.00%	assumed
Tax Rate	38.00%	federal & state tax
Coverages		
AAA Coverage	5.00	S & P benchmarks
AA Coverage	3.75	"
A Coverage	3.25	"
BBB Coverage	2.80	"
Yield Spreads		
AAA-AA Spread	0.62%	1979-1990 yield spreads
AA-A Spread	0.86%	"
A-BBB Spread	0.65%	"
% Earning Assets In Rate Base	90.00%	assumed

SUMMARY OF RESULTS: ADVERSE ECONOMIC ENVIRONMENT

Bond Rating	%Debt	%WACC	Rev Reqt's	Incremental Rev Reqt's
AAA	32.29%	17.04%	$170.44	$0.00
AA	40.15%	16.93%	$169.28	($1.16)
A	44.63%	17.70%	$176.95	$7.67
BBB	49.77%	18.01%	$180.09	$3.14

The summary of the key results of the model contained in Table 19-7 shows the debt ratios, capital costs, and revenue requirements associated with the various bond ratings under normal capital market conditions. The revenue requirements are computed simply by multiplying the capital costs by an hypothetical rate base of $1,000. The last column shows the incremental revenue requirements impact. Those results indicate a marginal cost advantage for the A bond rating. The striking feature of the results is that capital structure changes have a modest effect on capital costs, at least under normal economic conditions. Capital structure changes do affect debt and equity costs, but changes in those variables are offset by changes in the proportions of each capital structure component. A similar result was obtained by Brigham, Gapenski, and Aberwald (1987) and Baptiste, Borges, and Carr (1988) in their studies of optimal utility capital structures.

Table 19-8 is the analog of Table 19-7 but under adverse economic conditions. The yield spreads prevailing in the turbulent 1981-1982 capital market environment were assumed to represent the spreads under adverse capital market conditions. The cost-minimizing optimal bond rating is now a clear AA, given the coverage assumptions. Capital costs at the AA rating level are 16.93% versus above 17% for any other bond rating. The fundamental difference between the two sets of results lies in the spread differences between a normal and an adverse capital market environment. Spreads typically widen under adverse capital market conditions, as investor quality consciousness and flight to quality increases. Table 19-9 shows that the yield advantage of a higher bond rating increases dramatically in poor years of difficult financial markets. The cumulative yield advantage of a AA rating over a BBB rating is 70 basis points under normal conditions versus 151 basis points under adverse capital market conditions.

TABLE 19-9
YIELD SPREADS: NORMAL v. POOR YEARS

SPREAD (basis points)

	Normal Years	Poor Years
AAA v. AA	29	62
AA v. A	28	86
A v. BBB	42	65

In assessing the wisdom of striving for a different bond rating, the adversity scenario results are far more meaningful and relevant. After all, the fundamental ideas of adequate debt capacity and prudent capital structure policy only make sense in the context of adverse economic circumstances. By analogy, when assessing the creditworthiness of a potential client applying for a loan, a prudent banker or creditor tries to determine the likelihood of interest and principal repayment should the client's operations encounter difficulty. If the lender concludes that the applicant's earnings are insufficient to cover its financial obligations under adversity conditions, the lender will not extend credit. Similarly, a firm elects not to increase its debt ratio for fear that its cash flows may be insufficient when it encounters major adversities in its operating environment.

Robustness of Results

Several sensitivity analyses of the model results were conducted with respect to some key assumptions. The fundamental nature of the results and the ultimate conclusion that the optimal bond rating is at least a strong A remain unaltered. One assumption made throughout the analysis is that earning assets constitute 90% of the rate base capital. The chief results of this study are not sensitive to the magnitude of this assumption. The preferred stock ratio was varied from 5% to 10%, and the preferred-bond yield spread was varied from 0 to 125 basis points with no significant differences in the results. The tax rate was varied from 20% to 40%, again with no substantial alteration in the pattern of the results; of course, the magnitude of the revenue requirements changes with the tax rate, but the fundamental U-shaped pattern (cost minimum at AA rating) of the results was preserved, especially when running the more relevant adversity scenario.

As shown in the upper portion of Tables 19-7 and 19-8, the stock-bond risk premium was initially assumed to be 4% for a AAA- and AA-rated utility, and to increase to 4.25% and 4.50% for A- and BBB-rated utilities, respectively. This was based on a rigorous analysis of how equity costs vary with leverage. Several formal theoretical models of how the cost of equity varies with leverage are available from the finance literature. The behavior of equity costs as leverage increases was alternatively modeled using Modigliani-Miller's approach, which recognizes corporate income taxes, as discussed in Chapter 17 using Equation 17-7, Miller's extension of that equation to allow for personal taxes, as illustrated in Equation 17-10, variations of the so-called Capital Asset Pricing Model, and empirical functional forms of the cost of equity-leverage relationship. The average estimate from the various cost of equity capital frameworks at varying amounts of leverage implied debt-stock risk premiums progressively increasing from 4% to 4.5% as bond quality deteriorates. The ultimate conclusion of the optimal A to AA bond rating remained robust when the model was amended to reflect more rigorous treatments of equity costs.

