BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE PETITION BY NEW MEXICO-AMERICAN WATER COMPANY, INC. FOR ADJUSTMENT OF WATER RATES FOR ITS CLOVIS DISTRICTS,

Case No. 08-00134-UT

NEW MEXICO-AMERICAN WATER COMPANY, INC., Petitioner.

DIRECT TESTIMONY
OF
BENTE VILLADSEN
ON BEHALF OF
NEW MEXICO-AMERICAN WATER COMPANY

June 2008

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EXECUTIVE SUMMARY

Dr. Bente Villadsen, a Principal at *The Brattle Group*, files testimony on the cost of capital for New Mexico-American Water Company's water districts in New Mexico ("New Mexico-American Water").

Dr. Villadsen selects two benchmark samples, water utilities and gas local distribution companies ("LDC"). She estimates the sample companies' cost of equity, associated after-tax weighted-average cost of capital, and the corresponding cost of equity at 45 percent equity. In undertaking her analysis, Dr. Villadsen notes that the overall cost of capital is constant within a broad middle range of capital structures although the distribution of costs and risks among debt and equity holders is not. Because New Mexico-American Water's requested target of 45 percent equity is lower than the percentage equity among many utilities, its financial risk is higher and the return required by investors increases with the level of risk they carry.

Based on the evidence from the samples, Dr. Villadsen estimates a cost of equity for the benchmark samples at New Mexico-American Water's capital structure to be in the range of 11¼ to 12¼ percent, so that New Mexico-American Water's request for 11.75 percent return on equity is equal to the midpoint. She therefore finds that New Mexico-American Water's request for 11.75 percent return on equity is reasonable and fully supported by her analysis.

I. INTRODUCTION AND SUMMARY

Q1. PLEASE STATE YOUR NAME AND ADDRESS FOR THE RECORD.

A1. My name is Bente Villadsen. My business address is *The Brattle Group*, 44 Brattle Street, Cambridge, MA 02138.

Q2. PLEASE DESCRIBE YOUR JOB AND EDUCATIONAL EXPERIENCE.

A2. I am a Principal of *The Brattle Group*, ("Brattle"), an economic, environmental and management consulting firm with offices in Cambridge, Washington, San Francisco, London and Brussels. My work concentrates on regulatory finance and accounting. I have previously prepared and presented cost-of-capital testimony before regulatory entities. I hold a B.S. and M.S. from University of Aarhus, Denmark and a Ph.D. from Yale University's School of Management.

Q3. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A3. I have been asked by New Mexico-American Water Company ("New Mexico-American Water" or the "Company") to estimate the cost of equity for New Mexico-American Water's water districts. The cost of equity is the return that the Commission should provide the Company an opportunity to earn on the portion of its rate base financed by equity.

To determine the cost of equity for New Mexico-American Water, I first estimate the overall cost of capital for two samples of regulated companies using several versions of the discounted cash flow ("DCF") and risk-positioning models. Second, I determine the cost of equity that the estimated overall cost of capital gives rise to at New Mexico-American Water's requested capital structure consisting of 45.1 percent equity. Third, I evaluate the relative risk of New Mexico-American Water and the sample companies to determine the recommended cost of equity for New Mexico-American Water.

Q4. PLEASE SUMMARIZE ANY PARTS OF YOUR BACKGROUND AND EXPERIENCE THAT ARE PARTICULARLY RELEVANT TO YOUR TESTIMONY ON THESE MATTERS.

A4. Brattle's specialties include financial economics, regulatory economics, and the utility industry. I have worked extensively on cost of capital matters for electric, natural gas distribution, pipeline and water utilities in state, federal, and foreign jurisdictions. Additionally, I have significant experience in other areas of rate regulation, credit risk in the utilities industry, energy contracts, and accounting issues. I have filed expert testimony and appeared before arbitration tribunals concerning cost of capital, accounting questions, and damage issues**.** Appendix A contains more information on my professional qualifications.

Q5. PLEASE SUMMARIZE YOUR APPROACH TO ESTIMATING THE COST OF CAPITAL FOR NEW MEXICO-AMERICAN WATER.

A5. To assess the cost of capital for New Mexico-American Water, I select two benchmark samples, regulated water utilities and natural gas local distribution companies ("LDC"). These samples are selected to have risks characteristics comparable to those of New Mexico-American Water. I also report results for a subsample of the water companies with a high percentage of regulated revenues. I give greater weight to the results from the gas LDC sample, because the water sample suffers from numerous data issues that make the cost-of-equity estimates based on this sample less reliable at the present time. For each sample, I estimate the sample companies' cost of equity using several versions of the DCF method and of the risk-positioning model. Based on data availability and the current state of the water and gas distribution industries I assign the most weight to the risk-positioning models.

Next, based on the cost-of-equity estimates for each company and its market costs of debt and preferred stock, I calculate each firm's overall cost of capital, i.e., its after-tax weighted-average cost of capital ("ATWACC"), using the company's market value capital structure. I then calculate the samples' average ATWACC and the cost of equity for a capital structure with 45.1 percent equity. Thus, I present the cost of equity that is consistent with the samples' market information and New Mexico-American Water's

regulatory capital structure. (By "regulatory capital structure," I mean the capital structure that New Mexico-American Water proposes in its application.)

Focusing on the overall cost of capital rather than its components avoids potential problems of inconsistency between the estimated cost of equity and the level of financial risk at the regulated company's capital structure.

Q6. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING NEW MEXICO-AMERICAN WATER'S COST OF EQUITY.

A6. The cost of equity for the water utility sample is about 14 percent for a range of 13.50 to 14.50 percent at 45.1 percent equity using the long-term risk-positioning method. The corresponding overall after-tax weighted-average cost-of-capital point estimate is 8.5 percent. The gas LDC sample yields a cost-of-equity estimate of about 12 percent for a range of 11.50 to 12.5 percent; again using the long-term risk-positioning method. The corresponding after-tax weighted-average cost-of-capital range is 7.25 to 7.75 percent. I specify a minimum of plus or minus .25 percent (25 basis point) range around the after-tax weighted-average cost of capital because it is not really possible to estimate the cost of capital more precisely than that. The cost-of-equity estimates that result from the multi-stage discounted cash flow method are a bit lower for the water sample than for the gas LDC sample. The estimates based on the simple DCF are similar for the gas LDC sample, but very different and considerably higher for the water sample. Combined, the DCF results imply a range of 11.25 to 11.50 percent for the gas LDC sample and a wide range of 10.75 to 15.75 percent for the water sample.

Based on these results, and considering that I rely mostly on the gas LDC sample estimates due to numerous data problems associated with the water sample, the estimates for New Mexico-American Water's cost of equity indicate a range of 11.25 to 12.25 percent. New Mexico-American Water's request for an 11.75 percent return on equity is within this range and at the midpoint. In my opinion, the request for an 11.75 percent return on equity is near the middle of the range for the gas LDC sample and very reasonable.

Q7. WHY DO YOU NEED TO CONSIDER NEW MEXICO-AMERICAN WATER'S REGULATORY CAPITAL STRUCTURE?

A7. A firm's cost of equity is a function of both its business risk and its financial risk. The more leveraged a company is the higher its financial risk. Investors holding equity in companies with higher risk require a higher rate of return, so as a company adds debt, the cost of equity goes up at an ever increasing rate. The higher cost of equity offsets the lower cost of debt, so that the after-tax weighted-average overall cost of capital remains constant over a broad range of capital structures.

That is, the associated capital structure affects an estimated cost-of-equity estimate just as a life insurance applicant's age affects the required life-insurance premium. It is therefore necessary to calculate the cost of equity the sample companies would have had at New Mexico-American Water's regulatory capital structure to report accurately the market evidence on the cost of equity.

Q8. HOW IS THE REST OF YOUR TESTIMONY ORGANIZED?

A8. The rest of my testimony is organized as follows:

Section II defines the cost of capital and discusses the principles that relate a company's cost of capital and its capital structure.

Section III presents the methods used to estimate the cost of capital for the benchmark samples, and the associated numerical analyses. This section also explains the basis of my conclusions for the benchmark samples' returns on equity and overall costs of capital.

Section IV summarizes the analysis and discusses the recommendation for New Mexico-American Water.

Appendix A lists my qualifications.

Appendix B discusses in detail the selection procedure for each sample, and the methods used to derive the necessary capital structure market value information.

Appendix C details the risk-positioning method including the numerical analyses.

Appendix D details the DCF method, including the numerical analyses.

Appendix E discusses the impact of leverage on the cost of capital in more detail.

I repeat portions of my testimony in the appendices in order to give the reader the context of the issues before I present additional technical detail and further discussion.

II. THE COST OF CAPITAL AND RISK

A. The Cost of Capital and Risk

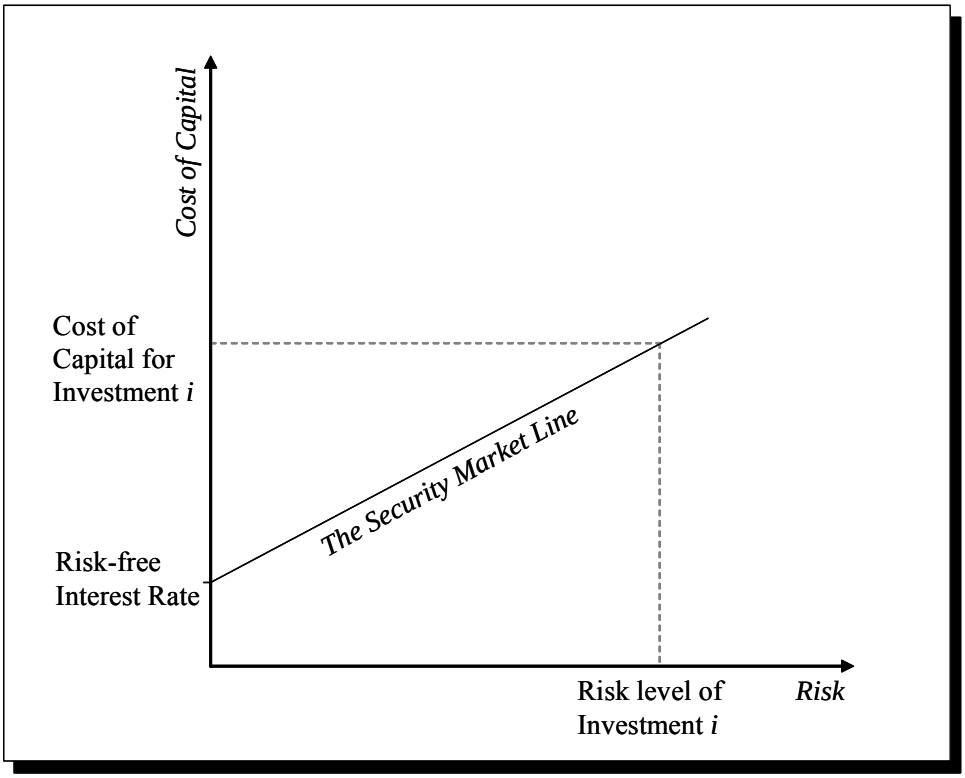
Q9. PLEASE FORMALLY DEFINE THE "COST OF CAPITAL."

A9. The cost of capital is the expected rate of return in capital markets on alternative investments of equivalent risk. In other words, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk.[1]

The definition of the cost of capital recognizes a tradeoff between risk and return that is known as the "security market risk-return line," or "security market line" for short. This line is depicted in Figure 1. Figure 1 shows that the higher the risk, the higher the cost of capital. A version of Figure 1 applies for all investments. However, for different types of securities, the location of the line may depend on corporate and personal tax rates.

[1] "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected" in this testimony, as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

Figure 1: The Security Market Line



Q10. WHY IS THE COST OF CAPITAL RELEVANT IN RATE REGULATION?

A10. U.S. rate regulation accepts the "cost of capital" as the right expected rate of return on utility investment.[2] This practice is normally viewed as consistent with the U.S. Supreme Court's opinions in *Bluefield Waterworks & Improvement Co. v. Public Service Commission*, 262 U.S. 678 (1923), and *Federal Power Commission v. Hope Natural Gas*, 320 U.S. 591 (1944).

From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the lowest levels that compensate investors for the risks they bear. Over the long run, an expected return above the cost of capital makes customers overpay for service. Regulatory authorities normally try to prevent such outcomes, unless there are offsetting benefits (e.g., from incentive regulation that reduces future costs). At the same time, an expected return below the cost of capital does a disservice not just to

[2] An early paper that links the cost of capital as defined by financial economics with the correct expected rate of return for utilities is Stewart C. Myers, "Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics and Management Science*, 3:58-97 (Spring 1972).

investors but, importantly, to customers as well. In the long run, such a return denies the company the ability to attract capital, to maintain its financial integrity, and to expect a return commensurate with that of other enterprises characterized by commensurate risks and uncertainties.

More important for customers, however, are the economic issues an inadequate return raises for them. In the short run, deviations of the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game"-- investors gain if customers are overcharged, and customers gain if investors are shortchanged. But in fact, even in the short run, such action may adversely affect the utility's ability to provide stable and favorable rates because some potential efficiency investments may be delayed or because the company is forced to file more frequent rate cases. In the long run, inadequate returns are likely to cost customers – and society generally – far more than may be gained in the short run. Inadequate returns lead to inadequate investment, whether for maintenance or for new plant and equipment. The costs of an undercapitalized industry can be far greater than the short-run gains from shortfalls in the cost of capital. Moreover, in capital-intensive industries (such as the water industry),[3] systems that take a long time to decay cannot be fixed overnight. Thus, it is in the customers' interest not only to make sure that the return investors expect does not exceed the cost of capital, but also to make sure that it does not fall short of the cost of capital, either.

Of course, the cost of capital cannot be estimated with perfect certainty, and other aspects of the way the revenue requirement is set may mean investors expect to earn more or less than the cost of capital even if the allowed rate of return equals the cost of capital exactly. However, a commission that sets rates so investors expect to earn the cost of capital on average treats both customers and investors fairly, which is in the long-run interests of both groups.

[3] Capital expenditures among water utilities have in the last several years exceeded 30% of revenues.

B. The Relationship Between Capital Structure and the Cost of equity

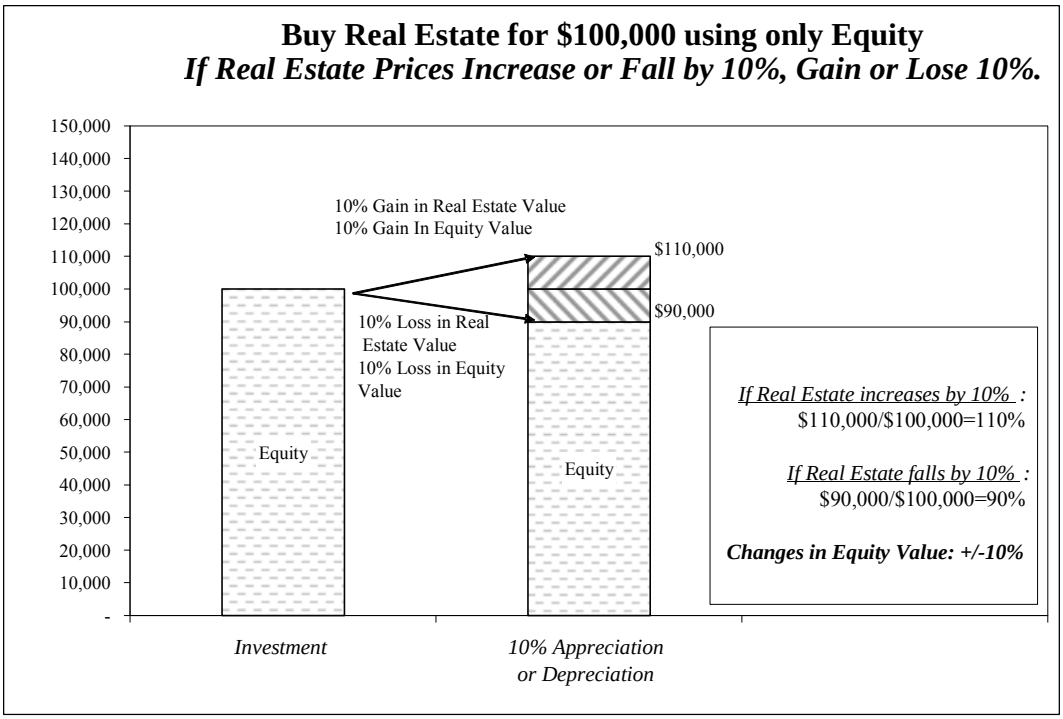
Q11. PLEASE EXPLAIN WHY IT IS NECESSARY TO REPORT THE COST OF EQUITY ADJUSTED FOR CAPITAL STRUCTURE.

A11. In most jurisdictions in North America, rate regulation focuses on the components of the rates. In other words, the focus of cost-of-capital estimation is usually on determining the "right" cost of equity, and to a lesser degree on setting the allowed capital structure. While the overall cost of capital depends primarily on the company's line of business, the distribution of the cost of capital among debt and equity depends on their share in total revenues. Debt holders' claim is usually a fixed amount (except in situations of default) while equity holders are residual claimants, meaning that equity holders get paid last. In other words, the use of debt imposes financial risk on the equity holders. Because a company's financial risk depends on its capital structure, the risk shareholders carry increases with the leverage of the company. As shareholders expect to be compensated for increased risk, the required rate of return increases with the company's leverage. The increased risk is caused by the fact that debt has a senior claim on a specified portion of earnings and in bankruptcy on assets. As common equity is the most junior security, it gets what's left after everyone else has been paid. In other words, common equity holders carry all residual risk. However, as explained in more detail in Appendix E, the overall cost of capital is constant within a broad middle range of capital structures, although the distribution of costs and risks among debt and equity holders is not.

Q12. PLEASE PROVIDE AN EXAMPLE ON HOW DEBT ADDS RISK TO EQUITY.

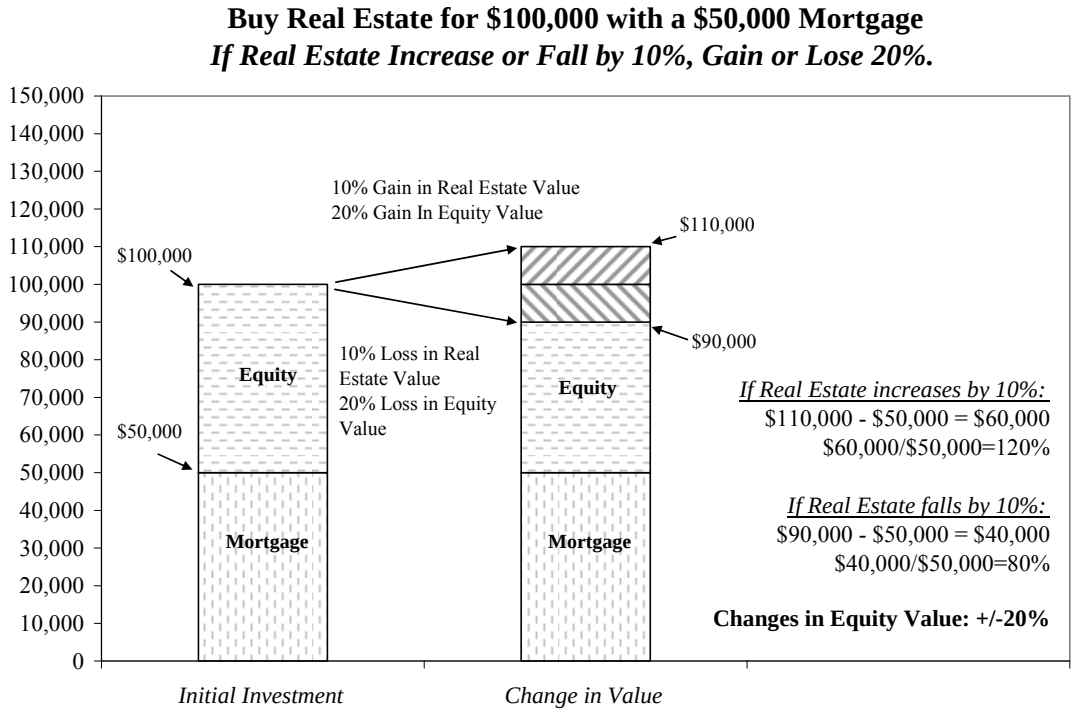
A12. As a simple example, think of an investor who takes money out of his savings account and invests $100,000 in real estate. The future value of the real estate is uncertain. If the real estate market booms, he wins. If the real estate market goes down, he loses. Figure 2 below illustrates this.

Figure 2. Financial risk example – equity financing



In the scenario above, the investor financed his real estate purchase through 100 percent equity. Suppose instead that the investor had financed 50 percent of his real estate investment with a mortgage of $50,000. The mortgage lender does not expect to share in any benefits from increases in real estate values. Neither does the mortgage lender expect to share in any losses from falling real estate values. As a result, the investor carries the entire risk of fluctuating real estate prices. Figure 3 illustrates this effect.

Figure 3. Financial risk example - debt and equity financing



In Figure 3, where the investor financed his purchase through 50 percent equity and 50 percent debt, the variability in the investor's equity return is two times greater than that of Figure 2. The entire fluctuation of 10 percent from rising or falling real estate prices falls on the investor's $50,000 equity investment. The lesson from the example is obvious: debt adds risk to equity.

C. Implications for Analysis

Q13. PLEASE EXPLAIN THE IMPLICATIONS OF THE RELATIONSHIP BETWEEN CAPITAL STRUCTURE AND THE COST OF EQUITY FOR RATE REGULATION.

A13. The risk equity holders carry, and therefore the cost of equity, depends on the capital structure. As illustrated in the example above, as leverage increases, the market risk increases and hence the required return on equity increases.

Q14. TO ASSESS THE MAGNITUDE OF FINANCIAL RISK FOR A RATE REGULATED COMPANY, SHOULD YOU USE THE MARKET-VALUE OR THE BOOK-VALUE CAPITAL STRUCTURE?

A14. The market-value capital structure is the relevant quantity for analyzing the cost-of-equity evidence, which is based on market information.[4]

Q15. PLEASE PROVIDE AN EXAMPLE THAT ILLUSTRATES WHY MARKET VALUES ARE RELEVANT.

A15. Suppose in the previous example that the investor has invested in real estate 10 years ago. Further assume that depreciation has reduced the book value of the real estate from $100,000 to $75,000 and assume the investor has paid off 40 percent of his $50,000 mortgage. Thus, the investor has a remaining mortgage of $30,000 (= 60% × $50,000). The book value of the investor's equity is therefore $45,000 (= $75,000 - $30,000).

What happens now if real estate prices rise or fall 20 percent? To answer that question, we need to know how real estate prices have developed over the past 10 years. If the market value of the real estate now is $200,000, then a 20-percent decrease in the price of real estate ($40,000) is almost equal to the investor's book value equity. However, his market value equity (or net worth) is equal to the value of the real estate minus what he owes on the mortgage. If we assume that the market value of the mortgage equals the unpaid balance ($30,000), then the investor's net worth is calculated as follows:

[4] The need to use market-value capital structures to analyze the effect of debt on the cost of equity has been recognized in the financial literature for a long time. For example, the initial reconciliation of the Modigliani-Miller theories of capital structure with the Capital Asset Pricing Model, in Robert S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporate Finance," *The Journal of Finance* 24: 13-31 (March 1969) works with market-value capital structures. For a more recent presentation of the concept, see, for example, Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, New York: McGraw-Hill/Irwin 8th ed. (2006) pp. 503-06. Book values may be relevant for some issues, e.g., for covenants on individual bond issues, but as explained in the text, market values are the determinants of the impact of debt on the cost of equity.

Net Worth	=	Market Value of Real Estate	-	Remaining Mortgage
	=	$200,000	-	$30,000
	=	$170,000		

Therefore, the rate of return on equity due to a 20 percent decline in real estate prices is calculated as follows:

Table 1. Calculating the Rate of Return on Equity

Decline in Real Estate Value	$40,000
Market-Value Equity	$170,000
Rate of Return on Equity	- $40,000/$170,000 = -23.5%

Q16. PLEASE EXPLAIN THE IMPLICATIONS FOR RATE REGULATION AND YOUR TESTIMONY.

A16. Because the market risk, and therefore the cost of equity, depends on the market-value capital structures, one must base the estimation of the sample companies' cost of capital on market value capital structures. An approach that estimates the cost of equity for each of the sample firms without explicit consideration of the market value capital structure (i.e. the financial risk) underlying those costs risks material errors. The cost-of-equity estimates of the sample companies at their actual market-value capital structures are not necessarily reflected in the regulatory capital structure. Therefore, using book values could lead to an incorrect rate of return. I avoid this problem by calculating each sample company's ATWACC using its market value capital structure. I then use the sample companies' average overall cost of capital to determine the corresponding return on equity at New Mexico-American Water's regulatory capital structure. This procedure ensures that the capital structure and the estimated cost of equity are consistent.

In my analyses, I estimate the cost of equity for each of the sample firms using traditional estimation methods (such as the DCF and Capital Asset Pricing Model ("CAPM")). I use each company's estimated cost of equity along with New Mexico-American Water's

marginal tax rate and each company's market cost of debt and market-value capital structure to estimate the sample companies' overall cost of capital. I then calculate the sample average overall cost of capital for each equity estimation method for both of the samples. For each estimation method discussed above, I determine the cost of equity at New Mexico-American Water's regulated capital structure, so that is consistent with the sample's overall cost-of-capital information.

Q17. IS THE USE OF MARKET VALUES TO CALCULATE THE IMPACT OF CAPITAL STRUCTURE ON THE RISK OF EQUITY INCOMPATIBLE WITH USE OF A BOOK-VALUE RATE BASE FOR A REGULATED COMPANY?

A17. No. Investors buy stock at market prices and expect a reasonable return on their investment. Market-based cost-of-equity estimation methods, such as DCF or CAPM which are frequently used in rate regulation, recognize this and rely on market data. That is, the cost of capital is the fair rate of return on regulatory assets for both investors and customers. Most regulatory jurisdictions in the U.S. measure the rate base using the net book value of assets, not current replacement value or historical cost trended for inflation. But the jurisdictions still apply market-derived measures of the cost of equity to that net book value rate base.

The issue here is "what level of risk is reflected in that cost-of-equity estimate?" That risk level depends on the sample company's market-value capital structure, not its book-value capital structure. *That risk level would be different if the sample company's market-value capital structure exactly equaled its book-value capital structure, so the estimated cost of equity would be different, too.*

Q18. PLEASE SUM UP THE IMPLICATIONS OF THIS SECTION.

A18. The market risk, and therefore the cost of equity depends directly on the market-value capital structure of the company or asset in question. It therefore is impossible to validly compare the measured costs of equity of different companies without taking capital structure into account. Capital structure and the cost of equity are unbreakably linked, and any effort to treat the two as separate and distinct questions violates both everyday experience (e.g., with home mortgages) and basic financial principles.

Q19. HOW SHOULD A COST-OF-CAPITAL ANALYST IMPLEMENT THIS PRINCIPLE?

A19. As discussed further in Appendix E, there has been a great deal of financial research on the effects of capital structure on the value of the firm. One of the key conclusions that result from the research is that no narrowly defined optimal capital structure exists within industries, although the typical range of capital structures does vary among industries. Instead, there is a relatively wide range of capital structures within any industry in which fine-tuning the debt ratio makes little or no difference to the value of the firm, and hence to its overall after-tax cost of capital.

Accordingly, analysts should treat the market-value weighted average of the cost of equity and the after-tax current cost of debt, or the "ATWACC" for short, as constant. Sample evidence should be analyzed to determine the sample's average ATWACC, which can be compared across different firms or industries. The economically appropriate cost of equity for a regulated firm is the quantity that, when applied to the regulatory capital structure, produces the same ATWACC. That value is the cost of equity that the sample would have had, estimation problems aside, if the sample's market-value capital structure had been equal to the regulatory capital structure in question.

Q20. HOW DO YOU CALCULATE THE COST OF EQUITY CONSISTENT WITH THE MARKET-DETERMINED ESTIMATE OF THE SAMPLE'S AVERAGE COST OF CAPITAL?

A20. For simplicity assume that all sample companies have only common stock and debt. Then the ATWACC is calculated as:

$$ATWACC = r_D \times (1 - T_C) \times D + r_E \times E \qquad \textbf{(1)}$$

where r_D is the market cost of debt, r_E is the market cost of equity, T_C is the marginal corporate income tax rate, D is the percent debt in the capital structure, and E is the percent equity in capital structure. The cost of equity consistent with the overall cost-of-capital estimate (ATWACC), the market cost of debt and equity, the marginal corporate

income tax rate and the amount of debt and equity in the capital structure can be determined by solving equation (1) for r_E.

Q21. CAN YOU PROVIDE AN EXAMPLE OF HOW THIS FORMULA IS USED TO DETERMINE THE COST OF EQUITY?

A21. Yes. Consider a company with a 40 percent marginal corporate income tax rate and a cost of debt equal to 6 percent. For simplicity, I assume there is no difference in the company's embedded cost of debt and the cost at which it currently can issue additional debt. Further, suppose that the ATWACC estimate based on a sample of companies with comparable business risk is 7.5 percent. If the company's capital structure has 50 percent debt and 50 percent equity, equation (1) above yields a cost-of-equity estimate of 11.4 percent. If the equity ratio is lower, for example 45 percent, the cost of equity would instead be 12.3 percent. Conversely, a higher equity ratio such as 55 percent would imply a lower cost-of-equity estimate of 10.7 percent. Table 2 below summarizes these calculations as well as the dollar amount customers have to pay for financing costs.

Table 2. Example of the effect of capital structure on the estimated cost of equity.

Marginal tax rate	40%		
Cost of debt	6%		
Estimated ATWACC	7.50%		
Rate Base	$ 1,000,000		
Regulatory Equity Ratio	45%	50%	55%
Regulatory Debt Ratio	55%	50%	45%
Estimated ATWACC	7.50%	7.50%	7.50%
Cost-of-equity	12.3%	11.4%	10.7%
After Tax Cost of Financing[1)]	$ 75,000	$ 75,000	$ 75,000
Before Tax Cost of Financing[2)]	$ 125,000	$ 125,000	$ 125,000

[1)] Estimated ATWACC × Rate Base.

[2)] Estimated ATWACC × Rate Base / (1 - Tax Rate).

The important point of this example is that the overall cost of capital does not depend on the company's capital structure, as long as the capital structure is in a wide middle range of values. Therefore, the cost to customers does not depend on the capital structure either. A higher equity ratio simply means that a higher percentage return is paid to equity investors, but the fraction of the rate base to which this higher return applies is lower.

The equity investors are compensated appropriately for the higher risk, but that has no effect on the overall cost borne by customers. As long as equity investors are correctly compensated for the risk of their investment, the only effect that a higher equity ratio has is on how the return is divided between debt holders and equity holders, and not on how much customers end up paying.

Q22. BUT IS IT NOT THE CASE THAT IF THE ALLOWED RATE OF RETURN ON EQUITY IS LOWER, THEN ALL ELSE EQUAL RATEPAYERS PAY LESS?

A22. Yes, for a given equity percentage. However, it comes at a cost: if the rate of return on equity appropriate for a capital structure with 55 percent equity were applied to a company whose equity ratio is 45 percent, the company's equity investors would not be appropriately compensated for the risk of their investment. In particular, in this situation the expected return on equity would be set too low. Such a result would impair the company's ability to attract investors, since they can expect higher returns elsewhere for the same risk level. This may well have negative consequences for the utility's ability to sustain an appropriate level of investment. Ultimately, this translates into a lower quality of the services that the utility can provide to its customers. Alternatively, the company could reduce its equity percentage with possibly negative effects on the cost of debt or other credit factors.

III. THE COST OF CAPITAL FOR THE BENCHMARK SAMPLES

Q23. HOW IS THIS SECTION OF YOUR TESTIMONY ORGANIZED?

A23. As noted in *Section II*, I estimate the cost of capital using two samples of comparable risk companies. This section first covers preliminary matters such as sample selection, market-value capital structure determination, and the sample companies' costs of debt. It then covers estimation of the cost of equity for the sample companies and the resulting estimates of the sample's overall after-tax cost of capital.

A. Preliminary Decisions

Q24. WHAT PRELIMINARY DECISIONS ARE NEEDED TO IMPLEMENT THE ABOVE PRINCIPLES?

A24. I must select the benchmark samples, calculate the sample companies' market-value capital structures, and determine the sample companies' market costs of debt and preferred equity.

1. The Samples: Water Utilities and Gas Local Distribution Companies

Q25. WHY DO YOU USE TWO SAMPLES?

A25. The overall cost of capital for a part of a company depends on the risk of the business in which the part is engaged, not on the overall risk of the parent company on a consolidated basis.

Estimating the cost of capital for New Mexico-American Water's regulated assets is the subject of this proceeding. The ideal sample would be a number of companies that are publicly traded "pure plays" in the water production, storage, treatment, transmission, distribution and wastewater lines of business.[5] "Pure play" is an investment term referring to companies with operations only in one line of business. Publicly traded firms, firms whose shares are freely traded on stock exchanges, are ideal because the best way to infer the cost of capital is to examine evidence from capital markets on companies in the given line of business.

Therefore, for this case, a sample of companies whose operations are concentrated solely in the regulated portion of the water industry would be ideal. Unfortunately, the available sample of "water" utility companies in the U.S. is relatively small and has serious data deficiencies. See *Section III.C.1* for a description of these deficiencies.

To select my sample of comparable water and gas LDC companies, I start with those companies that are listed as a water utility or natural gas utility in *Value Line*.[6] Usually, I would apply several selection criteria to delete companies with unusual circumstances that may bias the cost-of-capital estimation and companies whose risk characteristics

[5] Most of the water utilities in *Value Line* have operations in the water as well as wastewater business.

[6] To select the samples I include both the Standard, the Small and Mid-Cap Editions of *Value Line Investment Survey* and *Value Line Investment Survey - Plus Edition.*

differ from those of the filing entity. However, the application of such criteria would eliminate almost all the water utilities listed in *Value Line*. Therefore, I do not apply selection criteria to the water utility sample although I do apply my standard criteria to the gas LDC sample. Specifically, if I eliminate all water utilities with annual revenues below $300 million, less than 50 percent regulated revenues, lack of growth rates (from Bloomberg or *Value Line*), or lack of a bond rating, I would be left with at most three companies (American States Water, Aqua America and California Water Services). A three-company sample is simply too small to provide reliable results. Therefore, I keep all water utilities with data in my water utility sample, but I do report results for a subsample of companies that earn a large percentage of revenues from regulated activities.[7]

Q26. WHAT DO YOU DO TO OVERCOME THE WEAKNESSES OF THE WATER UTILITY SAMPLE?

A26. To overcome the weaknesses of the water sample, I select a second sample of regulated utilities: gas local distribution companies. Gas LDCs, like water utilities, are regulated by state regulatory bodies, have large distribution investments, and serve a mix of residential, industrial, and commercial customers.

One reason for using the gas LDC sample is to generate a sample of regulated companies whose primary source of revenues is in the regulated portion of the natural gas industry to provide a check for the results of the water sample. Therefore, I start with *Value Line*'s universe of natural gas utilities, and eliminate those companies whose percentage of assets attributed to regulated activities is less than 50 percent. In addition, I only include companies with an investment grade bond rating, no recent sizable mergers or acquisitions, no recent dividend cuts, and no other activity that could cause the estimation parameters to be biased. Additionally, I require the companies to have necessary data available. The final sample includes ten companies. Additional details of the sample selection process for each sample and subsample are described below as well as in Appendix B.

[7] The only company listed as a water utility in *Value Line* that I do not include is Sun Hydraulics. This

Q27. IF THE BUSINESS RISK OF THE GAS LDC SAMPLE DIFFERS FROM THE WATER SAMPLE, CAN YOU STILL RELY ON THE COST OF EQUITY ESTIMATED FOR THE GAS LDC SAMPLE?

A27. Yes. If the business and financial risk of the two samples differ, then a cost-of-capital analyst can still make use of the information from the more reliable sample to evaluate the reliability of the estimates from the water sample. The inference would be based on information about the relative risk of the two industries.

Q28. PLEASE ELABORATE ON THE WAY TWO SAMPLES WITH DIFFERENT BUSINESS AND FINANCIAL RISKS CAN BE COMPARED.

A28. As mentioned above, the overall cost of capital for a part of a company depends on the risk of the business in which the part is engaged, not on the overall risk of the parent company on a consolidated basis. According to financial economics, the overall risk of a diversified company equals the market value weighted-average of the risks of its components.

Calculating the overall after-tax weighted average cost of capital for each sample company as described above allows the analyst to estimate the average overall cost of capital for the sample. The ATWACC captures both the business risk and the financial risk of the sample companies in one number. This allows comparison of the cost of capital between two samples on a much more informed basis. If the alternative (more reliable) sample is judged to have slightly different risk than the water sample, but the results show wide differences in the ATWACC estimates, the analyst should carefully consider the validity of the water sample estimates, whether they are materially higher or lower than the alternative sample's estimates. Of course, the alternative sample could be the source of the error, but that is less likely because the alternative sample has been selected precisely because of its expected reliability.

Q29. PLEASE COMPARE THE CHARACTERISTICS OF THE WATER UTILITY SAMPLE AND THE GAS LDC SAMPLE.

company's main line of business is the production of industrial equipment, not the water utility business.

A29. The two samples differ primarily in that they operate in two different (regulated) industries, but they are very similar in terms of the percentage of revenues from regulated operations and the customers they serve. On average, both samples earn a large percentage of their revenue from regulated activities and serve a mix of residential, industrial, and other customers. In addition, both industries are characterized by large capital investment and both are operating a large distribution system. However, the gas LDC sample has fewer of the data and estimation issues identified above for the water sample. Please refer to Appendix B for additional details on the two samples.

2. Market-Value Capital Structure

Q30. WHAT CAPITAL STRUCTURE INFORMATION DO YOU REQUIRE?

A30. For reasons discussed below and in Appendix E, explicit evaluation of the market-value capital structures of the sample companies is vital for a correct interpretation of the market evidence on the return on equity. This requires estimates of the market values of common equity, preferred equity and debt, and the current market costs of preferred equity and debt.

Q31. PLEASE DESCRIBE HOW YOU CALCULATE THE MARKET VALUES OF COMMON EQUITY, PREFERRED EQUITY AND DEBT.

A31. I estimate the capital structure for each sample company by estimating the market values of common equity, preferred equity and debt from the most recent publicly available data. The details are in Appendix B.

Briefly, the market value of common equity is the price per share times the number of shares outstanding. For the risk-positioning approach, I use the last 15 trading days of each year to calculate the market value of equity for the year. I then calculate the average capital structure over the corresponding five-year period used to estimate the "beta" risk measures for the sample companies. This procedure matches the estimated beta to the degree of financial risk present during its estimation period. In the DCF analyses, I use

the average stock price over 15 trading days ending on the release date of the BEst growth rate forecasts utilized.[8]

The market value of debt is estimated at its book value adjusted by the difference between the "estimated fair (market) value" and the "carrying cost" of long-term debt reported in each company's 10-K.[9] The market value of preferred stock for the samples is set equal to its book value.[10]

3. Market Costs of Debt and Preferred Equity

Q32. HOW DO YOU ESTIMATE THE CURRENT MARKET COST OF DEBT?

A32. The market cost of debt for each company is set equal to the fifteen-day average yield on an index of public utility bonds that have the same credit rating, as reported by Bloomberg. The DCF analyses use the current credit rating whereas the risk-positioning analyses use the current yield of a utility bond that corresponds to the five-year average debt rating of each company so as to match consistently the horizon of information used by *Value Line* to estimate each company's beta. Bond rating information was obtained from Bloomberg which reports Standard & Poor's bond ratings. I calculate the after-tax cost of debt using the Company's estimated marginal income tax rate of 39.9 percent.

Q33. HOW DO YOU ESTIMATE THE MARKET COST OF PREFERRED EQUITY?

A33. For all sample companies, the preferred rating was assumed equal to the company's bond rating. The cost of a company's preferred equity was set equal to the yield on an index of

[8] BEst is Bloomberg's name for its earnings growth rate information. BEst growth rate forecasts are as of May 7, 2008.

[9] The book value of debt from Bloomberg includes all interest-bearing financial obligations that are not current and includes capitalized leases and mandatory redeemable preferred and trust preferred securities in accordance with FASB 150 effective June 2003. See Bloomberg's definition of long-term debt for additional details.

[10] This is unlikely to affect the results as the average percentage of preferred is less than .25 percent for both the water and gas sample.

preferred utility stock with the same rating. The data were obtained from the Mergent Bond Record.[11]

B. Cost-of-Equity Estimation Methods

Q34. HOW DO YOU ESTIMATE THE COST OF EQUITY FOR YOUR SAMPLE COMPANIES?

A34. Recall that the cost of capital is the expected rate of return in capital markets on alternative investments of equivalent risk. This definition leads me to address three key points in my estimation procedures. First, the cost of capital is an expected rate of return – it cannot be directly observed, but must be inferred from available evidence. Second, the cost of capital is determined in capital markets (such as the New York Stock Exchange). Therefore, capital market data provide the best evidence from which to draw inferences. Third, the cost of capital depends on the return offered by alternative investments of equivalent risk. Consequently, measures of risk that matter in capital markets are part of the evidence that I need to examine.

Q35. HOW DOES THE ABOVE DEFINITION HELP YOU ESTIMATE THE COST OF CAPITAL?

A35. The definition of the cost of capital recognizes a tradeoff between risk and expected return; this is the security market line plotted above in Figure 1 above. Cost-of-capital estimation methods usually take one of two approaches: (1) they establish the location of the security market line and estimate the relative risk of the security, which jointly determine the cost of capital, or (2) they try to identify a comparable-risk sample of companies and estimate the cost of capital directly. Looking at Figure 1, the first approach focuses directly on the vertical axis, while the second focuses both on the security's position on the horizontal axis and on the position of the security market line.

[11] Published monthly, Mergent's Bond Record offers a comprehensive review of over 68,000 bond issues including coverage of corporate, government, municipal, industrial development/environmental control revenue and international bonds, plus structured finance and equipment trust issues, medium-term notes, convertible issues, preferred stocks and commercial paper issues.

The first type of approach is more direct, but ignores the wealth of information available on securities not thought to be of precisely comparable risk. The "discounted cash flow" or "DCF" model is an example. The second type of approach, sometimes known as "equity risk premium approach," requires an extra step – positioning the security market line. Using the second approach allows me to use information from all traded securities rather than just those included in my sample. The capital asset pricing model ("CAPM") is an example. While both approaches can work equally well if conditions are right, one may be preferable to the other under certain circumstances. In particular, approaches that rely on the entire security market line are less sensitive to deviations from the assumptions that underlie the model, all else equal. In this case, I examine both DCF and risk-positioning approach evidence for the water utility and gas LDC sample.

1. The Risk-Positioning Approach

Q36. PLEASE EXPLAIN THE RISK-POSITIONING METHOD.

A36. The risk-positioning method estimates the cost of equity as the sum of a current interest rate and a risk premium. It is therefore sometimes also known as the "risk premium" approach. This approach may sometimes be applied more or less formally. As an example of an informal application, an analyst may estimate the spread between interest rates and what is believed to be a reasonable estimate of the cost of capital at a specific time, and then apply that spread to current interest rates to get a current estimate of the cost of capital.

More formal applications of the risk-positioning approach take full advantage of the security market line depicted in Figure 1: they use information on a large number of traded securities to identify the security market line and derive the cost of capital for the individual security based on that security's relative risk. This reliance on the entire security market line makes the method less vulnerable to the kinds of problems that arise from using one stock at a time (such as the DCF method). The risk-positioning approach is widely used and underlies much of the current research published in academic journals on the nature, determinants and magnitude of the cost of capital. The most commonly

used version of the formal risk-positioning models is the Capital Asset Pricing Model ("CAPM"). The equation for the CAPM is:

$$k_s = r_f + \beta_s \times MRP \quad \textbf{(2)}$$

where k is the cost of capital, r_F is the risk-free interest rate, *MRP* is the market risk premium, and β is the measure of relative risk.

Section I of Appendix C to this testimony provides more detail on the principles that underlie the risk-positioning approach. Section II of Appendix C provides the details of the risk-positioning approach empirical estimates I obtain.

Q37. HOW ARE THE "MORE FORMAL" APPLICATIONS OF THE RISK-POSITIONING APPROACH IMPLEMENTED?

A37. The first step is to specify the current values of the benchmarks that determine the security market line. The second is to determine the security's, or investment's, relative risk. The third is to specify exactly how the benchmarks combine to produce the security market line, so the company's cost of capital can be calculated based on its relative risk.

a) Security Market Line Benchmarks

Q38. WHAT BENCHMARKS ARE USED TO DETERMINE THE LOCATION OF THE SECURITY MARKET LINE?

A38. The essential benchmarks that determine the security market line are the risk-free interest rate and the premium that a security of average risk commands over the risk-free rate. This premium is commonly referred to as the "market risk premium" ("MRP"), i.e., the excess of the expected return on the average common stock over the risk-free interest rate. In the risk-positioning approach, the risk-free interest rate and MRP are common to all securities. A security-specific measure of relative risk (beta) is estimated separately and combined with the MRP to obtain the company-specific risk premium.

Q39. WHAT BENCHMARK DO YOU USE FOR THE MRP?

A39. I estimate two versions of the risk-positioning model. The first version measures the market risk premium as the risk premium of average-risk common stocks over long-term Government bonds. The second version measures the market risk premium over short-term Treasury bills, which is the usual measure of the MRP used in capital market theories.

Q40. HOW DO YOU ESTIMATE THE MRP?

A40. Appendix C summarizes academic and empirical research on the MRP. However, as discussed in the appendix, there is currently little consensus on the "best practice" for estimating the MRP. (Note: this is not the same as saying that all practices are equally good). For example, the leading graduate textbook in corporate finance expresses the view that a range between 5 to 8 percent is reasonable for the U.S.[12] Morningstar data from 1926 to 2007, the longest period reported, show an MRP average premium of stocks of 8.5 percent over Treasury bills and 7.1 percent over long-term Government bonds.[13] At the same time, Dimson, Marsh and Stauton (2008) estimate the arithmetic market risk premium for the U.S. over the 1900 to 2007 period at 6.5 percent over bonds.[14] In a regulatory setting, the Surface Transportation Board ("STB") recently decided to rely on the CAPM when determining the cost of capital for major railroads in the U.S. As part of its methodology, the STB decided to rely on the long-term market risk premium reported by Morningstar/Ibbotson in its implementation of the CAPM.[15] This approach currently results in a long-term MRP of 7.1 percent.

My testimony considers both the historical evidence and the results of scholarly studies of the factors that affect the risk premium for average-risk stocks in order to estimate the benchmark risk premium investors currently expect.

Considering all the evidence, I conclude that S&P 500 stocks of average risk today command a premium of 8.0 percent over the short-term risk-free rate and 6.5 percent over

[12] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, McGraw-Hill, 8th edition, 2006, pp. 151-154.

[13] Morningstar, *Ibbotson SBBI Valuation Yearbook 2008*.

[14] Dimson, Marsh and Staunton, *Global Investment Returns Yearbook 2008*, p. 48.

[15] *STB Ex Parte No. 664*, Issued January 17, 2008, pp. 8-9.

the long-term Government rate. The estimation of the MRP is discussed in greater detail in Appendix C.

Q41. HOW DO YOU DETERMINE THE RISK-FREE RATE YOU USE?

A41. Ideally, the risk-free rate is the estimated risk-free rate over the period where rates will be in effect. For this proceeding, I use the current yield on long-term Government bonds and 30-day T-bills as an estimate for the long-term and short-term risk-free rate, respectively. Using an average of 15 trading days ending May 7, 2008, I obtain a short-term risk-free rate of 1.1 percent and a long-term risk-free rate of 4.5 percent, respectively. However, I do not believe that the short-term interest rate currently is a good measure because it is driven more by recent monetary initiatives by the Federal Reserve than by market forces. [16]

b) Relative Risk

Q42. WHAT MEASURE OF RELATIVE RISK DO YOU USE?

A42. I examine the "beta" of the stocks in question. Beta is a measure of the "systematic" risk of a stock — the extent to which a stock's value fluctuates more or less than average when the market fluctuates.