One particularly sensitive assumption was the coverage ratio assumption for BBB-rated utilities. The benchmark S&P range is 1.5 to 3.0. Below 2.3, the implied debt ratio lies outside the benchmark range of acceptability. In the narrow range of 2.3 to 2.5, the optimal bond rating under adverse conditions was in fact BBB, but this latter result did not take into explicit account all the intangible costs associated with a low bond rating that are not incorporated into the model. Any reasonable quantification of such costs reverses this result.

19.4 Conclusions

The model results show that on an incremental cost basis, a strong A bond rating generally results in the lowest pre-tax cost of capital for electric utilities under normal economic conditions. Under adverse economic conditions, which are far more relevant to the question of capital structure, the optimal bond rating is AA. This result prevails over a wide range of cost of common equity models and estimates utilized, and remains very robust to changes in key assumptions. The message from the model is clear: over the long run, a strong A to AA bond rating will minimize the pre-tax cost of capital to ratepayers, even on the basis of the embedded cost of debt. This is crucial for ratemaking purposes, where the embedded cost of debt is employed. Over the years, as the company replaces its funded debt issues through either retirement or call tenders, the pre-tax cost of incremental debt and overall capital is minimized at the A to AA level, depending on capital market conditions.

The implication is clear. Long-term achievement of at least an A rating and preferably a AA rating is in the electric utility company's and ratepayers' best interests. Debt leverage targets should be set in the lower part of the range required to attain this optimal rating. Progressive attainment of this goal will minimize rates, all else remaining constant.[3] If the company maintains its debt ratio close to the bottom end of the optimal range, its overall cost of capital should be minimized. If the company reduces its debt ratio below that point, it would be giving up the tax benefits associated with debt but would not reap the benefits from a lower cost of debt and equity. If the company operates at a debt ratio beyond that point, the cost of debt and equity will rise. The latter rise will occur at an increasing rate if the operating environment deteriorates. Moreover, the company will reduce its financing flexibility.

The case example developed in this chapter is to be regarded as illustrative only, and not as a precise formula for finding the optimal capital structure. While capital structure theory provides insights into the determinants of an optimal capital structure, it cannot state exactly the composition of a company's capital structure. Even though theory provides valuable insights

[3] In the utility regulation context, the New York Public Service Commission agreed that in the case of electric and gas utilities, based on data from 1981 and earlier, an "A" rating was optimal from the standpoint of both overall capital cost and availability. There have been significant changes since that 1982 decision, notably the tightening of electric utility bond rating criteria by Standard & Poor's in response to the increased business risks of electric utilities, tax reform, and a transformed capital market environment.

for management to make more informed decisions, capital structure decisions must be made on the basis of informed judgment rather than by the mechanical application of mathematical models.

There are several industry-specific and company-specific circumstances that the simulation model cannot readily quantify, including intangible costs, impact on bondholders, capital market losses, flotation costs, and impact on company flexibility. The simulation model was specifically applied to an electric utility company under circumstances prevailing at the time, and does not automatically extend to other industries, other companies, or other capital market conditions.

It is also important to point out that the case for a strong A to AA bond rating is understated by the model results to the extent that several intangible costs and distress costs associated with a higher debt ratio cannot be readily accommodated into the model, without the model becoming computationally prohibitive. The simulation model does not capture several intangible cost items associated with a low bond rating. Several examples of such costs follow.

The need to maintain borrowing capacity was developed in Chapter 17. During normal times a utility company should conserve enough unused borrowing capacity so that during periods of adversity it can use this capacity to avoid foregoing investment opportunities, selling stock at confiscatory prices, or jeopardizing its mandated obligation to serve.

Earlier, it was shown that the yield advantage of a higher bond rating increases dramatically in adverse capital market conditions. But bond flotation costs, which must be borne by ratepayers, increase also as bond ratings decline, particularly in years of difficult financial markets. Not only is lower bond quality associated with higher yields, but lower-rated utility bonds also carry shorter maturities, especially in poor years. The result is a maturity mismatch between the firm's long-term capital assets and its liabilities. Moreover, lower bond quality is associated with more years of call protection, particularly during difficult financial markets; since bonds are frequently called after a decrease in interest rates, bonds that carry call protection for a greater number of years are more costly to utility companies. Finally, as bond ratings decline, the probability that a company will reduce the dollar amount or shorten the maturity of their bond issues increases dramatically. This in turn reduces the marketability of a bond issue, and hence increases its yield. Any reasonable quantification of these implicit costs reinforces the case for a strong A to AA bond rating.

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