The basic idea behind beta is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification. Beta is a measure of the risks that cannot be eliminated by diversification. This concept is explored further in Appendix C.

Q43. WHAT DOES A PARTICULAR VALUE OF BETA MEAN?

[16] See Table No. BV-9. Throughout the first part of 2008, short-term interest rates have been dropping rapidly as the Federal Reserve has cut interest rates and undertaken other measures to avoid more financial market distress. For example, on April 30, the Federal Reserve dropped the federal funds rate by 25 basis points to 2.0 percent (Federal Reserve, Press Release, April 30, 2008). Earlier, on March 18, the Federal Reserve had dropped the federal funds rate by .75 percent (Federal Reserve, Press Release, March 18, 2008) and on March 14, 2008, the Federal Reserve effectively became creditors of the financially distressed Bear Stearns bank (Craig Torres, Bernanke Discards Monetary History with Bear Stearns Bailout, *Bloomberg*, March 15, 2008).

A43. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up or down by 10 percent on average when the market goes up or down by 10 percent. Stocks with betas above 1.0 exaggerate the swings in the market. A stock with a beta of 2.0 tends to fall 20 percent when the market falls 10 percent, for example. Stocks with betas below 1.0 understate the swings in the market. A stock with a beta of 0.5 tends to rise 5 percent when the market rises 10 percent.

Q44. HOW DO YOU ESTIMATE BETA?

A44. I use beta estimates reported in the *Value Line* for the sample companies.

c) Cost of Equity Capital Calculation

Q45. HOW DO YOU COMBINE THE PRECEDING STEPS TO ESTIMATE THE COST OF EQUITY?

A45. The most widely used approach to combine a risk measure with the benchmark market risk premium on common stocks to find a risk premium for a particular firm or industry is the Capital Asset Pricing Model. However, the CAPM is only one risk-positioning technique.

In addition to the CAPM, I rely on an empirical variety of the model. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premia than predicted by the CAPM and high beta stocks tend to have lower risk premia than predicted. A number of variations on the original CAPM theory have been proposed to account for this finding.

This finding can be used directly to estimate the cost of capital, using beta to measure relative risk, without simultaneously relying on the CAPM. Here I examine results from both the CAPM and a version of the security market line based on the empirical finding that risk premia are related to beta, but are not as sensitive to beta as the CAPM predicts, to convert the betas into a risk premium. I refer to this latter model as the "ECAPM," where ECAPM stands for Empirical Capital Asset Pricing Model. The formula for the ECAPM is

$$k_s = r_f + \alpha + \beta_s \times (MRP - \alpha) \quad \textbf{(3)}$$

where as before *k* is the cost of capital, r_f is the risk-free interest rate, *MRP* is the market risk premium, β is the measure of relative risk, and α is the empirical adjustment factor.

Research supports values for α ranging from one to seven percent when using a short-term interest rate. I use baseline values of α of 2 percent for the short-term risk-free rate and 0.5 percent for the long-term risk-free rate. I also conduct sensitivity tests for different values of α. For the short-term risk-free rate I use values for α of 1, 2 and 3 percent. For the long-term risk-free rate I use values for α of 0, 0.5 and 1.5 percent. See Appendix C for a more detailed discussion of the ECAPM model and Table C-1 for a summary of the empirical evidence on the size of the required adjustment.

Q46. WHY IS IT APPROPRIATE TO USE THE ECAPM MODEL?

A46. Empirical tests of the CAPM have repeatedly shown that an investment's return is related to systematic risk, but that the increase in return for an increase in risk is less than is predicted. The empirical tests have also shown that the theoretical intercept, as measured by the return on Treasury bills, is too low to fit the data. In other words, the empirical tests indicate that the slope of the CAPM is too steep and the intercept is too low. The empirical data support the ECAPM. The ECAPM recognizes the consistent empirical observation that the CAPM underestimates (overestimates) the cost of capital for low (high) beta stocks. The ECAPM corrects the predictions of the CAPM to more closely match the results of the empirical tests. Ignoring the results of CAPM tests would lead to an estimate of the cost of capital that is likely to be less accurate than is possible.

Q47. IS THE USE OF THE ECAPM EQUIVALENT TO ADJUSTING THE ESTIMATED BETAS FOR THE SAMPLE COMPANIES?

A47. No. Fundamentally, this is not an adjustment (increase) in beta. This can easily be seen by the fact that the expected return on high beta stocks is lower with the ECAPM than when estimated by the CAPM. The ECAPM model is a recognition that the actual slope of the risk-return tradeoff is flatter than predicted and the intercept higher based upon

repeated empirical tests of the model.[17] Even if the beta of the sample companies were estimated accurately, the CAPM would still underestimate the required return for low beta stocks. Even if the ECAPM were used, the costs of equity would be underestimated if the betas were underestimated.

2. Discounted Cash Flow Method

Q48. PLEASE DESCRIBE THE DISCOUNTED CASH FLOW APPROACH.

A48. The DCF model takes the first approach to cost-of-capital estimation, i.e., to attempt to estimate the cost of capital in one step. The method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow stream:

$$P = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots + \frac{D_T}{(1+k)^T} \quad \textbf{(4)}$$

where "P" is the market price of the stock; "D_t" is the dividend cash flow expected at the end of period t (i.e., subscript period 1, 2, 3 or T in the equation); "k" is the cost of capital; and "T" is the last period in which a dividend cash flow is to be received. The formula just says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received.

Most DCF applications go even further, and make very strong (i.e., unrealistic) assumptions that yield a simplification of the standard formula, which then can be rearranged to estimate the cost of capital. Specifically, if investors expect a dividend stream that will grow forever at a steady state, the market price of the stock will be given by a very simple formula,

[17] Many investment firms make an adjustment to the beta. A commonly used adjustment is the Merrill Lynch adjustment, which adjusts betas 1/3 toward one. This type of adjustment is intended to compensate for sampling errors in the beta estimation, not for the empirical fact that CAPM tends to overestimate the sensitivity of the cost of capital to beta. See Appendix C for a more detailed explanation.

$$P = \frac{D_1}{(k-g)} \quad \textbf{(5)}$$

where "D_1" is the dividend expected at the end of the first period, "g" is the perpetual growth rate, and "P" and "k" are the market price and the cost of capital, as before. Equation (5) is a simplified version of Equation (4) that can be solved to yield the well known "DCF formula" for the cost of capital:

$$\begin{aligned} k &= \frac{D_1}{P} + g \\ &= \frac{D_0 \times (1+g)}{P} + g \end{aligned} \quad \textbf{(6)}$$

where "D_0" is the current dividend, which investors expect to increase at rate g by the end of the next period, and the other symbols are defined as before. Equation (6) says that if Equation (5) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the simple DCF model. Of course, the "simple" model is simple because it relies on very strong, unrealistic, assumptions.

Q49. ARE THERE OTHER VERSIONS OF THE DCF MODELS BESIDES THE "SIMPLE" ONE?

A49. Yes. There are many variations on the DCF models that may rely on less strong (more realistic) assumptions in that they allow growth rates to vary over time. I consider a variant of the DCF model that uses the companies' individual growth rates during the first five years, converges to a perpetual growth rate in years 6-10 and then uses the GDP growth rate as the perpetual growth rate after year 10 for all companies. This is a variant of the "multi-stage" DCF method. The DCF models are described in detail in Section I of Appendix D. (Section II of Appendix D provides the details of my empirical DCF results.)

Q50. WHAT ARE THE MERITS OF THE DCF APPROACH?

A50. The DCF approach is conceptually sound if its assumptions are met, but can run into difficulty in practice because those assumptions are so strong, and hence so unlikely to

correspond to reality. Two conditions are well known to be necessary for the DCF approach to yield a reliable estimate of the cost of capital: the variant of the present value formula that is used must actually match the variations in investor expectations for the dividend growth path; and the growth rate(s) used in that formula must match current investor expectations. Less frequently noted conditions may also create problems. (See Appendix D for details.)

Q51. WHAT IS THE MOST DIFFICULT PART OF IMPLEMENTATING THE DCF APPROACH?

A51. Finding the right growth rate(s) is the usual "hard part" of a DCF application. The original approach to estimation of the growth rate, g, relied on average historical growth rates in observable variables, such as dividends or earnings, or on the "sustainable growth" approach, which estimates g as the average book rate of return times the fraction of earnings retained within the firm. But it is highly unlikely that these historical averages over periods with widely varying rates of inflation and costs of capital will equal current growth rate expectations. This is particularly true for the water sample as many companies in the industry are growing fast, engaged in mergers, acquisitions or other restructuring activities.

Moreover, the constant growth rate DCF model requires that dividends and earnings grow at the same rate for companies that on average earn their cost of capital.[18] It is inconsistent with the theory on which the model is based to have different growth rates in earnings and dividends over the period when growth is assumed to be constant. If the growth in dividends and earnings were expected to vary over some number of years before settling down into a constant growth period, then it would be appropriate to estimate a multistage DCF model. In the multistage model, earnings and dividends can

[18] Why must the two growth rates be equal in a steady-growth DCF model? Think of earnings as divided between reinvestment, which funds future growth, and dividends. If dividends grow faster than earnings, there is less investment and slower growth each year. Sooner or later dividends will equal earnings. At that point, growth is zero because nothing is being reinvested (dividends are constant). If dividends grow slower than earnings, each year a bigger fraction of earnings are reinvested. That makes for ever faster growth. Both scenarios contradict the steady-growth assumption. So if you observe a company with different expectations for dividend and earnings growth, you know the company's stock price and its dividend growth forecast are inconsistent with the assumptions of the steady-growth DCF model.

grow at different rates, but must grow at the same rate in the final, constant growth rate period. A difference between forecasted dividend and earnings rates therefore is a signal that the facts do not fit the assumptions of the simple DCF model.

Q52. HOW DO YOU ESTIMATE THE GROWTH RATES YOU USE IN YOUR DCF ANALYSIS?

A52. I use earnings growth rate forecasts from Bloomberg and *Value Line*. Analysts' forecasts are superior to using single variables in time series forecasts based upon historical data as has been documented and confirmed extensively in academic research. Please see Section I in Appendix D for a detailed discussion on this issue.

Q53. ARE YOU AWARE THAT SOME REGULATORY COMMISSIONS RELY ON BOTH HISTORICAL AND FORECAST GROWTH RATES IN THEIR IMPLEMENTATION OF THE DCF MODEL?

A53. Yes, but I do not believe that is the best way to estimate the growth rate for use in the DCF model for the following reasons. First, as mentioned above, the model requires that dividends and earnings grow at the same rate at some point in the future in order to apply the model. The data on historical growth rates do not confirm this condition. Second, analysts have access to historical information and include that information in their forecast of earnings growth rates. In other words, using historical data provides no additional information than that captured in analyst forecasts. Data providers such as *Value Line* provide information on the going forward payout ratio as well as on other key financial parameters.

Q54. ARE YOU AWARE OF EVIDENCE THAT ANALYSTS' FORECASTS OF EARNINGS GROWTH HAVE HISTORICALLY OVER-ESTIMATED EARNINGS AND DIVIDEND GROWTH?

A54. Yes. Although analyst forecasts have historically been too optimistic, this problem is less acute for regulated companies.[19] Further, according to a recent joint report by NASD and the NYSE,

> … the SRO Rules have been effective in helping restore integrity to research by minimizing the influences of investment banking and promoting transparency of other potential conflicts of interest. Evidence also suggests that investors are benefiting from more balanced and accurate research to aid their investment decisions.[20]

In addition, the use of a two-stage DCF model, which substitutes the forecast growth of GDP, mitigates analyst optimism by substituting the GDP growth rate for the potentially optimistic (or pessimistic) earnings forecasts of analysts.

Q55. HOW WELL ARE THE CONSTANT-GROWTH RATE CONDITIONS NECESSARY FOR THE RELIABLE APPLICATION OF THE DCF LIKELY TO BE MET FOR THE SAMPLE COMPANIES AT PRESENT?

A55. The requisite conditions for the sample companies are not fully met at this time, particularly for the water sample. Of particular concern for this proceeding is the uncertainty about what investors truly expect the long-run outlook for the sample companies to be. The longest time period available for growth rate forecasts of which I am aware is five years. The long-run growth rate (i.e., the growth rate after the water industry settles into a steady state, which may be beyond the next five years for this industry) drives the actual results one gets with the DCF model. Unfortunately, this implies that unless the company or industry in question is stable – so there is little doubt as to the growth rate investors expect – DCF results in practice can end up being driven by the subjective judgment of the analyst who performs the work.

Of the nine companies in the water sample, four do not have earnings forecasts from *Value Line,* and as a result three companies have only one analyst forecast of earnings

[19] See, for example, L.K.C. Chan, J. Karceski, and J. Lakonishok (2003), "The Level and Persistence of Growth Rates," *Journal of Finance* 58(2), pp. 643-684.

[20] Joint Report by NASD and NYSE on the Operation and Effectiveness of the Research Analyst Conflict of Interest Rules, December 2005, p. 44.

growth.[21] The average long-term earnings forecasts from vary from a low of 0.9 percent to a high of 14 percent. Additionally, the analysts' forecasts for individual companies range widely. For example, the average BEst growth forecast for Southwest Water Co is 5 percent while the *Value Line* forecast is 15 percent. The lack of sufficient analyst following and the large variation in growth forecasts indicate that these forecasts are less reliable than ideal. The growth rates for gas LDC sample vary less from an average of 3.4 to 7.2 percent, and are more consistent with the GDP growth forecast of 4.8 percent. Of the ten companies in the gas LDC sample, one has only two analysts providing a forecast (one *Value Line* and one BEst), and one has a negative mean BEst estimate, which I treated as unavailable because it does not make sense for the long-term forecast to be negative. Thus, the available data are far from being ideal. As discussed above, the two-stage DCF model adjusts for any overly optimistic (or pessimistic) growth rate forecasts by adjusting the 5-year growth rate forecasts of the analysts toward the long-term GDP growth rate in the years after year 5. See Appendix D, *Section I* for a discussion of the two-stage model.

The DCF growth rates, whether estimated from historical data or from analyst forecasts, have likely been affected by several factors: many mergers and acquisitions in the water industry in recent years, significant growth in many parts of the country, and a trend towards consolidation. The industry appears to be moving towards a larger degree of consolidation – at least among the privately held water utilities. The consolidation of the industry may well increase as the industry needs significant infrastructure investments to comply with EPA water purification rules, maintain or replace old infrastructure, and deal with increased threats towards the water systems.[22] The American Society of Civil Engineers estimated in 2005 that the drinking water infrastructure required "$11 billion annually to replace aging infrastructure […] and to comply with safe drinking water regulations," while the wastewater segment required $390 billion in investments over the following 20 years.[23] Coupled with the rising construction costs of utility infrastructure,

[21] See Table BV-5 for details.

[22] See, for example, *Value Line*, Water Utility Industry, April 25, 2008.

[23] *Report Card for America's Infrastructure*, The American Society of Civil Engineers, 2005, pp. 15, 55.

this creates uncertainty about future conditions and diverging expectations. The uncertainty associated with these factors increases the industry's business risk. Additionally, environmental regulations impact the industry as standards for water quality evolve over time, and there is potential for new safety and security requirements in the future. The industry has no federal regulator (other than for environmental and health issues), and state public utility commissions regulate most investor owned water utilities. Different regulatory bodies may lead to differing regulatory requirements for companies operating in adjacent parts of the country. Taken together, these factors mean that it may be some time before the water industry settles into anything investors will see as a stable equilibrium necessary for the reliable application of the DCF model.

Such circumstances imply that a commission may often be faced with a wide range of DCF estimates, none of which can be well grounded in objective data on true long-run growth expectations, *because no such objective data now exist*. DCF for firms or industries in flux is *inherently* subjective with regard to the most important parameter, the long-run growth rate that drives the answer.

In short, the unavoidable questions about the DCF model's strong assumptions cause me to view the DCF method as *inherently* less reliable than the risk-positioning approach described above. This is particularly true for the water sample, because of the data problems discussed above. However, because the DCF method has been widely used in the past, I submit DCF evidence in this case. DCF estimates also serve as a check on the values provided by the risk-positioning methods.

In this proceeding, I give little weight to the DCF results. However, I use the results as a check on the reasonableness of my risk-positioning estimates.

C. THE SAMPLES AND RESULTS

1. The Water Utility Sample

Q56. EARLIER YOU SAID THAT THE SAMPLE OF WATER UTILITIES HAD SERIOUS DATA WEAKNESSES. PLEASE ELABORATE ON THESE WEAKNESSES.

A56. In attempting to apply the DCF model to the sample, five companies had no *Value Line* growth forecasts. The size of the companies in the water sample also makes cost-of-capital estimation difficult. Currently, only four companies have more than $500 million in market value of equity. More important, however, is the fact that the stock of these companies trades relatively infrequently. For example, four of the nine water utilities traded an average of less than 20,000 shares per trading day since January of 2007. In percentage terms, these companies traded less than 0.15 percent of their shares outstanding.[24] By contrast, each of the gas LDC sample companies had an average trading volume of at least 121,000 shares per day (greater than 180,000 if Laclede Group were excluded), which in percentage terms represented more than 0.45 percent of shares outstanding for each company. Low trading volume causes concern because there may be a delay between the release of important information and the time that this information is reflected in prices. Such delay is well known to cause beta estimates to be statistically insignificant and possibly biased.

In addition to lack of data and the small size of the companies, there are firm-specific events that render the water utility sample less reliable than would be ideal. First, Aqua America (the largest of the companies) has gone through a large number of mergers and acquisitions in recent years. Normally, I would not include companies with significant merger or acquisition activity in a sample because the individual information about the progress of the proposed merger is so much more important for the determination of the company's stock price than day-to-day market fluctuations. In practice, beta estimates for such companies tend to be too low. The growth rates for such companies may also be

[24] The four companies are Connecticut Water Service Co., Middlesex Water Co., Pennichuck Corp., and York Water Co.

affected. Second, Southwest Water Co. earns only 44 percent of its revenue from regulated activities.[25] I therefore report my results for both the full sample and for a subsample of companies that does not include Southwest Water Co.

It is because of these weaknesses in the water sample that I also utilize a sample of natural gas LDCs. The selection procedure for this sample was summarized earlier and details are provided in Appendix B.

2. Risk-Positioning Cost-of-Capital Estimates

Q57. HOW IS THIS SECTION OF YOUR TESTIMONY ORGANIZED?

A57. This section first describes the input data used in the CAPM and ECAPM models, then reports the resulting cost-of-equity estimates for the samples. The second section of Appendix C details the empirical analysis.

a) Interest Rate Estimate

Q58. HOW DID YOU DETERMINE THE EXPECTED RISK-FREE INTEREST RATE?

A58. I reviewed current constant maturity U.S. Government bond yield data available from the St. Louis Federal Reserve Bank. For the period April 17 to May 7, 2008, the average yield on 30-day Treasury bills was 1.07 percent and the average yield on long-term government bonds was 4.54 percent.[26]

b) Betas and the Market Risk Premium

Q59. WHAT BETA ESTIMATES DID YOU USE IN YOUR ANALYSIS FOR THE SAMPLES?

A59. I rely upon the most recent betas estimated by *Value Line* for both the water sample and for the gas LDC sample.

[25] However, the majority of the company's property, plant and equipment belong to its regulated utilities. See Southwest Water Co. 2007 10-K p. F-22.

[26] See Table No. BV-9.

Q60. ARE THE BETA VALUES REPORTED BY *VALUE LINE* ADJUSTED BETAS?

A60. Yes. *Value Line* reports betas that are adjusted about 1/3 towards one. For this proceeding, I reverse the *Value Line* adjustment. *Value Line* and many investment firms adjust the estimated betas. This type of adjustment is intended to compensate for sampling errors in the beta estimation, not for the empirical fact that the CAPM tends to overestimate the sensitivity of the cost of capital to beta. I use adjusted betas when the sample companies display statistically significant sensitivity to interest rate changes or likely would do so short of measurement errors. For this proceeding I use unadjusted betas as I have previously for water and wastewater utilities.

Q61. PLEASE SUMMARIZE THE BETA ESTIMATES YOU RELY ON.

A61. After reversing the *Value Line* adjustment procedure, the average estimated *Value Line* beta for the water sample is about .76 while the average for the gas LDC sample is about .77. These beta estimates are reported in Workpaper #1 to Tables No. BV-10 and BV-20.

Q62. WHAT VALUE DO YOU USE FOR THE MARKET RISK PREMIUM?

A62. For the premium over the short-term risk-free interest rate I use 8.0 percent, while for the premium over the long-term risk-free interest rate I use 6.5 percent, for the reasons discussed before and in Appendix C.

Q63. PLEASE EXPLAIN THE METHOD TO ADJUST FOR DIFFERENCES IN CAPITAL STRUCTURE.

A63. Starting with the ATWACC, the cost of equity for any capital structure within a broad range of capital structures can be determined by the following formula:

$$\text{Return on equity} = \frac{\text{ATWACC - Return on debt} \times \text{\% debt in capital structure} \times (1 - \text{tax rate})}{\text{\% equity in capital structure}}$$

This is the calculation that is displayed in Tables No. BV-12 and BV-22.[27] The tables display the result of converting the sample average ATWACC to a return on equity for a

[27] For companies that have preferred equity, an additional term equal to (Return on preferred equity x % preferred in capital structure) is subtracted from the numerator of this fraction.

specific capital structure. It is straightforward to use this method to determine the cost of equity consistent with the capital structure.

c) Risk-Positioning Results

Q64. WHAT ARE THE COST-OF-EQUITY ESTIMATES DERIVED FROM THE RISK-POSITIONING APPROACH FOR THE WATER SAMPLE?

A64. Using the long-term interest rate in the two risk-positioning models (CAPM and ECAPM), with two values of the ECAPM parameter (0.5% and 1.5%), I obtain three estimates of each sample company's cost of equity (Tables No. BV-10 and BV-20). The cost-of-equity estimates are combined with the estimates of the company's cost of debt and preferred to calculate the company's ATWACC (Tables No. BV-11 and BV-21). Tables No. BV-12 and BV-22 combine the sample average ATWACC with New Mexico-American Water's capital structure, cost of debt, and tax rate to obtain the cost of equity at New Mexico-American Water's 45.1 percent equity. Panel A of Table No. BV-12 shows the cost of equity and ATWACC value for all water sample companies, while Panel B shows the results for the subsample of companies with significant revenue from regulated water utility activities. The cost-of-equity results are summarized below in Table 3 below.

Table 3. Cost-of-Equity Estimates

Regulatory Capital Structure: *45.1% Equity / 0.0% Preferred / 54.9% Debt* *2008 Tax Rate: 39.9%*

		METHODS				
		RISK POSITIONING (using Long-Term Risk-Free Rate)			DCF	
		CAPM	α = 0.5%	α = 1.5%	Simple	Multi-stage
[1]	**Water Sample***					
	Full Sample					
	Cost of Equity	14.1%	14.2%	14.2%	15.7%	10.7%
	Average ATWACC	8.5%	8.5%	8.5%	9.2%	7.0%
	Sub-sample					
	Cost of Equity	14.0%	14.1%	14.2%	15.7%	10.9%
	Average ATWACC	8.4%	8.5%	8.5%	9.2%	7.0%
[2]	**Gas LDC Sample****					
	Cost of Equity	11.9%	12.0%	12.4%	11.4%	11.3%
	Average ATWACC	7.5%	7.5%	7.7%	7.3%	7.2%

[3]	Risk Positioning Security Market Line Parameters:		Multi-Stage DCF Parameter:	
	Long-Term			
	Risk Free Rate Estimate:	4.5%	GDP Growth	
	Estimated MRP:	6.5%	Estimate	4.8%

Sources and Notes:

* For the Water Sample, Risk Positioning data from Table No. BV-12 and DCF data from Table No. BV-8.

** For the Gas LDC Sample, Risk Positioning data from Table No. BV-22 and DCF data from Table No. BV-19.

[1] The full water sample consists of American States Water Co, Aqua America Inc, California Water Service Group, Connecticut Water Service Inc, Middlesex Water Co, SJW Corp, Southwest Water Co, York Water Co, and Pennichuck Corp. The subsample excludes Southwest Water Co. Results exclude companies whose estimated cost of equity is less than their cost of debt plus 25 basis points.

[2] The gas LDC sample consists of AGL Resources, Atmos Energy Corp, Laclede Group, New Jersey Resources, Nicor Inc., Northwest Natural Gas, Piedmont Natural Gas, South Jersey

[3] See Appendices C and D for details on Risk Positioning and DCF parameters used in estimates.

Using the short-term interest rate in the two risk-positioning models (CAPM and ECAPM) and using different values for the ECAPM parameter, α , I obtain four estimates of each sample companies' cost of equity. These estimates are also displayed in Tables No. BV-12 and BV-22. Because I do not believe these estimates currently represent longer term market expectations, I do not include the results in Table 3 above.

Q65. PLEASE SUMMARIZE YOUR FINDINGS FROM THE RISK-POSITIONING MODEL.

A65. Focusing on the middle ECAPM (α = .50%) for the long-term risk-positioning model, I find that the water sample's cost of equity of about 14.25 percent. However, it is more

correct to say that the sample results indicate a range of values from about 13.5 to 14.5 percent for the long-term model. Looking at the gas LDC sample, the results are lower, for a range of approximately 11.50 to 12.5 percent for the long-term risk-positioning model. Because short-term interest rates have been repeatedly driven down by the Federal Reserve in an effort to prevent the economy from sliding into a recession and to provide liquidity in the credit markets in the wake of the subprime mortgage crisis,[28] I assign no weight to the short-term model in this proceeding. This is consistent with, for example, a recent decision by the Surface Transportation Board that decided to rely on the CAPM using 20-year Treasury bonds for the risk-free rate, 5-year weekly beta estimates, and Ibbotson's reported long-term market risk premium when determining railroads' cost of equity.[29] Additionally, as discussed previously, I place very little weight on the water sample results because of numerous data problems. Therefore, I conclude that the risk-positioning model provides cost-of-equity estimates in the range of 11.50 to 12.5 percent. I discuss the assessment of New Mexico-American Water's cost of equity in the concluding section.

3. The DCF Cost-of-Capital Estimates

Q66. WHAT STEPS DO YOU TAKE IN YOUR DCF ANALYSES?

A66. Given the above discussion of DCF principles, the steps are to collect the data, estimate the sample companies' costs of equity at their current capital structures, and then to adjust the sample's estimates to New Mexico-American Water's 45.1 percent equity ratio.

a) Growth Rates

Q67. WHAT GROWTH RATE INFORMATION DO YOU USE?

[28] On April 30, 2008, the Federal Reserve cut the Federal Funds rate by .25 percent, so that it now (May 31, 2008) stands at 2 percent. Also, on March 14, 2008 the Federal Reserve joined forces with JPMorgan to bail out the failing Bear Stearns bank. See, for example, Craig Torres, Bernanke Discards Monetary History with Bear Stearns Bailout, *Bloomberg*, March 15, 2008. See also, *Business Week*, A Sweeter Bear Bid May Sour the Fed, March 24, 2008.

[29] *STB Ex Parte No. 664*, Issued January 17, 2008.

A67. For reasons discussed above and in Appendix D, historical growth rates today are not as relevant as forecasts of current investor expectations for these samples. I therefore use rates forecast by security analysts.

The ideal in a DCF application would be a detailed forecast of future dividends, year by year well into the future until a true steady state (constant) dividend growth rate was reached, based on a large sample of investment analysts' expectations. I know of no source of such data. Dividends are ultimately paid from earnings, however, and earnings forecasts from a number of analysts are available for a few years. Investors do not expect dividends to grow in lockstep with earnings, but for companies for which the DCF approach can be used reliably (*i.e.*, for relatively stable companies whose prices do not include the option-like values described in Appendix D), they do expect dividends to track earnings over the long-run. Thus, use of earnings growth rates as a proxy for expectations of dividend growth rates is a common practice.

Accordingly, the first step in my DCF analysis is to examine a sample of investment analysts' forecast earnings growth rates from Bloomberg and *Value Line* to the degree such forecasts are available. The details are in Appendix D. At present, *Value Line* data run through a 2011-2013 horizon, representing an average of about four years from the current earning forecasts available for 2008. Bloomberg also provides a long-term earnings growth rate estimate. The longest-horizon forecasted growth rates from these sources underlie the simple DCF model (*i.e.*, the standard perpetual-growth model associated with the "DCF formula," dividend yield plus growth). Unfortunately, the longest growth forecast data only go out four to five years, which is too short a period to make the DCF model completely reliable.

b) Dividend and Price Inputs

Q68. WHAT VALUES DO YOU USE FOR DIVIDENDS AND STOCK PRICES?

A68. Dividends are either for the first or the second quarter of 2008, depending on the most recent dividend information available at the time of estimation for each company.[30] This

[30] The dividend information was obtained from Bloomberg.

dividend is grown at the estimated growth rate and divided by the price described below to estimate the dividend yield for the simple DCF model.

Stock prices are an average of closing stock prices for the 15-day trading period ending on the day the BEst forecast was obtained from Bloomberg. A 15-day stock price average is used to guard against anomalous price changes in any single day.

c) DCF Results

Q69. WHAT ARE THE DCF ESTIMATES FOR THE SAMPLES?

A69. The data are used in the two versions of the DCF method to get sample company estimates at the sample company's capital structure. The resulting cost of equity at New Mexico-American Water's 45.1 percent equity estimates are shown in Table 3 above. There is a very large difference between the simple and multi-stage DCF results for the water sample (15.7 versus 10.7 percent), confirming the conclusion drawn above that the water industry is not in a stable equilibrium. As a result, DCF results from the water sample are unreliable, and I therefore do not put any weight on them in arriving at my final estimate. However, for the gas LDC sample both DCF models yields very similar results (11.3 and 11.4 percent), suggesting that the gas LDC sample is indeed of better quality than the water sample at this time. In addition, DCF estimates for the gas LDC sample are not too different from risk-positioning results, albeit on average lower than them.

IV. NEW MEXICO-AMERICAN WATER'S COST OF EQUITY

Q70. WHAT CONCLUSIONS DO YOU DRAW FROM THE ABOVE DATA REGARDING EACH SAMPLE'S COST OF EQUITY AT NEW MEXICO-AMERICAN WATER'S 45.1 PERCENT EQUITY RATIO?

A70. For the gas LDC sample, the estimated costs of equity from the risk-positioning model and from the DCF model are reasonably in line. For the water sample, estimates vary more significantly between different methods, and the DCF results are particularly variable. Although I do not rely upon the DCF model results for the water sample, I believe that DCF cost-of-capital estimates provide a useful check on the risk-positioning

results for the gas LDC sample. The consistency of the multi-stage DCF and the risk-positioning cost-of-equity estimates for the gas LDC sample indicate that those estimates are reasonable.

Q71. DO YOU HAVE ANY COMMENTS REGARDING THE RESULTS OF THE RISK-POSITIONING MODELS?

A71. The estimated cost of equity displayed in Panel B of Table No. BV-12 compared to Table No. BV-22 is significantly higher on average for the water sample. The risk-positioning results are summarized above in Table 3. Of those results, the CAPM values deserve the least weight, because this method does not adjust for the empirical finding that the cost of capital is less sensitive to beta than predicted by the CAPM (which my testimony considers by using the ECAPM). Conversely, the ECAPM numbers deserve the most weight, because this method adjusts for the empirical findings.

Additionally, the estimates based upon the short-term risk-free rate are currently not very reliable for reasons discussed above. If the Fed believes further action is necessary, short-term rates are likely to fall further. On the other hand, if inflation becomes a concern, as it appears to be the case,[31] then short-term rates could remain constant or even start increasing. Because of this uncertainty, I give only weight to the estimates using the long-term risk-free rate at this time, because long-term interest rates are generally less responsive to Fed actions than short-term rates.

Q72. BASED ON THE EVIDENCE WHAT IS YOUR CONCLUSION REGARDING NEW MEXICO-AMERICAN WATER'S REQUESTED 11.75 PERCENT RETURN ON EQUITY?

A72. Based on the results from my cost-of-capital estimation procedures, I conclude that an 11.75 percent return on equity is very reasonable.

Q73. DOES THIS CONCLUDE YOUR TESTIMONY?

A73. Yes.

[31] "Rising Inflation Limits the Fed as Growth Lags," *The New York Times*, February 21, 2008.

APPENDIX A

RESUME OF DR. BENTE VILLADSEN

Bente Villadsen's work concentrates in the areas of regulatory finance and accounting. Her recent work has focused cost of capital, credit issues in the utility industry as well the impact of regulatory initiatives such as energy efficiency and de-coupling. Other recent work has included damage estimation, accounting disclosure and principles including impairment testing, leases, mark-to-market accounting, accounting for hybrid securities, accounting for equity investments, cash flow estimation as well as overhead allocation. She has testified on cost of capital, accounting issues, and damages.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management with a concentration in accounting. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining *The Brattle Group*, she was a Professor of Accounting at the University of Iowa, University of Michigan, and at Washington University in St. Louis where she taught financial and cost accounting. Dr. Villadsen also worked as a consultant for Risoe National Laboratories in Denmark.

REPRESENTATIVE EXPERIENCE

ENERGY AND PUBLIC UTILITY FINANCE

- Dr. Villadsen has filed several cost of capital testimonies and appeared at hearings for water, wastewater and electric utilities in connection with rate hearings before regulatory commissions.

- She has considerable experience in estimating the cost of capital for major U.S., Canadian and European utilities, pipelines, and railroads. The work has been used in connection with the companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, the Surface Transportation Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies, water utilities, railroads and other parties.

- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.

- Dr. Villadsen has been part of a team assessing the impact of conservation initiatives, energy efficiency, and decoupling of volumes and revenues on electric utilities financial

performance. Specifically, she has estimated the impact of specific regulatory proposals on the affected utilities earnings and cash flow.

- For a large integrated utility in the U.S., Dr. Villadsen participated in all aspects of the company's rate filing, including the company's cost of capital, incentive based rates, and certain regulatory accounting issues.

- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluating the impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.

- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.

- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).

ACCOUNTING AND CORPORATE FINANCE

- In a recent international arbitration matter, Dr. Villadsen filed expert testimony on the allocation of corporate overhead costs and damages in the form of lost profit.

- Dr. Villadsen has provided expert reports and testimony on several accounting issues in international and domestic arbitrations or court proceedings. In a recent international arbitration, she testified on the proper application of US GAAP in determining shareholders' equity. Among other topics, she testified regarding impairment of long-lived assets, lease accounting, the equity method of accounting, and the measurement of investing activities. In a U.S. arbitration, she provided expert reports on the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities in a contract dispute between two major oil companies.

- In U.S. District Court, Dr. Villadsen filed testimony regarding the information required to determine accounting income losses associated with a breach of contract and cash flow modeling.

- She has worked extensively on litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts, the application of accounting principles, and disclosure requirements regarding derivatives.

- Dr. Villadsen evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.

- Dr. Villadsen evaluated the performance of segments of regulated entities. She also reviewed and evaluated the methods used for in overhead allocation.

- She has worked on accounting issues in connection with several tax shelter cases. The focus of her work has been the application of accounting principles to evaluate intra-company transactions, the accounting treatment of security sales, and the classification of debt and equity instruments.

- Dr. Villadsen has modeled the cash flows of several companies to estimate the impact of specific (energy) contracts or to determine the impact of specific loans.

- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.

- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.

- In connection with commercial litigation, Dr. Villadsen estimated the cost of capital for companies in the chemical industry and for companies in the cement industry.

RECENT PUBLICATIONS

"Understanding Debt Imputation Issues," (with Michael J. Vilbert and Joe Wharton and *The Brattle Group* listed as an author), *Edison Electric Institute*, forthcoming, Summer 2008.

"Building Sustainable Efficiency Businesses: Volume I – Approaches and Models," (with Joe Wharton and Peter Fox-Penner, and with "*The Brattle Group*" listed as author), *Edison Electric Institute*, forthcoming, Summer 2008.

"Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low," *Public Utilities Fortnightly*, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

"The Effect of Debt on the Cost of Equity in a Regulatory Setting," (with A. Lawrence Kolbe and Michael J. Vilbert, and with "*The Brattle Group*" listed as author), *Edison Electric Institute*, April 2005.

"Communication and Delegation in Collusive Agencies," *Journal of Accounting and Economics*, Vol. 19, 1995.

"Beta Distributed Market Shares in a Spatial Model with an Application to the Market for Audit Services" (with M. Hviid), *Review of Industrial Organization*, Vol. 10, 1995.

REPRESENTATIVE PRESENTATIONS

"Subprime Mortgage-Related Litigation: What to Look for and Where to Look," *Law Seminars International: Damages in Securities Litigation*, Boston, May 2008.

"Evaluating Alternative Business / Inventive Models," (with Joe Wharton). *EEI Workshop, Making a Business of Energy Efficiency: Sustainable Business Models for Utilities*, Washington DC, December 2007.

"Deferred Income Taxes and IRS's NOPR: Who should benefit?", *NASUCA Annual Meeting*, Anaheim, CA, November 2007.

"Current Issues in Cost of Capital," (with M.J. Vilbert). *EEI Electric Rates Advanced Course*, Madison, 2005.

"Issues for Cost of Capital Estimation," (with M.J. Vilbert). *EEI Cost of Capital Conference*, Chicago, 2004.

"Discussion of 'Are Performance Measures Other Than Price Important to CEO Incentives?'" *Annual Meeting of the American Accounting Association*, 2000.

"Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach," (with R.T. Boylan) *Business and Management Assurance Services Conference*, Austin 2000.

TESTIMONY

Direct Testimony on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-08-0227, April 2008.

Direct Testimony on cost of capital and carrying charge on damages, U.S. Department of Energy, Bonneville Power Administration, BPA Docket No. WP-07, March 2008.

Expert Report, Supplemental Expert Report, and Hearing Appearance on the allocation of corporate overhead and damages from lost profit. The International Centre for the Settlement of Investment Disputes, Case No. ARB/03/29, February, April, and June 2008 (*Confidential*).

Expert Report on accounting information needed to assess income. United States District Court for the District of Maryland (Baltimore Division), Civil No. 1:06cv02046-JFM, June 2007 (*Confidential*)

Expert Report, Rebuttal Expert Report, and Hearing Appearance regarding investing activities, impairment of assets, leases, shareholder' equity under U.S. GAAP and valuation. International Chamber of Commerce (ICC), Case No. 14144/CCO, May 2007, August 2007, September 2007. (Joint with Carlos Lapuerta, *Confidential*)

Direct Testimony, Rebuttal Testimony, and Hearing Appearance on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0491, July 2006, July 2007, August 2007.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, Supplemental Rejoinder Testimony and Hearing Appearance on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0403, June 2006, April 2007, May 2007.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, and Hearing Appearance on cost of capital before the Arizona Corporation Commission on behalf of Arizona-American Water in Docket No. W-01303A-06-0014, January 2006, October 2006, November 2006.

Expert report, rebuttal expert report, and deposition on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, August 2004 and November 2004. (*Confidential*).

APPENDIX B

SELECTING THE WATER AND GAS LDC SAMPLES AND THE USE OF MARKET VALUES

I. SAMPLE SELECTION AND THE CHARACTERISTICS OF EACH SAMPLE

A. The Water Sample

Q1. How did you select your sample of water utilities?

A1. The goal was to create a sample of companies whose primary business is as a regulated water utility with business risk generally similar to that of New Mexico-American Water. To construct this sample, I started with the universe of ten water utility companies listed as such in the *Value Line Investment Survey - Plus Edition*. I then eliminated Sun Hydraulics because, although listed as a water utility by *Value Line*, its operations consist mainly of producing industrial equipment.[1]

Normally, I would apply several additional selection criteria to eliminate companies with unique circumstances that may affect the cost of capital estimates. For example, I would normally eliminate companies with annual revenues lower than $300 million in 2007,[2] no or low bond ratings, lack of growth estimates or Bloomberg data, and all companies with announced dividend cuts or that were involved in significant merger activity over the last five years (2003 to today). However, applying these procedures to the nine water utilities followed by *Value Line* would result in a sample of at most three companies. (The areas of concern associated with the companies included in the sample are detailed below.) I try to balance my standard criteria against the need to have a reasonable sample size. This results in the use of all nine companies to form a full sample, as well as the use of eight companies to form a subsample with a high percentage of regulated revenues.[3] The nine companies that form the full sample of water utilities are American States Water Co., Aqua America Inc., California Water Service Group, Connecticut Water Service Inc.,

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[1] According to the company's webpage (www.sunhydraulics.com), it develops and manufactures valves and manifolds. Bloomberg lists it as part of its "metal fabricate/hardware" industry group.

[2] Table No. BV-2 and its associated workpapers report the share of operating revenues from different lines of business in 2007 for these companies. (Table No. BV-1 provides an index to the other tables.)

[3] Southwest Water Company is dropped from the subsample because it only earns an estimated 44 percent of its 2007 revenues from regulated activities. The remaining companies in the subsample earn at least an estimated 88 percent of their 2007 revenues through regulated activities.

Middlesex Water Co., Pennichuck Corp., SJW Corp., Southwest Water Co., and York Water Co.[4]

Q2. Why do you usually eliminate companies currently involved in a merger from your samples?

A2. The stock prices of companies involved in mergers are often more affected by news relating to the merger than by movements in the stock market. In other words, the stock price "decouples" from its normal relationship to the stock market (the economy) which is the basis upon which a company's relative risk is calculated. Instead the stock price of a merger candidate is more affected by the latest speculation on the terms and probability of the merger.

Q3. What are some of the water sample's data problems?

A3. First, of the nine water utilities followed by *Value Line*, four companies (Connecticut Water, Middlesex Water, Pennichuck, and York Water) have 2007 revenues below $100 million. If I were to consider the threshold of $300 million I usually rely on, then six of the nine companies would fall under it. The stocks of small companies frequently exhibit "thin trading" which means that their stock trades infrequently. Indeed, since January of 2007, the four companies listed above have traded an average of less than 20,000 shares per trading day. In percentage terms, these companies traded less than 0.15 percent of their shares outstanding. By contrast, each of the gas LDC sample companies had an average trading volume of at least 120,000 shares per day (180,000 if Laclede Group were excluded), which in percentage terms represented more than 0.45 percent of shares outstanding for each company. Greater trading volume gives the expert more confidence in estimates relying on market data since there is less likelihood of a delay between the release of important information and the time that this information is reflected in prices. For example, such delay is well known to cause beta estimates to be statistically insignificant and possibly biased.

[4] Pennichuck Corp. is a recent addition to *Value Line's* water utilities group.

Second, five companies lack long-term earnings forecasts from *Value Line*, and four companies only have one analyst providing BEst growth rate forecasts. In addition, the existing growth rates estimates are highly variable, ranging from a low of 0.9 percent to a high of 14 percent. Such highly variable growth rates are not indicative of an industry that is stable and cast doubt on the applicability of the DCF model to this industry at this time.

Third, only three companies have significant revenue, stocks with substantial trading, a bond rating and more than one long-term growth forecast from BEst.

Fourth, many companies have significant merger activity over the last five years, leading *Value Line* to note that "the acquisitions market has been white hot."[5] For example, Aqua America acquired more than two dozen smaller companies in 2007, while Southwest Water Co. completed six small acquisitions in the last three years, the most recent of which in February 2008.[6] The large number of mergers and acquisitions is an indication of an industry in flux which will certainly affect the DCF estimates and perhaps the risk positioning estimates as well.

These factors may all potentially affect the cost of equity estimates in ways not completely predictable. Because of the substantial data problems and the lack of a large number of publicly traded water utilities, without considering the gas LDC sample I would be forced to rely either on a sample with significant data problems, or on a sample with at most three companies (American States Water Company, Aqua America Inc., and California Water Services Group).[7]

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[5] *Value Line Investment Survey*, Water Utility Industry, April 25, 2008.

[6] Sources: *Value Line Investment Survey*, April 25, 2008, Bloomberg mergers and acquisitions historical search, performed March 24, 2008.

[7] Several companies have multiple problems. For example, Connecticut Water has revenues below $100 million, exhibits thin trading and lacks *Value Line* long-term earnings growth forecasts. Middlesex Water has revenues below $100 million, no long-term *Value Line* earnings forecast, and had a dividend cut in 2003. York Water has revenues below $100 million, exhibits thin trading and has no long-term *Value Line* earnings forecast.

B. The Gas Local Distribution Companies Sample

Q4. How do you select your gas local distribution company sample?

A4. To select this sample, I started with the universe of publicly traded natural gas utilities covered by *Value Line Investment Survey – Plus Edition.* This resulted in an initial group of 18 companies. I then eliminated companies by applying additional selection criteria designed to eliminate companies with unique circumstances which may bias the cost of capital estimates.

Q5. What are the selection criteria you applied?

A5. I eliminated all companies whose regulated assets are not greater than 50 percent of their total assets as reported in each company's 2007 10-K form, because one goal for this sample was for the companies to be primarily engaged in regulated activities. I also eliminated all companies whose bond rating was less than BBB- as rated by S&P, and companies that had a large merger during the period May 2003 to May 2008.[8] Merger activity is obtained from Bloomberg, which provides a history of past acquisitions and divestitures for each company, and also the size of each transaction, if such information is available.[9] To guard against measurement bias caused by "thin trading," I also restricted the sample to companies with total operating revenues greater than $300 million in 2007.

Finally, I required that the companies have historical data available from Bloomberg and that they had no dividend cuts or restatement of financial statements in the past five years, since the latter can be signs of financial distress.

The final sample consists of ten gas LDC companies: AGL Resources Inc., Atmos Energy Corp., Laclede Group Inc., Nicor Inc., New Jersey Resources Corp., Northwest Natural Gas Co., Piedmont Natural Gas Co., South Jersey Industries Inc., Southwest Gas Corp., and WGL Holdings Inc.

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[8] One company included in the sample (Atmos Energy Corp.) did undertake an acquisition in 2004. I discuss below the reasons for keeping it in the sample.

[9] For purposes of sample selection, a sizeable merger is defined to be one which would exceed 30 percent of the total capitalization of the company at the time of the merger announcement.

Q6. What companies did you eliminate before arriving at the final sample?

A6. I eliminated four companies because they had no bond rating and their annual revenues were less than $300 million (Chesapeake Utilities Corp., Energy West Inc., EnergySouth Inc., and RGC Resources Inc.), three companies because their credit ratings were below investment grade, and were involved primarily in the sale of propane or heating oil (Amerigas Partners LP, Ferrellgas Partners LP, and Star Gas Partners LP), and lastly one company because it had significant M&A activity in the last five years, was not rated by S&P, and is involved primarily in the sale of propane (UGI Corp.).

Q7. Are there any issues with the remaining companies in your sample?

A7. Possibly. Atmos Energy acquired TXU Gas Company in 2004 for $1.925 billion, making it a candidate for exclusion from the sample because of significant M&A activity. In balancing the goal to have a larger sample with the desire to have a problem-free sample, I decided to include Atmos in the gas LDC sample because the acquisition occurred relatively close to the five-year threshold that I consider relevant for this criterion. However, excluding Atmos Energy from the sample would raise cost of equity estimates by approximately 10 basis points. As a result, my estimates are conservative, and the inclusion of Atmos Energy is not a source of concern about sample quality.

Q8. Please compare the characteristics of the water utility sample and the gas LDC sample.

A8. Both samples consist of companies with substantial capital investments in distribution facilities. Also, companies in both samples earn a large percentage of their revenue from regulated activities and serve a mix of residential, industrial, and other customers. The water subsample includes only those companies with a higher percent of their revenues from regulated utilities and fewer data problems which was at least 88 percent of revenues from regulated activities in 2007. Companies in the gas LDC sample had at least 70 percent of their assets attributable to regulated activities. (See Table No. BV-2

and Table No. BV-13).[10] All companies in the water utility sample and the gas LDC sample are regulated by one or more states.

For both the water/wastewater industry and the gas distribution industry, environmental compliance costs and infrastructure investments are of importance. Many gas LDC companies discuss environmental clean-up requirements in their 10-K. Similarly, the companies in the water industry also face regulatory requirements from federal and local authorities through, for example, the Clean Water Act of 1974 and EPA enforcement, which will likely require the water industry to invest substantial amounts in infrastructure going forward.[11]

Q9. What do you conclude from the comparison of the water utility and the gas LDC samples?

A9. The two samples differ primarily in that they operate in two different (regulated) industries, but they are very similar in terms of the magnitude of regulated activities, the customers mix they serve, and the magnitude and type of infrastructure needed. The gas LDC sample provides a reasonable comparison sample for the water utility industry but without the substantial data issues.

[10] Water utilities often do not report the percentage of assets subject to regulatory activities, while gas LDCs do. Both measures are likely to be good indicators of the relative magnitude of regulated activities, which is relevant to gauge the risk of the entities. Therefore, Table No. BV-2 and its associated workpapers report the share of operating revenues from different lines of business in 2007 for water utilities while Table No. BV-13 reports the share of regulated assets for gas LDC companies. (Table No. BV-1 provides an index to the other tables.)

[11] The *Value Line Investment Survey* (Water Utility Industry, April 25, 2008) mentions that infrastructure-related costs "are likely to remain at exorbitant levels and climb into the hundreds of millions of dollars in the coming decade."

II. MARKET VALUE CAPITAL STRUCTURE, COSTS OF DEBT & COSTS OF PREFERRED EQUITY

Q10. What capital structure information do you require?

A10. For reasons discussed in my written evidence and explained in detail in Appendix E, explicit evaluation of the market-value capital structures of the sample companies versus the capital structure used for rate making is vital for a correct interpretation of the market evidence. This requires estimates of the market values of common and preferred equity and debt, and the current market costs of preferred equity and debt.

Q11. How do you calculate the market-value capital structures of the sample companies?

A11. I estimate the capital structure for each company by estimating the market values of common equity, preferred equity and debt from publicly available data. The calculations are in Panels A to I of Table No. BV-3 and Panels A to J of Table No. BV-14 for the water and gas LDC sample, respectively.

The market value of equity is straightforward: the price per share times the number of shares outstanding. The market value of preferred equity is set equal to its book value because the portion of the capital structure financed with preferred equity is generally small. The market value of debt is estimated at the book value of debt reported by Bloomberg plus or minus the difference in the estimated fair (market) value and book value of long-term debt as reported in the companies' 10-Ks or annual reports.[12]

For purposes of assessing financial risk to common shareholders, I add an adjustment for short-term debt to the debt portion of the capital structure. This adjustment is used only for those companies whose short-term (current) liabilities exceed their short-term (current) assets. I add an amount equal to the minimum of the difference between short-term liabilities and short-term assets or the amount of short-term debt. The reason for

[12] See Panels A through I in Table No. BV-3 and Panels A through J in Table BV-14 for details. The adjustment relies on the difference between the companies' self-reported fair value of long-term debt and the carrying value of the same line items. This information was obtained from the sample companies' annual reports.

this adjustment is to recognize that when current liabilities exceed current assets, a portion of the company's long-term assets are being financed, in effect, by short-term debt.

The market value capital structure is calculated to be consistent with the time period over which the cost of capital is estimated for each sample. The capital structure is determined over the historical period over which the relevant risk positioning parameters were determined and as of the date analysts provide forward looking growth forecasts. Therefore, Tables No. BV-3 and BV-14 report the market value capital structure at year end for the years ending 2003 – 2007. The output of each of these tables is the market equity-to-value, debt-to-value, and preferred equity-to-value ratios. The overall cost of capital calculation for the risk positioning estimates rely on the average of the market value capital structure computed for the years 2003 through 2007, as shown in Tables No. BV-4 and BV-15, respectively. The results in columns [1]-[3] are used in the DCF model calculations, while columns [4]-[6] are for the risk positioning models.

Q12. How do you estimate the current market cost of preferred equity?

A12. For companies with preferred equity, the cost of preferred equity for each company was set equal to the yield on an index of preferred stock as reported in the *Mergent Bond Record* corresponding to the S&P rating of that company's debt. The yields from *Mergent Bond Record* were as of March 2008.[13] In general, the average amount of preferred equity in the sample companies' capital structures is very small and frequently zero. No company in either sample has more than one percent preferred equity (see Tables BV-4 and BV-15).

Q13. How do you estimate the current market cost of debt?

A13. The market cost of debt for each company in the DCF analysis is the current yield reported by Bloomberg for a public utility company bond corresponding to the sample company's current debt rating as classified by S&P. The risk positioning analysis, on the other hand, uses the current yield of a utility bond that corresponds to the five-year

[13] As of the time of estimation, March data were the most recent available on preferred yields.

average debt rating of each company so as to match consistently the horizon of information used by *Value Line* to estimate company betas. The current S&P debt ratings were obtained from Bloomberg.[14]

The fifteen day average yield on A-rated Public Utility bonds was 6.41 percent as of May 7, 2008, and 6.76 percent on average for BBB-rated Public Utility bonds. (See Panel A of Workpaper #1 to Table No. BV-11 for the yields on utility bonds and preferred stock by credit rating.) Based on information from the Company, the corporate tax rate was set at 39.9 percent which corresponds to the corporate tax rate in New Mexico. Calculation of the after-tax cost of debt uses the marginal tax rate 39.9 percent.

[14] Debt ratings were not available for Pennichuck Corp., SJW Corp, and Southwest Water Co.'s. I assumed a rating of A, which is the same as that of all other water utilities in the sample.

APPENDIX C

RISK POSITIONING METHODOLOGY AND EMPIRICAL RESULTS

Q1. What is the purpose of this appendix?

A1. This appendix reviews the principles behind the risk positioning methodologies, describes the estimation of the parameters used in the models, and details the cost of capital estimates obtained from these methodologies. This appendix intentionally repeats portions of my direct testimony, because I want the reader to be able to have a full discussion of the issues addressed here, rather than having to continually turn back to the corresponding section of the testimony.

I. EQUITY RISK PREMIUM METHODOLOGY

Q2. How is this section of the appendix organized?

A2. It first reviews the basic nature of the equity risk premium approach. It then discusses the individual components of the model: the benchmark risk premium, the relative risk of the company or line of business in question, the appropriate interest rate, and the combination of these elements in a particular equity risk premium model.

A. THE BASIC EQUITY RISK PREMIUM MODEL

Q3. How does the equity risk premium model work?

A3. The equity risk premium approach estimates the cost of equity as the sum of a current interest rate and a risk premium. (It therefore is sometimes also known as the "risk premium" or the "risk positioning" approach.)

This approach may sometimes be applied informally. For example, an analyst or a commission may check the spread between interest rates and what is believed to be a reasonable estimate of the cost of capital at one time, and then apply that spread to changed interest rates to get a new estimate of the cost of capital at another time.

More formal applications of the equity risk premium method implement theoretical finance models of cost of capital. They use information on all securities to identify the security market line (Figure 1 in the body of the testimony) and derive the cost of capital

for the individual security based on that security's relative risk. This equity risk premium approach is widely used and underlies most of the current scholarly research on the nature, determinants and magnitude of the cost of capital.

Q4. How are "more formal applications" put into practice?

A4. The essential benchmarks that determine the security market line are the risk-free interest rate and the premium that a security of average risk commands over the risk-free rate. This premium is commonly referred to as the "market risk premium" ("MRP"), i.e., the excess of the expected return on the average common stock over the risk-free interest rate. In the equity risk premium approach the risk-free interest rate and MRP are common to all securities. A security-specific measure of relative risk (beta) is estimated separately and combined with the MRP to obtain the company-specific risk premium.

In principle, there may be more than one factor affecting the expected stock return, each with its own security-specific measure of relative risk and its own benchmark risk premium. For example, the "arbitrage pricing theory" and other "multi-factor" models have been proposed in the academic literature. These models estimate the cost of capital as the sum of a risk-free rate and several security-specific risk premia. However, none of these alternative models has emerged in practice as "the" improvement to use instead of the original, single-factor model. I use the traditional single-factor model in this testimony.

Accordingly, the required elements in my formal equity risk premium approach are the market risk premium, an objective measure of relative risk, the risk-free rate that corresponds to the measure of the market risk premium, and a specific method to combine these elements into an estimate of the cost of capital.

B. MARKET RISK PREMIUM

Q5. Why is a risk premium necessary?

A5. Experience (e.g., the U.S. market's October Crash of 1987) demonstrates that shareholders, even well diversified shareholders, are exposed to enormous risks. By

investing in stocks instead of risk-free Government bills, investors subject themselves not only to the risk of earning a return well below those they expected in any year but also to the risk that they might lose much of their initial capital. This is why investors demand a risk premium.

I estimate and show two versions of the Capital Asset Pricing Model ("CAPM"). The first version measures the market risk premium as the risk premium of average risk common stocks over the long-term risk-free rate. Because short-term risk-free rates currently are influenced substantially by monetary policy, I do not rely on the numbers from this version of the CAPM. Specifically, the short-term risk-free rates are unusually low and likely driven by the Federal Reserve's recent interest rate cuts.[1] It is also noteworthy that the Surface Transportation Board ("STB") in a recent decision decided to rely exclusively on long-term risk-free rates in the implementation of the CAPM.[2]

Q6. Please discuss some of the issues involved in selecting the appropriate MRP.

A6. To determine the cost of capital in a regulatory proceeding, the MRP should be used with an estimate of the same interest rate used to calculate the MRP (i.e., the short-term Treasury bill rate or the long-term Government rate). For example, it would be inconsistent to utilize a short-term risk-free with an estimate of the MRP derived from comparisons to long-term interest rates. In addition, the appropriate measure of the MRP should be based upon the arithmetic mean not the geometric mean return.[3] The arithmetic mean is the simple average while the geometric mean is the compound rate of return between two periods.

Q7. How do you estimate the MRP?

A7. There is presently little consensus on "best practice" for estimating the MRP, which does not mean that each approach is equally valid. For example, the leading graduate textbook

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[1] According to the Federal Reserve Board: *Monetary Policy, Open Market Operations*, June 13, 2008, the Federal Reserve has cut interest rates seven times for a total of 275 basis points since September 2007, so that the Federal Funds Rate now (June 13, 2008) stands at 2%.

[2] See, *STB Ex Parte No. 664*, issued January 17, 2008, p. 7.

[3] See, for example, Morningstar, *Ibbotson SBBI Valuation Yearbook 2008*, pp. 77-79.

in corporate finance, after recommending use of the arithmetic average realized excess return on the market for many years (which for a while was noticeably over 9 percent), now reviews the current state of the research and expresses the view that the a range between 5 to 8 percent is reasonable for the U.S.[4,5] At the same time, Dimson, Marsh, and Staunton (2008) estimate that the average arithmetic risk premium of stocks *over bonds* in the U.S. was 6.5% for the period 1900 to 2007.[6] In a recent proceeding the Surface Transportation Board ("STB") decided to switch from a DCF model to the CAPM model when estimating the cost of equity for U.S. railroads. The STB further decided to rely on the arithmetic risk premium of stocks over long-term bonds as reported in Morningstar / Ibbotson (currently 7.1 percent).[7]

My written testimony considers both the historical evidence and the results of scholarly studies of the factors that affect the risk premium for average-risk stocks in order to estimate the benchmark risk premium investors currently expect. I consider the historical difference in returns between the Standard and Poor's 500 Index ("S&P 500") and the risk-free rate, recent academic literature on the MRP and the results of recent surveys to estimate the market risk premium.

Q8. Please summarize the recent literature on the MRP and the conclusions you draw from it.

A8. Some recent research based upon U.S. data challenges the conventional wisdom of using the arithmetic average historical excess returns to estimate the MRP. However, after reviewing the issues in the debate, I remain skeptical for several reasons that the market risk premium has declined in the U.S. as much as is claimed in some of the literature.

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[4] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, McGraw-Hill, 8th edition, 2006, pp. 151-154.

[5] In past editions, the authors expressed the view that they are "most comfortable" with values toward the upper end of that range, but this language does not appear in the 8th edition. Although Professor Myers still holds this view, this language and other sections were dropped to accommodate a request to reduce the length of the text.

[6] Dimson, Marsh and Staunton, *Global Investment Returns Yearbook 2008*, p. 48.

[7] *STB Ex Parte No. 664*, Issued January 17, 2008, pp. 8-9.

First, despite eye-catching claims like "equity risk premium as low as three percent,"[8] and "the death of the risk premium,"[9] not all recent research arrives at the same conclusion. In his presidential address to the American Finance Association in 2001, Professor Constantinides seeks to estimate the unconditional equity premium based on average historical stock returns.[10] (Note that this address was based upon evidence just before the major fall in market value.) He adjusts the average returns downward by the change in price-earnings ratio because he assumes no change in valuations in an unconditional state. His estimates for 1926 to 2000 and 1951 to 2000 are 8.0 percent and 6.0 percent, respectively, over the 3-month T-bill rate. In another published study in 2001, Professors Harris and Marston use the DCF method to estimate the market risk premium for the U.S. stocks.[11] Using analysts' forecasts to proxy for investors' expectation, they conclude that over the period 1982-1998 the MRP over the *long-term* risk-free rate is 7.14 percent. As yet another example, the paper by Drs. Ibbotson and Chen (2003) adopts a supply side approach to estimate the forward looking long-term sustainable equity returns and equity risk premium based upon economic fundamentals. Their equity risk premium over the *long-term* risk-free rate is estimated to be 3.97 percent in geometric terms and 5.90 percent on an arithmetic basis. They conclude their paper by stating that their estimate of the equity risk premium is "far closer to the historical premium than being zero or negative."[12] Morningstar has in recent years updated part of the Ibbotson and Chen analysis and found in the 2007 edition that the arithmetic MRP was approximately 6.35 percent over government bonds.[13]

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[8] Claus, J. and J. Thomas, (2001), "Equity Risk Premium as Low as Three Percent: Evidence from Analysts' Earnings Forecasts for Domestic and International Stocks," *Journal of Finance* 56:1629-1666.

[9] Arnott, R. and R. Ryan, (2001), "The Death of the Risk Premium," *Journal of Portfolio Management* 27(3):61-84.

[10] Constantinides, G.M. (2002), "Rational Asset Prices," *Journal of Finance* 57:1567-1591.

[11] Robert S. Harris and Felicia C. Marston, "The Market Risk Premium: Expectational Estimates Using Analysts' Forecasts," *Journal of Applied Finance* 11 (1) 6-16, 2001.

[12] Ibbotson, R. and P. Chen (2003), "Stock Market Returns in the Long Run: Participating in the Real Economy," *Financial Analyst Journal*, 59(1):88-98. Cited figures are on p. 97.

[13] Morningstar, Morningstar, SBBI Valuation Edition 2007 Yearbook, p. 97.

Second, Professor Ivo Welch surveyed a large group of financial economists in 1998 and 1999. The average of the estimated MRP was 7.1 percent in Prof. Welch's first survey and 6.7 percent in his second survey which was based on a smaller number of individuals. A subsequent survey[14] by Prof. Welch reported only a 5.5 percent MRP.[15] In characterizing these results Prof. Welch notes that "[T]he equity premium consensus forecast of finance and economics professors seems to have dropped during the last 2 to 3 years, a period with low realized equity premia."[16] However, in the most recent survey,[17] conducted in December 2007, Prof. Welch finds that the average estimate has increased to about 5.7 percent.

The above quotation from Prof. Welch emphasizes the caution that must attend survey data even from knowledgeable survey participants: the outcome is likely to change quickly with changing market circumstances.

Third, some of the evidence for negative or close to zero market risk premium simply does not make sense. Despite the relatively high valuation levels, stock returns remain much more volatile than Treasury bond returns. I am not aware of any empirical or theoretical evidence showing that investors would rationally hold equities and not expect to earn a positive risk premium for bearing their higher risk.

Fourth, I am unaware of a convincing theory for why the future MRP should have substantially declined. At the height of the stock market bubble in the U.S., many claimed that the only way to justify the high stock prices would be if the MRP had

[14] Ivo Welch (2000), "Views of Financial Economists on the Equity Premium and on Professional Controversies," *Journal of Business*, 73(4):501-537. The cited figures are in Table 2, p. 514.

[15] Ivo Welch (2001), "The Equity Premium Consensus Forecast Revisited," School of Management at Yale University working paper. The cited figure is in Table 2.

[16] *Ibid*, p. 8.

[17] See Ivo Welch (2008), "The Consensus Estimate for the Equity Premium by Academic Financial Economists in December 2007," School of Management at Yale University working paper. The cited figure is in Table 2.

declined dramatically,[18] but this argument was heard less frequently after the market declined substantially from its tech bubble high. All else equal, a high valuation ratio such as price-earnings ratio implies a low required rate of return, hence a low MRP. However, there is considerable debate about whether the high level of stock prices (despite the burst of the internet bubble from its high in the summer of 2000) represents the transition to a new economy or is simply an "irrational exuberance," which cannot be sustained for the long term. If the former case is true, then the MRP may have decreased permanently. Conversely, the long-run MRP may remain the same even if expected market returns in the short-term are smaller.

Another common argument for a lower expected MRP is that the U.S. experienced very remarkable growth in the 20th century that was not anticipated at the start of the century. As a result, the average realized excess return is overestimated meaning the standard method of estimating the MRP would be biased upward. However, one recent study by Professors Jorion and Goetzmann finds, under some simplifying assumptions, that the so-called "survivorship bias" is only 29 basis points.[19] Furthermore, "[I]f investors have overestimated the equity premium over the second half of the last century, Constantinides (2002) argues that 'we now have a bigger puzzle on our hands' Why have investors systematically biased their estimates over such a long horizon?"[20]

To sum up the above, I cite two passages from Profs. Mehra and Prescott's review of the theoretical literature on equity premium puzzle:[21]

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[18] See Robert D. Arnott and Peter L. Bernstein, "What Risk Premium is 'Normal'?," *Financial Analysts Journal* 58:64-85, for an example.

[19] Jorion, P., and W. Goetzmann (1999), "Global Stock Markets in the Twentieth Century," *Journal of Finance* 54:953-980. Dimson, Marsh, and Staunton (2003) make a similar point when they comment on the equity risk premia for 16 countries based on returns between 1900 and 2001: "While the United States and the United Kingdom have indeed performed well, compared to other markets there is no indication that they are hugely out of line." p.4.

[20] Mehra, R., and E.C. Prescott (2003), "The Equity Premium in Retrospect," in *Handbook of the Economics of Finance*, Edited by G.M. Constantinides, M. Harris and R. Stulz, Elsevier B.V, p. 926

[21] *Ibid*, p. 926.

> Even if the conditional equity premium given current market conditions is small, and there appears to be general consensus that it is, this in itself does not imply that it was obvious either that the historical premium was too high or that the equity premium has diminished.
>
> In the absence of this [knowledge of the future], and based on what we currently know, we can make the following claim: over the long horizon the equity premium is likely to be similar to what it has been in the past and the returns to investment in equity will continue to substantially dominate that in T-bills for investors with a long planning horizon.

Q9. Is there other scholarly support for the conclusion?

A9. Yes. Another line of research was pursued by Steven N. Kaplan and Richard S. Ruback. They estimate the market risk premium in their article, "The Valuation of Cash Flow Forecasts: An Empirical Analysis."[22] Professors Kaplan and Ruback compare published cash flow forecasts for management buyouts and leveraged recapitalization over the 1983 to 1989 period against the actual market values that resulted from these transactions. One of their results is an estimate of the market risk premium over the long-term Treasury bond yield that is based on careful analysis of actual major investment decisions, not realized market returns. Their median estimate is 7.78 percent and their mean estimate is 7.97 percent.[23] This is considerably higher than my estimate of 6.5 percent. Even if the maturity premium of Treasury bonds over Treasury bills were only 1 percent, well below the best estimate of 1.5 percent the resulting estimate of the market risk premium over Treasury bills is higher than my estimate of 8.0 percent.

Q10. In addition to the scholarly articles and survey evidence you discussed in Section I of your Direct Testimony, what other evidence do you consider to estimate the MRP?

A10. I also consider the long-run realized equity premia reported in Morningstar's *Ibbotson SBBI Valuation Yearbook 2008*. The data provided cover the period 1926 through 2007. The results are discussed below.

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[22] *Journal of Finance*, 50, September 1995, pp. 1059-1093.

[23] *Ibid*, p. 1082.

Q11. What is the "long-run realized risk premium" in the U.S.?

A11. From 1926 to 2007, the full period reported, Morningstar's data show that the average premium of stocks over Treasury bills is 8.5 percent. I also examine the "post-War" period. The risk premium for 1947-2007 is 8.3 percent.[24] (I exclude 1946 because its economic statistics are heavily influenced by the War years; e.g., the end of price controls yielded an inflation rate of 18 percent. It is not really a "post-War" year, from an economic viewpoint.) These averages often change slightly when another year of data is added to the Ibbotson series. The average premium of stocks over the income returns on long-term Government bonds is 7.1 percent for the 1926 to 2007 period and 7.0 for the 1947 to 2007 period.

Recently there has been a great deal of academic research on the MRP. This research has put practitioners in a dilemma: there is nothing close to a consensus about how the MRP should be estimated, but a general agreement in the academic community seems to be emerging that the old approach of using the average realized return over long periods gives too high an answer.

Q12. What is your conclusion regarding the MRP?

A12. Estimation of the MRP remains controversial. There is no consensus on its value or even how to estimate it. Given a careful review of all of the information, I estimate the risk premium for average risk stocks to be 8.0 percent over Treasury bills and 6.5 percent over long-term Government bonds.

C. RELATIVE RISK

Q13. How do you measure relative risk?

A13. The risk measure I examine is the "beta" of the stocks in question. Beta is a measure of the "systematic" risk of a stock — the extent to which a stock's value fluctuates more or less than average when the market fluctuates. It is the most commonly used measure of risk in capital market theories.

[24] Morningstar, *Ibbotson SBBI Valuation Yearbook 2008*, Appendix A, Table A-3.

Q14. Please explain beta in more detail.

A14. The basic idea behind beta is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification. Beta is a measure of the risks that *cannot* be eliminated by diversification.

Diversification is a vital concept in the study of risk and return. (Harry Markowitz won a Nobel Prize for work showing just how important it was.) Over the long run, the rate of return on the stock market has a very high standard deviation, on the order of 15 - 20 percent per year. But many individual stocks have much higher standard deviations than this. The stock market's standard deviation is "only" about 15 - 20 percent because when stocks are combined into portfolios, some of the risk of individual stocks is eliminated by diversification. Some stocks go up when others go down, and the average portfolio return — positive or negative — is usually less extreme than that of individual stocks within it.

In the limiting case, if the returns on individual stocks were completely uncorrelated with one another, the formation of a large portfolio of such stocks would eliminate risk entirely. That is, the market's long-run standard deviation would be not 15-20 percent per year, but virtually zero.

The fact that the market's actual annual standard deviation is so large means that, in practice, the returns on stocks are correlated with one another, and to a material degree. The reason is that many factors that make a particular stock go up or down also affect other stocks. Examples include the state of the economy, the balance of trade, and inflation. Thus some risk is "non-diversifiable". Single-factor equity risk premium models derive conditions in which all of these factors can be considered simultaneously, through their impact on the market portfolio. Other models derive somewhat less restrictive conditions under which several of them might be individually relevant.

Again, the basic idea behind all of these models is that risks that cannot be diversified away in large portfolios matter more than those that can be eliminated by diversification, because there are a large number of large portfolios whose managers actively seek the

best risk-reward tradeoffs available. Of course, undiversified investors would like to get a premium for bearing diversifiable risk, but they cannot.

Q15. Why not?

A15. Well-diversified investors compete away any premium rates of return for diversifiable risk. Suppose a stock were priced especially low because it had especially high diversifiable risk. Then it would seem to be a bargain to well diversified investors. For example, suppose an industry is subject to active competition, so there is a large risk of loss of market share. Investors who held a portfolio of all companies in the industry would be immune to this risk, because the loss on one company's stock would be offset by a gain on another's stock. (Of course, the competition might make the whole industry more vulnerable to the business cycle, but the issue here is the diversifiable risk of shifts in market share among firms.)

If the shares were priced especially low because of the risk of a shift in market shares, investors who could hold shares of the whole industry would snap them up. Their buying would drive up the stocks' prices until the premium rates of return for diversifiable risk were eliminated. Since all investors pay the same price, even those who are not diversified can expect no premium for bearing diversifiable risk.

Of course, substantial non–diversifiable risk remains, as the October Crash of 1987 demonstrates. Even an investor who held a portfolio of all traded stocks could not diversify against that type of risk. Sensitivity to such market–wide movements is what beta measures. That type of sensitivity, whether considered in a single- or multi-factor model, determines the risk premium in the cost of equity.

Q16. What does a particular value of beta signify?

A16. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up or down by 10 percent on average when the market goes up or down by 10 percent. Stocks with betas above 1.0 exaggerate the swings in the market: stocks with betas of 2.0 tend to fall 20 percent when the market falls 10 percent, for example. Stocks with betas

below 1.0 are less volatile than the market. A stock with a beta of 0.5 will tend to rise 5 percent when the market rises 10 percent.

Q17. How is beta measured?

A17. The usual approach to calculating beta is a statistical comparison of the sensitivity of a stock's (or a portfolio's) return to the market's return. Many investment services report betas, including Merrill Lynch's quarterly Security Risk Evaluation, Bloomberg and the *Value Line Investment Survey*. Betas are not always calculated the same way, and therefore must be used with a degree of caution, but the basic point that a high beta indicates a risky stock has long been widely accepted by both financial theorists and investment professionals.

Q18. Are there circumstances when the "usual approach to calculating beta" should not be used?

A18. There are at least two cases where the standard estimate of beta should be viewed skeptically.

First, companies in serious financial distress seem to "decouple" from their normal sensitivity to the stock market. The stock prices of financially distressed companies tend to change based more on individual news about their particular circumstances than upon overall market movements. Thus, a risky stock could have a low estimated beta if the company was in financial distress. Other circumstances that may cause a company's stock to decouple include an industry restructuring or major changes in a company's supply or output markets.

Second, similar circumstances seem to arise for companies "in play" during a merger or acquisition. Once again, the individual information about the progress of the proposed takeover is so much more important for that stock than day-to-day market fluctuations that, in practice, beta estimates for such companies seem to be too low.

Q19. How reliable is beta as a risk measure?

A19. Scholarly studies have long confirmed the importance of beta for a stock's required rate of return. It is widely regarded as the best single risk measure available. The merits of beta seemed to have been challenged by widely publicized work by Professors Eugene F. Fama and Kenneth R. French.[25] However, despite the early press reports of their work as signifying that "beta is dead," it turns out that beta is still a potentially important explanatory factor (albeit one of several) in their work. Thus, beta remains alive and well as the best single measure of relative risk.

D. INTEREST RATE ESTIMATE

Q20. What interest rates do your procedures require?

A20. Modern capital market theories of risk and return use the short-term risk-free rate of return as the starting benchmark. My measures of the MRP incorporate this approach, since they represent the excess of the expected return on the market over the 30-day U.S. Treasury bill rate and over the long-term U.S. Government bond rate. Accordingly, implementation of my procedures requires use of an estimate of the 30-day Treasury bill rate and the long-term Government bond rate. I use the average over the most recent 15 trading days ending on May 7, 2008.

E. COST OF CAPITAL MODELS

Q21. How do you combine the above components into an estimate of the cost of capital?

A21. By far the most widely used approach to estimation of the cost of capital is the "Capital Asset Pricing Model," and I do calculate CAPM estimates. However, the CAPM is only one equity risk premium approach technique, and I also use another.

Q22. Please start with the CAPM, by describing the model.

A22. As noted above, the modern models of capital market equilibrium express the cost of equity as the sum of a risk-free rate and a risk premium. The CAPM is the longest-

standing and most widely used of these theories. The CAPM states that the cost of capital for investment *s* (e.g., a particular common stock) is given by the following equation:

$$k_s = r_f + \beta_s \times MRP \qquad \textbf{(C-1)}$$

where k_s is the cost of capital for investment *s*; r_f is the risk-free rate, β_s is the beta risk measure for the investment *s*; and *MRP* is the market risk premium.

The CAPM relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities do. It says that the security market line starts at the risk-free interest rate (that is, that the return on a zero-risk security, the y-axis intercept in Figure 1 in the body of my testimony, equals the risk-free interest rate). Further, it says that the risk premium over the risk-free rate equals the product of beta and the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

Q23. What other equity risk premium approach model do you use?

A23. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premia than predicted by the CAPM and high-beta stocks tend to have lower risk premia than predicted. A number of variations on the original CAPM theory have been proposed to explain this finding. The difference between the CAPM and the type of relationship identified in the empirical studies is depicted in Figure BV-C1.

[25] See for example, "The Capital Asset Pricing Model: Theory and Evidence", Eugene F. Fama and Kenneth R. French, *Journal of Economic Perspectives*, Volume 18, Summer 2004, pp. 25-46.

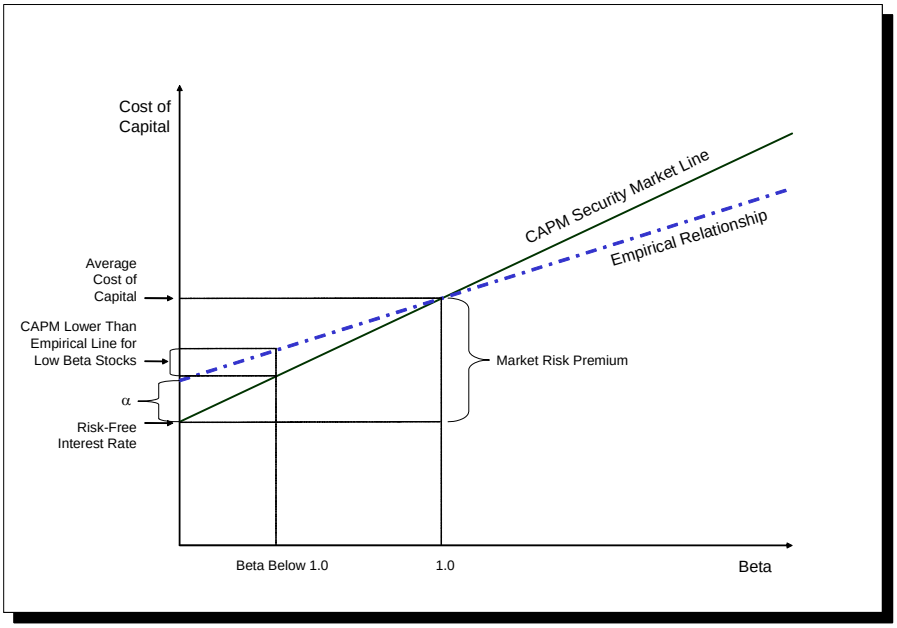

Figure BV-C1: The Empirical Security Market Line

The second model makes use of these empirical findings. It estimates the cost of capital with the equation,

$$k_s = r_f + \alpha + \beta_s \times (MRP - \alpha) \qquad \textbf{(C-2)}$$

where α is the "alpha" of the risk-return line, a constant, and the other symbols are defined as above. I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." For the short-term risk-free rate models, I set alpha equal to 1, 2, and 3 percent which are values somewhat lower than that estimated empirically. For low-beta stocks such as regulated utilities, the use of a lower value for alpha leads to a lower estimate of the cost of capital. For the long-term risk-free rate models, I set alpha equal to both 0.5 percent and 1.5 percent, but I rely more heavily on the 0.5 percent results. The use of a long-term risk-free rate incorporates some of the desired effect of using the ECAPM. That is, the long-term risk-free rate version of the Security Market Line has a higher intercept and a flatter slope than the short-term risk-free version which has been tested. Thus, it is likely that I do not need to make the same degree adjustment when I use the long-term risk-free rate. A summary of the empirical evidence on the magnitude of alpha is provided in Table No. BV-C1 below.

II. EMPIRICAL EQUITY RISK PREMIUM RESULTS

Q24. How is this part of the appendix organized?

A24. This section presents the full details of my equity risk premium approach analyses, which are summarized in the body of my testimony. Details behind the estimates of the short-term and the long-term risk-free interest rates are discussed. Next, the beta estimates, and the estimates of the MRP I use in the models are addressed. Finally, this section reports the CAPM and ECAPM results for the sample's costs of equity, and then describes the results of adjusting for differences between the benchmark sample and New Mexico-American's regulated capital structures.

A. RISK-FREE INTEREST RATE

Q25. How do you obtain estimates of the risk-free interest rates over the period the utility rates set here are to be in effect?

A25. I obtain these rates using data provided by Bloomberg. In particular, I use their reported government debt yields from the "constant maturity series". This information is displayed in Table No. BV-9.

Q26. What values do you use for the short-term and long-term risk-free interest rates?

A26. I use a value of 1.1 percent for the short-term risk-free interest rate and a value of 4.5 percent for the long-term risk-free interest rate as the benchmark interest rates in the equity risk premium analyses. These values represent the average yields on 30-day and long term (20-year) Treasury securities respectively, over the 15-trading day period ending on May 7, 2008.

B. BETAS AND THE MARKET RISK PREMIUM

1. Beta Estimation Procedures

Q27. Which betas do you use in your risk positioning models?

A27. I obtained estimates from the *Value Line Investment Survey* for the sample companies.[26]

Q28. How does *Value Line* estimate the reported betas?

A28. *Value Line* estimates the reported betas using weekly data for a five year period. As a market index, *Value Line* uses the New York Stock Exchange. Also *Value Line* reports so-called adjusted betas, i.e. the betas reported by *Value Line* are calculated as follows:

$$\beta_{Value\ Line} = .67 \times \beta + 0.35 \qquad \textbf{(C-3)}$$

where β is the standard beta estimate. To obtain standard betas, I reverse the adjustment to obtain standard betas, β. *Value Line* and many investment firms adjust the estimated betas using a procedure similar to the one described in equation (C-3). This type of adjustment is intended to compensate for sampling errors in the beta estimation. It adjusts betas below one upwards and betas above one downwards.

Q29. Please summarize the beta estimates you rely on.

A29. After reversing the *Value Line* adjustment procedure, the estimates range from 0.15 to 1.12 for the water sample and from 0.67 to 0.97 for the gas LDC sample, with an average of 0.76 and 0.77 respectively. The beta estimates for individual sample companies are reported in Workpaper #1 to Tables No. BV-10 and BV-20.

Q30. What are the characteristics of recent beta estimates?

A30. Betas for both water and gas utilities have increased in recent years. For example, *Value Line* betas for water utilities averaged approximately .60 in 2002 while they now stand at approximately .86 for an increase of about 45% over the last six years. Similarly, the average beta for the gas LDC sample has increased from approximately 0.65 to

[26] For each sample I used the *Value Line* beta estimates most recently available. For the water sample, estimates are as of April 25, 2008, while for the gas LDC sample estimates are as of March 14, 2008.

approximately .87 for an increase of almost 34% over six years. Thus, at least in *Value Line*'s judgment, the water and gas LDC companies are exposed to more systematic risk today than they were a few years back.

2. Market Risk Premium Estimation

Q31. Given all of the evidence, what MRP do you use in your analysis?

A31. It is clear that market return information is volatile and difficult to interpret, but based on the collective evidence, the MRP I use for the short-term risk-free rate is 8 percent and for the long-term risk-free rate is 6.5 percent.

C. Cost Of Capital Estimates

Q32. Based on these data, what are the values you calculate for the overall cost of capital and the corresponding cost of equity for the water utility sample?

A32. Panels A and B of Table No. BV-10 present the cost of equity results using the equity risk positioning methods at the sample companies' market value capital structures. Panel A uses the long-term risk-free rate estimate while Panel B uses the short-term risk-free rate.

Q33. What does the water market data imply about the sample's cost of equity at the proposed 45.1 percent equity ratio for New Mexico-American Water?

A33. The return on equity and the overall cost of capital for the various equity risk positioning methods are reported in Table No. BV-11, Panels A to G. Panels A through C utilize the long-term risk-free rate while Panels D through G use the short-term risk free rate. Panel A reports the cost of capital estimates using the CAPM results for the long-term risk-free rate, while Panels B and C report these estimates for the ECAPM cost of equity results using ECAPM parameters of 0.5 and 1.5 percent, respectively. Panel D reports the CAPM estimates using the short-term risk free rate, while Panels E, F and G report ECAPM results using ECAPM parameters of 1, 2 and 3 respectively. In each panel, column [8] reports the overall cost of capital for each company. The last two rows of each panel report the sample and the subsample averages. The first is for all companies

in the water sample (average [a]), and the second is for the subsample of companies with significant revenue from regulated activities (average [b]).

The sample average ATWACC from each panel of Table No. BV-11 is reproduced in column [1] of Table No. BV-12, which then reports the cost of equity for each of the risk positioning methods that is consistent with the sample information and the capital structure of New Mexico-American. Panel A of Table No. BV-12 reports the results for all sample companies. Panel B of the table summarizes the results for the subsample of companies that have a large percentage of revenues from regulated activities. The sample average ATWACCs and corresponding costs of equity at a 45.1 percent equity ratio are also displayed in Table 3 of my testimony.

Q34. What cost of equity values do you calculate for the gas LDC sample?

A34. The cost of equity estimates for the gas LDC sample are displayed on Panels A and B of Table No. BV-20. As with the water utility sample results, Panel A uses the long-term risk-free rate, and Panel B uses the short-term risk-free rate.

Q35. What does the gas LDC market data imply about the sample's cost of equity at the proposed 45.1 percent equity ratio for New Mexico-American Water?

A35. The sample average ATWACC from each panel of Table No. BV-21 is reproduced in column [1] of Table No. BV-22, which then reports the cost of equity for each of the risk positioning methods that is consistent with the sample information and the capital structure of New Mexico-American. The sample average ATWACCs and corresponding costs of equity at a 45.1 percent equity ratio are also displayed in Table 3 of my testimony.

Q36. What are the implications of the risk positioning results for New Mexico-American's estimated cost of equity?

I discuss the implications of the risk positioning results for the two samples in the main body of my testimony.

Table BV-C1

EMPIRICAL EVIDENCE ON THE ALPHA FACTOR IN ECAPM*

AUTHOR	RANGE OF ALPHA	PERIOD RELIED UPON
Black (1993)[1]	1% for betas 0 to 0.80	1931-1991
Black, Jensen and Scholes (1972)[2]	4.31%	1931-1965
Fama and McBeth (1972)	5.76%	1935-1968
Fama and French (1992)[3]	7.32%	1941-1990
Litzenberger and Ramaswamy (1979)[4]	5.32%	1936-1977
Litzenberger, Ramaswamy and Sosin (1980)	1.63% to 3.91%	1926-1978
Pettengill, Sundaram and Mathur (1995)[5]	4.6%	1936-1990

*The figures reported in this table are for the longest estimation period available and, when applicable, use the authors' recommended estimation technique. Many of the articles cited also estimate alpha for sub-periods and those alphas may vary.

[1]Black estimates alpha in a one step procedure rather than in an un-biased two-step procedure.

[2]Estimate a negative alpha for the subperiod 1931-39 which contain the depression years 1931-33 and 1937-39.

[3]Calculated using Ibbotson's data for the 30-day treasury yield.

[4]Relies on Lizenberger and Ramaswamy's before-tax estimation results. Comparable after-tax alpha estimate is 4.4%.

[5]Pettengill, Sundaram and Mathur rely on total returns for the period 1936 through 1990 and use 90-day treasuries. The 4.6% figure is calculated using auction averages 90-day treasuries back to 1941 as no other series were found this far back.

Sources:

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APPENDIX D

DISCOUNTED CASH FLOW METHODOLOGY:

DETAILED PRINCIPLES AND RESULTS

Q1. What is the purpose of this appendix?

A1. This appendix reviews the principles behind the discounted cash flow or "DCF" methodology and the details of the cost-of-capital estimates obtained from this methodology.

I. DISCOUNTED CASH FLOW METHODOLOGY PRINCIPLES

Q2. How is this section of the appendix organized?

A2. The first part discusses the general principles that underlie the DCF approach. The second portion describes the strengths and weaknesses of the DCF model and why it is generally less reliable for estimating the cost of capital for the sample companies at the present time than the risk positioning method discussed in Appendix C.

A. Simple And Multi-Stage Discounted Cash Flow Models

Q3. Please summarize the DCF model.

A3. The DCF model takes the first approach to cost-of-capital estimation discussed with Figure 1 in Section II-A of my direct testimony. That is, it attempts to measure the cost of equity in one step. The method assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow stream:

$$P = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots + \frac{D_T}{(1+k)^T} \qquad \textbf{(D-1)}$$

where "P" is the market price of the stock; "D_t" is the dividend cash flow expected at the end of period t; "k" is the cost of capital; and "T" is the last period in which a dividend cash flow is to be received. The formula just says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received.

Most DCF applications go even further, and make very strong (*i.e.*, unrealistic) assumptions that yield a simplification of the standard formula, which then can be rearranged to estimate the cost of capital. Specifically, if investors expect a dividend stream that will grow forever at a steady rate, the market price of the stock will be given by a very simple formula,

$$P = \frac{D_1}{(k - g)} \qquad \textbf{(D-2)}$$

where "D_1" is the dividend expected at the end of the first period, "g" is the perpetual growth rate, and "P" and "k" are the market price and the cost of capital, as before. Equation D-2 is a simplified version of Equation D-1 that can be solved to yield the well known "DCF formula" for the cost of capital:

$$\begin{aligned} k &= \frac{D_1}{P} + g \\ &= \frac{D_0 \times (1+g)}{P} + g \end{aligned} \qquad \textbf{(D-3)}$$

where "D_0" is the current dividend, which investors expect to increase at rate g by the end of the next period, and the other symbols are defined as before. Equation D-3 says that if Equation D-2 holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the simple DCF model. Of course, the "simple" model is simple because it relies on very strong (*i.e.*, very unrealistic) assumptions.

Q4. Are there other versions of the DCF models besides the "simple" one?

A4. Yes. If Equation D-2 and its underlying assumptions do not hold, sometimes other variations of the general present value formula, Equation D-1, can be used to solve for k in ways that differ from Equation D-3. For example, if there is reason to believe that investors do *not* expect a steady growth rate forever, but rather have different growth rate forecasts in the near term (e.g., over the next five or ten years as compared with subsequent periods), these forecasts can be used to specify the early dividends in Equation D-1. Once the near-term dividends are specified, Equation D-2 can be used to

specify the share price value at the end of the near-term (e.g., at the end of five or ten years), and the resulting cash flow stream can be solved for the cost of capital using Equation D-1.

More formally, the "multistage" DCF approach solves the following equation for *k*:

$$P = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots + \frac{D_T + P_{TERM}}{(1+k)^T} \quad \textbf{(D-4)}$$

The terminal price, P_{TERM} is estimated as

$$P_{TERM} = \frac{D_{T+1}}{(k - g_{LR})} \quad \textbf{(D-5)}$$

where T is the last of the periods in which a near term dividend forecast is made and g_{LR} is the long-run growth rate. Thus, Equation D-4 defers adoption of the very strong perpetual growth assumptions that underlie Equation D-2 — and hence the simple DCF formula, Equation D-3 — for as long as possible, and instead relies on near term knowledge to improve the estimate of k. I examine both simple and multistage DCF results below.

Q5. Please describe the multi-stage DCF model you use.

A5. The multi-stage model I use is presented in Equations D-4 and D-5 above, and assumes that the long-term perpetual growth rate for all companies in the two samples is the forecast long-term growth rate of the GDP. This model allows growth rates to differ across companies during the first ten years before settling down to a single long-term growth rate. The growth rate for the first five years is the long-term growth rate derived from analysts' reports. After year five, the growth rate is assumed to converge linearly to the GDP growth rate. In other words, the growth rate in year 6 is adjusted by $1/6^{th}$ of the difference between each company's 5-year growth rate forecast and the GDP forecast. The growth rates in years 7 to 10 are adjusted by an additional $1/6^{th}$ so that the earning growth rate pattern converges on the long-term GDP growth rate forecast.

Q6. Why do you assume that the long-term growth rate of the sample companies will converge to the long-term growth rate of GDP?

A6. Recall that the DCF model assumes that dividends grow at a constant rate literally forever. If the growth rate of earnings (and therefore, dividends) were greater than (less than) the long-term growth rate of the economy, mathematically it would mean that the company (and the industry) would become an ever increasing (or decreasing) proportion of the economy. Therefore, the most logical assumption is that the company's earnings grow at the same rate as the economy on average over the long run.

Q7. What are the merits of the DCF model?

A7. The DCF approach is conceptually sound only if its assumptions are met. In actual practice one can run into difficulty because those assumptions are so strong, and hence so unlikely to correspond to reality. Two conditions are well-known to be necessary for the DCF approach to yield a reliable estimate of the cost of capital: the variant of the present value formula, Equation D-1, that is used must actually match the variations in investor expectations for the dividend growth path; and the growth rate(s) used in that formula must match current investor expectations. Less frequently noted conditions may also create problems.

The DCF model assumes that investors expect the cost of capital to be the same in all future years. Investors may not expect the cost of capital to be the same, which can bias the DCF estimate of the cost of capital in either direction.

The DCF model only works for companies for which the standard present value formula works. The standard formula does *not* work for companies that operate in industries or markets options (*e.g.*, puts and calls on common stocks), and so it will not work for companies whose stocks behave as options do. Option-pricing effects will be important for companies in financial distress, for example, which implies the DCF model will *understate* their cost of capital, all else equal.

In recent years even the most basic DCF assumption, that the market price of a stock in the absence of growth options is given by the standard present value formula (*i.e.*, by

Equation D-1 above), has been called into question by a literature on market volatility.[1] In any case, it is still too early to throw out the standard formula, if for no other reasons than that the evidence is still controversial and no one has offered a good replacement. But the evidence suggests that it must be viewed with more caution than financial analysts have traditionally applied. Simple models of stock prices may not be consistent with the available evidence on stock market volatility.

Q8. Normally DCF debates center on the right growth rate. What principles underlie that choice?

A8. Finding the right growth rate(s) is indeed the usual "hard part" of a DCF application. The original approach to estimation of g relied on average historical growth rates in observable variables, such as dividends or earnings, or on the "sustainable growth" approach, which estimates g as the average book rate of return times the fraction of earnings retained within the firm. But it is highly unlikely that historical averages over periods with widely varying rates of inflation, interest rates and costs of capital, such as in the relatively recent past, will equal current growth rate expectations.

A better approach is to use the growth rates currently expected by investment analysts, if an adequate sample of such rates is available. Analysts' forecasts are superior to time series forecasts based upon single variable historical data as has been documented and confirmed extensively in academic research.[2] If this approach is feasible and if the

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[1] See for example, Robert J. Shiller (1981), "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?," *The American Economic Review*, Vol. 71, No. 3, pp. 421-436. John Y. Campbell and Robert J. Shiller (1988), "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors," *The Review of Financial Studies*, Vol. 1, No. 3, pp. 195-228. Lucy F. Ackert and Brian F. Smith (1993), "Stock Price Volatility, Ordinary Dividends, and Other Cash Flows to Shareholders," *Journal of Finance*, Vol. 48, No. 1, pp. 1147-1160. Eugene F. Fama and Kenneth R. French (2001), "Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?," *Journal of Financial Economics*, Vol. 60, pp. 3-43. Borja Larrain and Motohiro Yogo (2005), "Does Firm Value Move Too Much to be Justified by Subsequent Changes in Cash Flow?," Federal Reserve Bank of Boston, *Working Paper*, No. 05-18.

[2] Lawrence D. Brown and Michael S. Rozeff (1978), "The Superiority of Analyst Forecasts as Measures of Expectations: Evidence from Earnings," *Journal of Finance*, Vol. XXXIII, No. 1, pp. 1-16. J. Cragg and B.G. Malkiel (1982), *Expectations and the Structure of Share Prices*, National Bureau of Economic Research, University of Chicago Press. R.S. Harris (1986), "Using Analysts' Growth Forecasts to Estimate Shareholder Required Rates of Return," *Financial Management*, Spring Issue, pp. 58-67. J. H. Vander

person estimating the cost of capital is able to select the appropriate version of the DCF formula, the DCF method should yield a reasonable estimate of the cost of capital for companies not in financial distress and without material option-pricing effects (always subject to recent concerns about the applicability of the basic present value formula to stock prices as well as issues of optimism bias). However, for the DCF approach to work, the basic stable-growth assumption must become reasonable and the underlying stable-growth rate must become determinable *within the period for which forecasts are available*.

Q9. What is the so called "optimism bias" in the earnings growth rate forecasts of security analysts and what is its effect on the DCF analysis?

A9. Optimism bias is related to the observed tendency for analysts to forecast earnings growth rates that are higher than are actually achieved. This tendency to over estimate growth rates is perhaps related to incentives faced by analysts that provide rewards not strictly based upon the accuracy of the forecasts. To the extent optimism bias is present in the analysts' earnings forecasts, the cost-of-capital estimates from the DCF model would be too high.

Q10. Does optimism bias mean that the DCF estimates are completely unreliable?

A10. No. The effect of optimism bias is least likely to affect DCF estimates for large, rate regulated companies in relatively stable segments of an industry. Furthermore, the magnitude of the optimism bias (if any) for regulated companies is not clear. This issue is addressed in a paper by Chan, Karceski, and Lakonishok (2003)[3] who sort companies on the basis of the size of the I/B/E/S forecasts to test the level of optimism bias. Utilities constitute 25 percent of the companies in lowest quintile, and by one measure the level of optimism bias is 4 percent. However, the 4 percent figure does not represent the

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Weide and W. T. Carleton (1988), "Investor Growth Expectations: Analysts vs. History," *Journal of Portfolio Management*, spring, pp. 78-82. T. Lys and S. Sohn (1990), "The Association Between Revisions of Financial Analysts Earnings Forecasts and Security Price Changes," *Journal of Accounting and Economics*, vol 13, pp. 341-363.

[3] L. K.C. Chan, J. Karceski, and J. Lakonishok, 2003, "The Level and Persistence of Growth Rates," *Journal of Finance* 58(2):643-684.

complete characterization of the results in the paper. Table IX of the paper shows that the median I/B/E/S forecast for the first (lowest) quintile averages 6.0 percent. The realized "Income before Extraordinary Items" is 2.0 percent (implying a four percent upward bias in I/B/E/S forecasts), but the "Portfolio Income before Extraordinary Items" is 8.0 percent (implying a two percent downward bias in I/B/E/S forecasts).

The difference between the "Income before Extraordinary Items" and "Portfolio Income before Extraordinary Items" is whether individual firms or a portfolio are used in estimating the realized returns. The first is a simple average of all firms in the quintile while the second is a market value weighted-average. Although both measures of bias have their own drawbacks according to the authors,[4] the Portfolio Income measure gives more weight to the larger firms in the quintile such as regulated utilities. In addition, the paper demonstrates that "analysts' forecasts as well as investors' valuations reflect a wide-spread belief in the investment community that many firms can achieve streaks of high growth in earnings."[5] Therefore, it is not clear how severe the problem of optimism bias may be for regulated utilities or even whether there is a problem at all.

Finally, the two-stage DCF model also adjusts for any over optimistic (or pessimistic) growth rate forecasts by substituting the long-term GDP growth rate for the 5-year growth rate forecasts of the analysts in the years beginning in year 11. I linearly trend the 5-year forecast growth rate to the GDP forecast growth rate in years 6 to 10.

Q11. What about the reforms by the National Associate of Security Dealers (NASD) that were designed to reduce the conflicts of interest and pressures brought against security analysts? Have those reforms been generally successful?

A11. Yes. The conclusion from the Joint Report by NASD and the New York Stock Exchange ("NYSE") on the reforms states

> … the SRO Rules have been effective in helping restore integrity to research by minimizing the influences of investment banking and

[4] Chan, Karceski, and Lakonishok, *op. cit.*, p. 675.

[5] Chan, Karceski, and Lakonishok, *op. cit*., p. 663.

> promoting transparency of other potential conflicts of interest. Evidence also suggests that investors are benefiting from more balanced and accurate research to aid their investment decisions.[6]

The report does note additional reforms are advisable, but the situation is far different today than during the height of the tech bubble when analyst objectivity was clearly suspect.

B. CONCLUSIONS ABOUT DCF

Q12. Please sum up the implications of this part of the appendix.

A12. The unavoidable questions about the DCF model's strong assumptions — whether the basic present value formula works for stocks, whether option pricing effects are important for the company, whether the right variant of the basic formula has been found, and whether the true growth rate expectations have been identified — cause me to view the DCF method as *inherently* less reliable than equity risk premium approach, the other approach I use.

II. EMPIRICAL DCF RESULTS

Q13. How is this part of the appendix organized?

A13. This section presents the details of my DCF analyses for the water and gas LDC samples, which are summarized in my written testimony.

Implementation of the simple DCF models described above requires an estimate of the current price, the dividend, and near-term and long-run growth rate forecasts. The simple DCF model relies only on a single growth rate forecast, while the multistage DCF model employs both near-term individual company forecasts and long-run GDP growth rate forecasts. The remaining parts of this section describe each of these inputs in turn.

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[6] Joint Report by NASD and NYSE on the Operation and Effectiveness of the Research Analyst Conflict of Interest Rules, December 2005, p. 44.

A. PRELIMINARY MATTERS

Q14. In Appendix C you discuss estimating cost of capital and implied cost of equity using the risk positioning methodology. What, if anything, is different when you use the DCF method?

A14. The timing of the market value capital structure calculations is different in the DCF method than in the equity risk premium method. The equity risk premium method relies on the average capital structure over the five-year period *Value Line* uses to estimate beta while the DCF approach uses only current data, so the relevant market value capital structure measure is the most recent that can be calculated. This capital structure for the water sample companies is reported in columns [1]-[3] of Table No. BV-4, and for the gas LDC sample companies in columns [1]-[3] of Table No. BV-15.

B. GROWTH RATES

Q15. What growth rates do you use?

A15. For reasons discussed above, historical growth rates today are not useful as forecasts of current investor expectations for the water utility industry. I therefore use rates forecasted by security analysts.

The ideal in a DCF application would be a detailed forecast of future dividends, year by year well into the future, based on a large sample of investment analysts' expectations. I know of no source of such data. Dividends are ultimately paid from earnings, however, and earnings forecasts are available for a few years. Investors do not expect dividends to grow in lockstep with earnings, but for companies for which the DCF approach can be used reliably (*i.e.*, for relatively stable companies whose prices do not include the option-like values described previously), they do expect dividends to track earnings over the long-run. Thus, use of earnings growth rates as a proxy for expectations of dividend growth rates is a common practice.

Accordingly, the first step in my DCF analysis is to examine a sample of investment analysts' forecasted earnings growth rates. In particular, I utilize Bloomberg's BEst and

Value Line's forecasted earnings growth.[7] The projected earnings growth rates for the water sample companies are in Table No. BV-5, and those for the gas LDC sample companies are in Table No. BV-16. Column [1] reports Bloomberg's BEst analysts' forecasts of the long-term earnings growth for the sample companies. Column [2] reports the number of analysts that provided a forecast. Columns [3] and [4] report *Value Line's* forecasted earnings per share ("EPS") value for each company for 2008 and 2011-2013 respectively. Column [5] provides *Value Line's* implied long-term growth rate forecast, and column [6] provides a weighted average growth rate for each company across the two sources. (I treat the *Value Line* forecasts as though they overlap exactly with the forecasts from Bloomberg.) These growth rates underlie my simple and multistage DCF analyses.

In the simple DCF, I use the five-year average annual growth rate as the perpetual growth rate.[8] In the multistage model, I rely on the company-specific growth rate until the second quarter of 2013 and on the long-term GDP forecast from the third quarter of 2018 onwards. During the intervening five-year period, I assume the growth rate converges linearly towards the long-term GDP forecast.[9]

Q16. Do these growth rates correspond to the ideal you mentioned above?

A16. No. While forecasted growth rates are the quantity required in principle, the forecasts need to go far enough out into the future so that it is reasonable to believe that investors expect a stable growth path afterwards. As can be seen from Table No. BV-5 and Table No. BV-16, the growth rate forecasts vary widely from company to company. For example the BEst growth forecast for Southwest Water is 5 percent while the *Value Line* growth forecast is 15 percent.[10] While the differences between BEst and *Value Line*

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[7] The BEst growth rates were downloaded from Bloomberg on May 7, 2008. *Value Line* estimates are from the most recent report available, dated April 25, 2008 for the water sample utilities, and March 14, 2008 for the gas LDCs.

[8] This growth rate is in column [6] of Table No. BV-5 (Table No. BV-16 for the gas LDC sample).

[9] I use the long-term U.S. GDP growth forecast from *Blue Chip Economic Indicators* (March 10, 2008).

[10] See Table No. BV-5.

forecasts are lower for the gas LDC sample, there is still significant variation.[11] Also, for some companies, the five-year growth rate forecasts are significantly above or below the long-term GDP growth rate forecast, indicating lack of stability in growth rates. Overall, the growth rates indicate that some companies and maybe the industries have yet to reach a stable equilibrium which is required for the correct application of the DCF method.

Q17. How well are the conditions needed for DCF reliability met at present?

A17. The requisite conditions for the sample companies are not fully met at this time. Of particular concern for this proceeding is the uncertainty about what investors truly expect the long-run outlook for the sample companies to be. The longest time period available for growth rate forecasts of which I am aware is five years. The long-run growth rate (*i.e.*, the growth rate after the industry settles into a steady state, which is certainly *beyond* the next five years for water industry) drives the actual results one gets with the DCF model. Unfortunately, this implies that unless the company or industry in question is stable, so there is little doubt as to the growth rate investors expect. DCF results in practice can end up being driven by the subjective judgment of the analyst who performs the work.

This is a problem at present because it is hard to imagine that today's water industry would accurately be described as stable. There is great uncertainty about the costs required to undertake the large investments in infrastructure forecasted for the industry. Indeed, *Value Line* notes the need for investments aimed at replacing the aging infrastructure and complying with increasingly stringent water safety regulations, partially driven by increased fear of bioterrorism. Additionally, American Society of Civil Engineers estimated in 2005 that the drinking water infrastructure requires $11 billion of annual investments, while the wastewater segment requires $390 billion in investments over the following 20 years.[12] The water industry is also going through a series of mergers and acquisitions, which affects the companies' earnings growth rate estimates. This is one reason why companies heavily involved in mergers and acquisitions are normally excluded from the sample. Taken together, these factors mean

[11] See table No. BV-16.

[12] Report Card for America's Infrastructure, The American Society of Civil Engineers, 2005.

that it may be some time before the water industry settles into anything investors will see as a stable equilibrium.

Such circumstances imply that a regulator may often be faced with a wide range of DCF numbers, none of which can be well grounded in objective data on true long-run growth expectations, *because no such objective data now exist*. DCF for firms or industries in flux is *inherently* subjective with regard to a parameter (the long-run growth rate) that drives the answer one gets.

It is clear that much longer detailed growth rate forecasts than currently available from Bloomberg and *Value Line* would be needed to implement the DCF model in a completely reliable way for the water sample at this time; however, the general stability of the 5-year growth rate forecasts for the gas LDC sample indicates a higher degree of reliability than for the water sample at this time.

C. DIVIDEND AND PRICE INPUTS

Q18. What values do you use for dividends and stock prices?

A18. Dividends are the most recent recorded dividend payments as reported by Bloomberg. For most companies this is the second quarter 2008 dividend, but for several it is the 3rd quarter 2008 dividend, and for one company it is the 1st quarter 2008 dividend. The most recent dividend is grown at the estimated growth rate and divided by the price described below to estimate the dividend yield for the simple and multistage DCF models.

Stock prices are the average of the closing stock prices for the 15 trading days ending on the day the BEst forecasts were released (May 7, 2008). Using these dates ensures that the information in growth rates and stock prices are contemporaneous. I use a 15-day average as a compromise. Using a longer period would be inconsistent with the principles that underlie the DCF formula. The DCF approach assumes the stock price is the present value of future expected dividends. Stock prices six months or a year ago reflect expectations at that time, which are different from those that underlie the currently available growth forecasts. At the same time, use of an average over a brief period helps

guard against a company's price on a particular day price being unduly influenced by mistaken information, differences in trading frequency, and the like.

The closing stock price is used because it is at least as good as any other measure of the day's outcome, and may be better for DCF purposes. In particular, if there were any single price during the day that would affect investors' decisions to buy or sell a stock, I would suspect that it would be each day's closing price, not the high or low during the day. The daily price changes reported in the financial pages, for example, are from close to close, not from high to high or from low to low.

D. COMPANY-SPECIFIC DCF COST-OF-CAPITAL ESTIMATES

Q19. What DCF estimates do these data yield?

A19. The cost-of-equity results for the simple and multistage DCF models are shown in Table No. BV-6 for the water utility sample and in Table No. BV-17 for the gas LDC sample. In both tables, Panel A reports the results for the simple DCF method while Panel B reports the results for the multistage DCF method using the long-term GDP growth rate as the perpetual growth rate.

Q20. What overall cost-of-capital estimates result from the DCF cost-of-equity estimates?

A20. The capital structure, DCF cost of equity, and cost of debt estimates are combined to obtain the overall after-tax weighted-average cost of capital for each sample company. These results are presented in Table No. BV-7 for the water sample and in Table No. BV-18 for the gas LDC sample. Again, Panel A relies on the simple DCF cost-of-equity results while Panel B relies on the multistage DCF cost-of-equity results.

Q21. What information do you report in Table No. BV-8 and in Table No. BV-19?

A21. These tables report, for each sample, the return on equity consistent with that sample's estimated overall after-tax weighted-average cost of capital and the proposed equity thickness of 45.1 percent for New Mexico-American Water. For both the simple DCF and multistage DCF methods, the sample's average ATWACC is reported in column [1].

Column [6] reports the return on equity as if the sample companies' average market value capital structure had been that currently proposed for New Mexico-American Water.

Q22. What are the implications of these results?

A22. The implication of these numbers is discussed in my direct testimony, along with the findings of the equity risk premium approach.

APPENDIX E

EFFECT OF DEBT ON THE COST OF EQUITY

Q1. What is the purpose of this Appendix?

A1. In this appendix, I provide details on the effects of debt on the cost of equity. First, I summarize a fairly large body of financial research on capital structure. Second, I provide an extended example to illustrate the effect of debt on the cost of equity.

I. AN OVERVIEW OF THE ECONOMIC LITERATURE

Q2. What is the focus of the economic literature on the effects of debt?

A2. The economic literature focuses on the effects of debt on the value of a firm. The standard way to recognize one of these effects, the impact of the fact that interest expense is tax-deductible, is to discount the all-equity after-tax operating cash flows generated by a firm or an investment project at a weighted average cost of capital, typically known in textbooks as the "WACC." The textbook WACC equals the *market*-value weighted average of the cost of equity and the *after-tax*, *current* cost of debt. However, rate regulation in North America has a legacy of working with another weighted-average cost of capital, the *book*-value weighted average of the cost of equity and the *before-tax*, *embedded* cost of debt. To distinguish the concepts, I refer to the after-tax weighted-average cost of capital as ATWACC.

Q3. How is this section of the appendix organized?

A3. It starts with the tax effects of debt. It then turns to other effects of debt.

A. TAX EFFECTS

Q4. What are the key findings in the literature regarding tax effects?

A4. Three seminal papers are vital for this literature. The first assumes no taxes and risk-free debt. The second adds corporate income taxes. The third adds personal income taxes.

1. Base Case: No Taxes, No Risk to High Debt Ratios

Q5. Please start by explaining the simplest case of the effect of debt on the value of a firm.

A5. The "base case," no taxes and no costs to excessive debt, was worked out in a classic 1958 paper by Franco Modigliani and Merton Miller, two economists who eventually won Nobel Prizes in part for their body of work on the effects of debt.[1] Their 1958 paper made what is in retrospect a very simple point: if there are no taxes and no risk to the use of excessive debt, use of debt will have no effect on a company's operating cash flows (i.e., the cash flows to investors as a group, debt plus equity combined). If the operating cash flows are the same regardless of whether the company finances mostly with debt or mostly with equity, then the value of the firm cannot be affected at all by the debt ratio. In cost-of-capital terms, this means the overall cost of capital is constant regardless of the debt ratio, too.

In the base case, issuing debt merely divides the cash flows into two pools, one for bondholders and one for shareholders. If the divided pools have different priorities in claims on the cash flows, the risks and costs of capital will differ for each pool. But the risk and overall cost of capital of the entire firm, the sum of the two pools, is constant regardless of the debt ratio. Thus,

$$r_1^* = r_{A1} \qquad \text{(E-1a)}$$

where r_1^* is the overall after-tax cost of capital at any particular capital structure and r_{A1} is the all-equity cost of capital for the firm. (The "1" subscripts distinguish the case where there are no taxes from subsequent equations that consider first corporate and then both corporate and personal taxes.) With no taxes and no risk to debt, the overall cost of capital does not change with capital structure.

This implies that the relationship of the overall cost of capital to the component costs of debt and equity is

[1] Franco Modigliani and Merton H. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, 48, pp. 261-297.

$$r_{E1} \times \left(\frac{E}{V}\right) + r_{D1} \times \left(\frac{D}{V}\right) = r_1^* \qquad \text{(E-1b)}$$

with the overall cost of capital (r^*) on the *right* side, as the *independent* variable, and the costs of equity (r_E) and debt (r_D) on the left side, as *dependent* variables determined by the overall cost of capital and by the capital structure (i.e., the shares of equity (E) and debt (D) in overall firm value ($V = E + D$) that the firm happens to choose. Note that if equation (E-1a) were correct, the equation that solved it for the cost of equity would be,

$$r_{E1} = r_1^* + (r_1^* - r_D) \times \left(\frac{D}{E}\right) \qquad \text{(E-1c)}$$

Note also that (D / E) gets exponentially higher in this equation as the debt-to-value ratio increases[2] i.e., the cost of equity increases exponentially with leverage.

2. Corporate Tax Deduction for Interest Expense

Q6. What happens when you add corporate taxes to the discussion?

A6. If corporate taxes exist with risk-free debt (and if only taxes at the corporate level matter, not taxes at the level of the investor's personal tax return), the initial conclusion changes. Debt at the corporate level reduces the company's tax liability by an amount equal to the marginal tax rate times the interest expense. All else equal, this will add value to the company because more of the operating cash flows will end up in the hands of investors as a group. That is, if only corporate taxes mattered, interest would add cash to the firm equal to the corporate tax rate times the interest expense. This increase in cash would increase the value of the firm, all else equal. In cost-of-capital terms, it would reduce the overall cost of capital.

How much the value of the firm would rise and *how far* the overall cost of capital would fall would depend in part on how often the company adjusts its capital structure, but this is a second-order effect in practice. (The biggest effect would be if companies could

[2] For example, at 20-80, 50-50, and 80-20 debt-equity ratios, (D / E) equals, respectively, (20/80) = 0.25, (50/50) = 1.0, and (80/20) = 4.0. The extra 30 percent of debt going from 20-80 to 50-50 has much less impact on (D / E) [i.e., by moving it from 0.25 to 1.0] than the extra 30 percent of debt going from 50-50

issue riskless perpetual debt, an assumption Profs. Modigliani and Miller explored in 1963, in the second seminal paper;[3] this assumption could *not* be true for a real company.) Prof. Robert A. Taggart provides a unified treatment of the main papers in this literature and shows how various cases relate to one another.[4] Perhaps the most useful set of benchmark equations for the case where only corporate taxes matter are:

$$r_2^* = r_{A2} - r_D \times t_C \times \left(\frac{D}{V}\right) \quad \text{(E-2a)}$$

$$r_2^* = r_{E2} \times \left(\frac{E}{V}\right) + r_D \times \left(\frac{D}{V}\right) \times (1 - t_C) \quad \text{(E-2b)}$$

which imply for the cost of equity,

$$r_{E2} = r_{A2} + (r_{A2} - r_D) \times \left(\frac{D}{E}\right) \quad \text{(E-2c)}$$

where the variables have the same meaning as before but the "2" subscripts indicate the case that considers corporate but not personal taxes.

Note that Equation (E-2a) implies that when only corporate taxes matter, the overall after-tax cost of capital declines steadily as more debt is added, until it reaches a minimum at 100 percent debt (i.e., when $D/V = 1.0$). Note also that Equation (E-2c) still implies an exponentially increasing cost of equity as more and more debt is added. In fact, except for the subscript, Equation (E-2c) looks just like Equation (E-1c). However, whether any value is added and whether the cost of capital changes at all also depends on the effect of taxes at the personal level.

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to 80-20 [i.e., by moving it from 1.0 to 4.0]. Since the cost of equity equals a constant risk premium times the debt-equity ratio, the cost of equity grows ever more rapidly as you add more and more debt.

[3] Franco Modigliani and Merton H. Miller (1963), "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review*, 53, pp. 433-443.

[4] Robert A. Taggart, Jr. (1991), "Consistent Valuation and Cost of Capital Expressions with Corporate and Personal Taxes," *Financial Management* 20, pp. 8-20.

3. Personal Tax Burden on Interest Expense

Q7. How do personal taxes affect the results?

A7. Ultimately, the purpose of investment is to provide income for consumption, so personal taxes affect investment returns. For example, in the U.S., municipal bonds have lower interest rates than corporate bonds because their income is taxed less heavily at the personal level. In general, capital appreciation on common stocks is taxed less heavily than interest on corporate bonds because (1) taxes on unrealized capital gains are deferred until the gains are realized, and (2) the capital gains tax rate is lower. Dividends are taxed less heavily than interest, also, under current tax law.[5] The effects of personal taxes on the cost of common equity are hard to measure, however, because common equity is so risky.

Professor Miller, in his Presidential Address to the American Finance Association,[6] explored the issue of how personal taxes affect the overall cost of capital. The paper pointed out that personal tax effects could offset the effect of corporate taxes entirely.

Q8. Is it likely that the effect of personal taxes will completely neutralize the effect of corporate taxes?

A8. I do not believe so, although the likelihood of such a result would be increased if the current federal tax reductions on dividends and capital gains became permanent rather than expiring in 2010. However, personal taxes are important even if they do not make the corporate tax advantage on interest vanish entirely. Capital gains and dividend tax advantages definitely convey some personal tax advantage to equity, and even a partial personal advantage to equity reduces the corporate advantage to debt.

The Taggart paper explores the case of a partial offset, also. With personal taxes, the risk-free rate on the security market line is the after-personal-tax rate, which must be

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[5] The current maximum personal tax rate on dividend income was extended to the end of 2010 by the President on May 17, 2006. It is uncertain whether the reduced rates on dividend income will be further extended.

[6] Merton H. Miller (1977), "Debt and Taxes," *The Journal of Finance*, 32: 261-276, the third of the seminal papers mentioned earlier.

equal for risk-free debt and risk-free equity.[7] Therefore, the pre-personal-tax risk-free rate for equity will generally not be equal to the pre-personal-tax risk-free rate for debt. In particular, $r_{fE} = r_{fD} \times [(1-t_D)/(1-t_E)]$, where r_{fE} and r_{fD} are the risk-free costs of equity and debt and t_E and t_D are the personal tax rates for equity and debt, respectively. In terms of the cost of debt, the Taggart paper's results imply that a formal statement of these effects can be written as:[8]

$$r_3^* = r_{A3} - r_D \times t_N \times \left(\frac{D}{V}\right) \quad \text{(E-3a)}$$

$$= r_{E3} \times \left(\frac{E}{V}\right) + r_D \times \left(\frac{D}{V}\right) \times (1-t_C) \quad \text{(E-3b)}$$

which imply

$$r_{E3} = r_{A3} + \left[r_{A3} - r_D \times \left(\frac{1-t_D}{1-t_E}\right)\right] \times \left(\frac{D}{E}\right) \quad \text{(E-3c)}$$

Suppose, for example, that $t_C = 35$ percent, $t_E = 7.7$ percent and $t_D = 40$ percent. Then $[(1-t_D)/(1-t_E)] = 0.65 = (1-t_C)$. That condition corresponds to Miller's 1977 paper, in which the net personal tax advantage of equity fully offsets the net corporate tax advantage of debt. Note also that in that case, $t_N = 0$.[9] Therefore, if the personal tax advantage on equity fully offsets the corporate tax advantage on debt, Equation (E-3a) confirms that the overall after-tax cost of capital is a constant.

However, it is unlikely that the personal tax advantage of equity fully offsets the corporate tax advantage of debt. If taxes were all that mattered (i.e., if there were no

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[7] As Prof. Taggart notes (his footnote 9), it is not necessary that a specific, risk-free equity security exist as long as one can be created synthetically, through a combination of long and short sales of traded assets. Such constructs are a common analytical tool in financial economics.

[8] The net all-tax effect of debt on the overall cost of capital, t_N, equals $\{[t_C+t_E-t_D-(t_C \times t_E)] / (1-t_E)\}$, where t_D is the personal tax rate on debt, as before. This measure of net tax effect is designed for use with the cost of debt in Equation (E-3a), which seems more useful in the present context. The Taggart paper works with a similar measure, but one which is designed for use with the cost of risk-free equity in the equivalent Taggart equation.

[9] In the above example, $t_N = \{[0.35+0.077\underline{0.4}(0.35 \square 0.077)] / (1.\underline{0}0.077)\} = 0.0/0.923 = 0$.

other costs to debt), the overall after-corporate-tax cost of capital would still fall as debt was added, just not as fast.

Finally, note that the overall after-tax cost of capital, Equation (E-3b), still uses the corporate tax rate even when personal taxes matter. Equations (E-2b) and (E-3b) both correspond to the usual formula for the ATWACC. Personal taxes affect the way the cost of equity changes with capital structure – Equation (E-3c) – but not the formula for the overall after-tax cost of capital given that cost of equity.

B. NON-TAX EFFECTS

Q9. Please describe the non-tax effects of debt.

A9. If debt is truly valuable, firms should use as much as possible, and competition should drive firms in a particular industry to the same, optimal capital structure for the industry. If debt is harmful on balance, firms should avoid it. Neither picture corresponds to what we actually see. A large economic literature has evolved to try to explain why.

Part of the answer clearly is the costs of excessive debt. Here the results cannot be reduced to equations, but they are no less real for that fact. As companies add too much debt, the costs come to outweigh the benefits. Too much debt reduces or eliminates financial flexibility, which cuts the firm's ability to take advantage of unexpected opportunities or weather unexpected difficulty. Use of debt rather than internal financing may be taken as a negative signal by the market.

Even if the company is generally healthy, more debt increases the risk that the company cannot use all of the interest tax shields in a bad year. As debt continues to grow, this problem grows and others may crop up. Management begins to worry about meeting debt payments instead of making good operating decisions. Suppliers are less willing to extend trade credit, and a liquidity shortage can translate into lower operating profits.

Ultimately, the firm might have to go through the costs of bankruptcy and reorganization. Collectively, such factors are known as the costs of "financial distress."[10]

The net tax advantage to debt, if positive, is affected by costs such as a growing risk that the firm might have to bear the costs of financial distress. First, the expected present value of these costs offsets the value added by the interest tax shield. Second, since the likelihood of financial distress is greater in bad times when other investments also do poorly, the possibility of financial distress will increase the risks investors bear. These effects increase the variability of the value of the firm. Thus, firms that use too much debt can end up with a higher overall cost of capital than those that use none.

Other parts of the answer include the signals companies send to investors by the decision to issue new securities, and by the type of securities they issue. Other threads of the literature explore cases where management acts against shareholder interests, or where management attempts to "time" the market by issuing specific securities under different conditions. For present purposes, the important point is that no theory, whether based on taxes or on some completely different issue, has emerged as "the" explanation for capital structure decisions by firms. Nonetheless, despite the lack of a single "best" theory, there is a great deal of relevant empirical research.

Q10. What does that research show?

A10. The research does not support the view that debt makes a material difference in the value of the firm, at least not once a modest amount of debt is in place. If debt were truly valuable, competitive firms should use as much debt as possible short of producing financial distress, and competitive firms that use less debt ought to be less profitable. The research shows exactly the opposite.

[10] See, for example, Section 18.3 of Brealey, Myers and Allen, 2006, *Principles of Corporate Finance*, 8th Edition, McGraw-Hill/Irwin, 2006.

For example, Kester[11] found that firms in the same industry in both the U.S. and Japan do not band around a single, "optimal" capital structure, and the most profitable firms are the ones that use the *least* debt. This finding comes despite the fact that both countries at the time (unlike the U.S. currently) had fully "classical" tax systems, in which dividends are taxed fully at both the corporate and personal level. Wald[12] confirms that high profitability implies low debt ratios in France, Germany, Japan, the U.K., and the U.S. Booth *et al.* find the same result for a sample of developing nations.[13] Fama and French[14] analyze over 2000 firms for 28 years (1965-1992, inclusive) and conclude, "Our tests thus produce no indication that debt has net tax benefits."[15] A paper by Graham[16] carefully analyzes the factors that might have led a firm not to take advantage of debt. It confirms that a large proportion of firms that ought to benefit substantially from use of additional debt, including large, profitable, liquid firms, appear not to use it "enough."

This research leaves us with only three options: either (1) apparently good, profit-generating managers are making major mistakes or deliberately acting against shareholder interests, (2) the benefits of the tax deduction on debt are less than they appear, or (3) the non-tax costs to use of debt offset the potential tax benefits. Only the first of these possibilities is consistent with the view that the tax deductibility of debt conveys a material cost advantage. Moreover, if the first explanation were interpreted to mean that otherwise good managers are acting against shareholder interests, either deliberately or by mistake, it would require the additional assumption that their competitors (and potential acquirers) let them get away with it.

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[11] Carl Kester (1986), "Capital and Ownership Structure: A Comparison of United States and Japanese Manufacturing Concerns," *Financial Management*, 15:5-16.

[12] John K. Wald (1999), "How Firm Characteristics Affect Capital Structure: An International Comparison," *Journal of Financial Research*, 22:161-167.

[13] Laurence Booth *et al.* (2001), "Capital Structures in Developing Countries," *The Journal of Finance* Vol. LVI, pp. 87-130, finds at p. 105 that "[o]verall, the strongest result is that profitable firms use less total debt. The strength of this result is striking ..."

[14] Eugene F. Fama and Kenneth R. French (1998), "Taxes, Financing Decisions and Firm Value," *The Journal of Finance*, 53:819-843.

[15] *Ibid.*, p. 841.

[16] John R. Graham (2000), "How Big Are the Tax Benefits of Debt," *The Journal of Finance*, 55:1901-1942.

Q11. Are there any explanations in the financial literature for this puzzle other than stupid or self-serving managers at the most profitable firms?

A11. Yes. For example, Stewart C. Myers, a leading expert on capital structure, made it the topic of his Presidential Address to the American Finance Association.[17] The poor performance of tax-based explanations for capital structure led him to propose an entirely different mechanism, the "pecking order" hypothesis. This hypothesis holds that the net tax benefits of debt (i.e., corporate tax advantage over personal tax disadvantage) are at most of a second order of importance relative to other factors that drive actual debt decisions.[18] Similarly, Baker and Wurgler (2002)[19] observe a strong and persistent impact that fluctuations in market value have on capital structure. They argue that this impact is not consistent with other theories. The authors suggest a new capital structure theory based on market timing -- capital structure is the cumulative outcome of attempts to time the equity market.[20] In this theory, there is no optimal capital structure, so market timing financing decisions just accumulate over time into the capital structure outcome. (Of course, this theory only makes sense if investors do not recognize what managers are doing.)

Q12. Do inter-firm differences within an industry explain the wide variations in capital structure across the firms in an industry?

A12. No. This view is contradicted by the empirical research. As mentioned before, it has long been found that the most profitable firms in an industry, i.e., those in the best position to take advantage of debt, use the least.[21] Graham (2000) carefully examines differences in firm characteristics as possible explanations for why firms use "too little"

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[17] Stewart C. Myers (1984), "The Capital Structure Puzzle," *The Journal of Finance*, 39: 575-592. See also S. C. Myers and N. S. Majluf (1984), "Corporate Financing Decisions When Firms Have Information Investors Do Not Have," *Journal of Financial Economics* 13:187-222.

[18] See also Stewart C. Myers (1989), "Still Searching for Optimal Capital Structure," *Are the Distinctions Between Debt and Equity Disappearing?,* R.W. Kopke and E. S. Rosengren, eds., Federal Reserve Bank of Boston.

[19] Malcolm Baker and Jeffrey Wurgler (2002), "Market Timing and Capital Structure," *The Journal of Finance* 57:1-32.

[20] *Ibid*., p. 29.

[21] For example, Kester, *op. cit.* and Wald, *op. cit.*

debt and concludes that such differences are *not* the explanation: firms that ought to benefit substantially from more debt by all measurable criteria, if the net tax advantage of debt is truly valuable, voluntarily do not use it.[22]

Nor does the research support the view that firms are constantly trying to adjust their capital structures to optimal levels. Additional research on the pecking order hypothesis demonstrates that firms do not tend towards a target capital structure, or at least do not do so with any regularity, and that past studies that seemed to show the contrary actually lacked the power to distinguish whether the hypothesis was true or not.[23] In the words of the Shyam-Sunder - Myers paper p. 242, "If our sample companies did have well-defined optimal debt ratios, it seems that their managers were not much interested in getting there."

II. EXPANDED EXAMPLE

Q13. What topics do you cover in this section?

A13. The discussion in my testimony did not detail the impact of different starting points for the level of debt nor did it address income earned on the investment, interest expense, or taxes. This section covers these topics. First, it discusses how the level of debt affects the cost of equity. Second, it addresses the influence of income and interest on the investment. Third, it explains the impact of taxes on capital structure decisions. The final topic covered in this section is the combined consequence of tax and non-tax effects of debt.

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[22] While not contradicting Graham's finding that differences in firm characteristics do not explain capital structure differences, Nengjiu Ju, Robert Parrino, Allen M. Poteshman, and Michael S. Weisbach, "Horses and Rabbits? Trade-Off Theory and Optimal Capital Structure," *Journal of Financial and Quantitative Analysis*, June 2005, pp. 1-24, looks at the issue in a different manner. Their paper uses a dynamic rather than static model to analyze the tradeoff between the tax benefits of debt and the risk of financial distress. It finds that bankruptcy costs by themselves are enough to explain observed capital structures, once dynamic effects are considered. This means debt is not as valuable as suggested by the traditional static analysis (of the sort used by Graham).

[23] Lakshmi Shyam-Sunder and Stewart C. Myers (1999), "Testing static tradeoff against pecking order models of capital structure," *Journal of Financial Economics* 51:219-244.

A. DETAILS OF DIFFERENT LEVELS OF DEBT

Q14. Please repeat briefly the setup in the example discussed in the direct testimony.

A14. The example considered an investor who purchases $100,000 in real estate. The future value of the real estate is uncertain. Figures 2 and 3 in my direct testimony show how the return on equity to the investor differs if he finances the purchase with 100 percent equity, and if he finances it with 50 percent equity and 50 percent mortgage debt. The lesson from the example is that debt adds risk to equity.

Q15. What happens if the investor finances the real estate purchase with different proportions of debt?

A15. The equity return becomes more variable when the mortgage percentage is a greater proportion of the initial price. Table E-1 below calculates the return on equity when real estate prices increase by 10 percent when mortgages are 0 percent, 30 percent, 50 percent, and 70 percent of the initial price.

Table E-1: The Impact of Leverage on the Return on Equity

	100% Equity	70% Equity	50% Equity	30% Equity
Debt	$0	$30,000	$50,000	$70,000
Original Equity Investment	$100,000	$70,000	$50,000	$30,000
Increase in Market Value of Equity	$10,000	$10,000	$10,000	$10,000
Return on Equity Investment	10%	14.3%	20%	33.3%

Note that going from 70 percent equity down to 50 percent equity increases the return on the equity investment by 5.7 percent while going from 50 percent equity to 30 percent equity increases the return on equity by 13.3 percent. This illustrates a general point; the rate of return on equity increases more quickly at higher levels of debt than at lower levels. Investors demand a higher equity rate of return to bear more risk and debt magnifies equity's risk at an ever increasing rate. Therefore, the required equity rate of

return goes up at an ever increasing rate as debt is added. This is not only basic finance theory, it is the everyday experience of anyone who buys a home. The bigger the mortgage, the more percentage risk the equity faces from changes in housing prices.

B. THE IMPACT OF INCOME AND INTEREST

Q16. How does earning income from the investment and paying interest on debt affect the results?

A16. In the following explanation, I ignore income taxes which I deal with in Section C below. Assume the investor is receiving income, e.g., rent, from the real estate. Specifically, assume the investor receives $500 per month in income after all non-interest expenses ($6,000 per year). Also, assume that the expected appreciation is 5 percent per year, so the expected market value is $105,000 after one year. Then the expected rate of return from the real estate with all equity financing is:

$$\text{Expected Return on Equity @ 0\% debt} = \frac{\text{Expected Net Income + Expected Appreciation}}{\text{Initial Investment}}$$

$$= \frac{\$6{,}000 + (\$105{,}000 - \$100{,}000)}{\$100{,}000}$$

$$= 11\%$$

Now suppose that the mortgage interest rate were 5 percent. Then at a mortgage equal to 50 percent, or $50,000, interest expense would be ($50,000 x 0.05), or $2,500. The expected equity rate of return would be:

$$\text{Expected Return on Equity @ 50\% debt} = \frac{\text{Expected (Net Income + Appreciation) – Int. Expense}}{\text{Initial } \textit{Equity} \text{ Investment}}$$

$$= \frac{\$6{,}000 + \$5{,}000 - \$2{,}500}{\$50{,}000}$$

$$= 17\%$$

Notice that the expected return on equity is higher as is the risk carried by equity.

Q17. Can you provide a more general illustration?

Yes. Figure E-1 uses these assumptions at different mortgage levels to plot both (i) the expected rate of return on the equity in the real estate, and (ii) the realized rate of return on that equity in a year if the real estate value increases by 10 percent more than the expected 5 percent rate (i.e., if the value increases by 15 percent) or by 10 percent less than expected (i.e., if it decreases by 5 percent).[24]

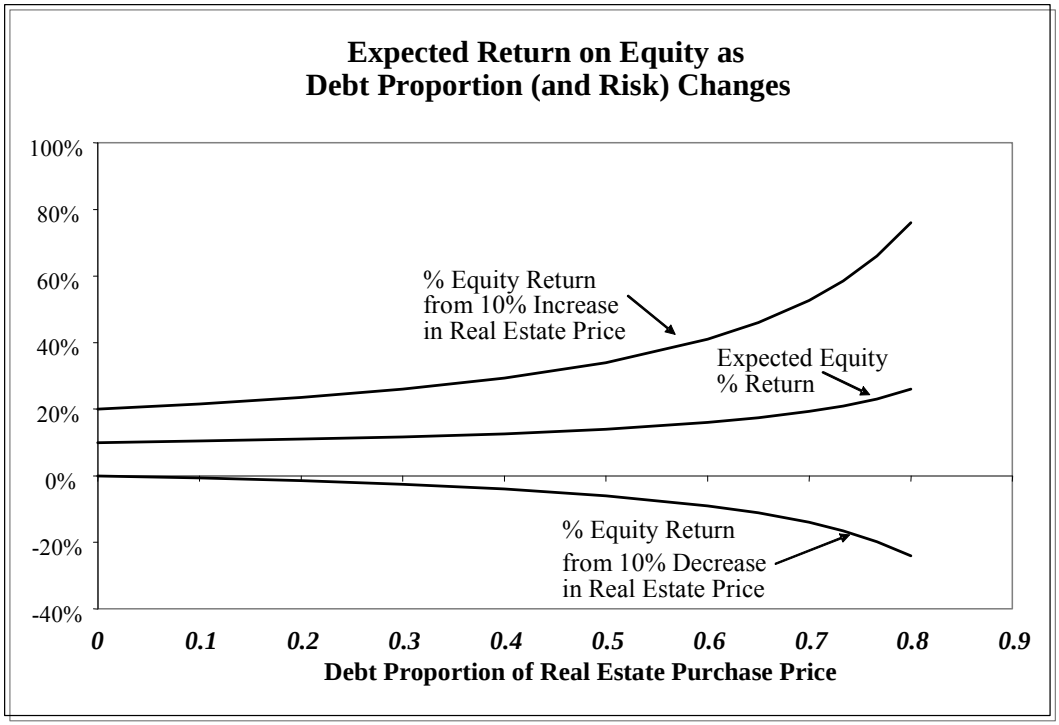

Figure E-1

The expected rate of return on equity increases at an increasing rate as the investor finances more and more of the real estate through loans (e.g., with a mortgage). Since equity bears all the risk of increases or decreases in real estate values (absent financial distress or bankruptcy), the amount of risk the buyer bears grows at an ever increasing rate as the mortgage percentage also increases.

[24] For simplicity, the figure assumes the debt's interest rate is independent of the debt proportion. This might not always be true, and in general would not be true for a corporation that issued debt. However, the general shape of the graphs remains the same.

Q18. What are the implications of this example?

A17. Any time an individual or a company uses debt to finance part an investment, the same risk magnifies. For example, if an investor buys stocks "on margin" -- by borrowing part of the money used to buy the stock -- the expected rate of return will be higher as will the risks the investor carries. As an everyday example, imagine investing your retirement savings in a stock portfolio bought with as much margin as possible. If you were lucky, you could end up living very well in retirement. But you would be taking a lot of risk on the opposite outcome, since your portfolio could decline by more than 100 percent of your initial investment.

The same risk-magnifying effects happen when companies borrow to finance part of their investments.

C. THE EFFECT OF TAXES

Q19. What is the impact of taxes?

A18. Analyzing the net effect of taxes in capital structure decisions by corporations is an important part of the financial research. (Other parts of that research address such issues as the risk of financial distress or bankruptcy, and the signals corporations send investors by the choice of how to finance new investments.) The bottom line is that taxes complicate the picture without changing the basic conclusion.

Q20. Please describe the potential impact of taxes.

A19. Interest expense is tax-deductible for corporations. That increases the pool of cash the corporation gets to keep out of its operating earnings (i.e., its earnings before interest expense). With no debt, 100 percent of operating income is subject to taxes. With debt, only the equity part of the operating income is subject to taxes.

All else equal, the extra money kept from operating income increases the value of the corporation. The standard way to recognize that increase in value is to use an after-tax weighted-average cost of capital as a discount rate when valuing a company's operating cash flows.

Q21. Do personal taxes affect the value of debt, too?

A20. Yes, but in the other direction. One offset to debt's tax benefits at the corporate level is its higher tax burden at the personal level. Investors care about the money they get to keep after all taxes are paid, and while the corporation saves taxes by opting for debt over equity, individuals pay more taxes on interest than on capital gains from equity (and for now, on dividends as well).

Q22. Are there factors other than taxes matter?

A21. Absolutely, "all else" does not remain equal as more debt is added. The more debt, the more the non-tax effects of debt offset the tax benefits. Other costs include such effects as a loss of flexibility, the possibility of sending negative signals to investors, and a host of costs and risks associated with the danger of financial distress.

Q23. Does the tradeoff between the tax and non-tax effects of debt mean that firms have well-defined, optimal capital structures?

A22. No, this sort of "tradeoff" model does not explain actual corporate behavior. A substantial body of economic research confirms that real-world corporations act as if, after a moderate amount of debt is in place, the tax benefits of debt are not worth debt's other costs. In country after country and in industry after industry, the most profitable corporations in an industry tend to use the least debt. The research on this point is quite thorough, and the finding that the most profitable companies tend to use the least debt in a given industry is robust. Yet these are the companies with the most operating income to shield from taxes, who would benefit most if interest tax shields were truly valuable net of debt's other costs. They also presumptively are the best-managed on average (else why are they the most profitable?). This means it is unrealistic to suppose that more debt is always better, or that greater tax savings due to higher interest expense always add value to the firm on balance.

Q24. If the tradeoff model doesn't explain capital structure decisions by firms, is there a model that does?

A23. No single model has (yet) emerged as 'the" explanation of capital structure. However, several alternative models attempt to model the tradeoff (e.g., the "pecking order" hypothesis and "agency cost" explanations).

Q25. What does the absence of an agreed theory of capital structure in the financial literature imply about the overall effect of debt on the value of the firm?

A24. The findings of the financial literature mean that within an industry, there is no well-defined optimal capital structure. The use of some debt does convey some value advantage in most industries, but that advantage is offset by other costs as firms add more debt.[25] The range of capital structures over which the value of the firm in any industry is maximized is wide and should be treated as flat. The location and level of that range, however, does vary from industry to industry, just as the overall cost of capital varies from industry to industry.

Figure E-2 illustrates the picture that emerges from the research. This figure shows the present value of an investment in each of four different industries. For simplicity, the investment is expected to yield $1.00 per year forever. For firms in relatively high-risk industries (Industry 1 in the graph, the lowest line), the $1.00 perpetuity is not worth much and any use of debt decreases firm value. For firms in relatively low-risk industries (Industry 4 in the graph), the perpetuity is worth more and substantial amounts of debt make sense. Industries 2 and 3 are intermediate cases.

The maximum net rate at which taxes can increase value in this figure equals 20 percent of interest expense, representing a balance between the corporate tax advantage to debt

[25] Note that if debt did increase the value of the firm materially, competition would tend to take that value away, since issuing debt is an easy-to-copy competitive strategy. Prices would fall as firms copied the strategy, lowering operating earnings and passing the net tax advantages to debt through to customers (just as happens under rate regulation). Therefore, if also there were a narrow range of optimal capital structures within an industry, competition would drive all firms in the industry to capital structures within that range. This does not happen in practice, which contradicts one or both of the assumptions, i.e., (1) that debt adds material value on balance, and/or (2) that there is a narrow range of optimal capital structures.

and the personal tax disadvantage. The figure plots the maximum possible impact of taxes on value as a separate line, starting at the all-equity value of the lowest-risk industry (Industry 4).

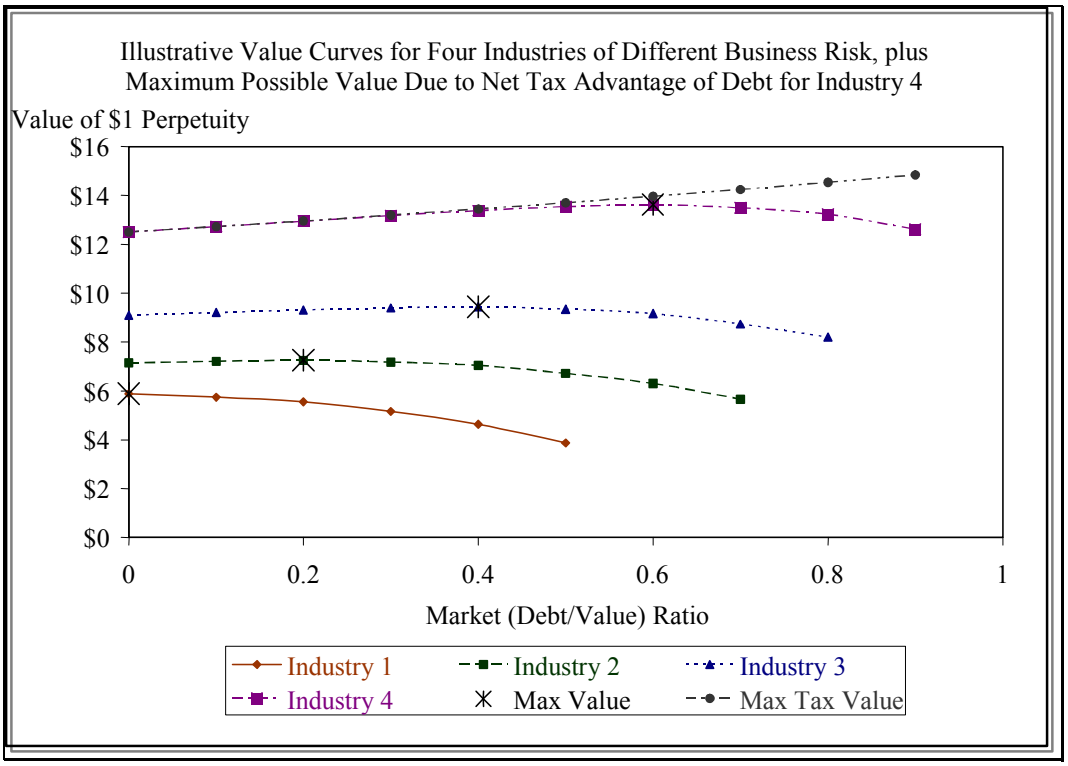

Figure E-2

Figure E-2 identifies a particular point as the maximum value on each of the four curves. However, the research shows that reliable identification of this maximum point, except in the extreme case where no debt should be used, is impossible. In accord with the research, the graph is prepared so that in none of the industries does a change in capital structure make much difference near the top of the curve. Even Industry 4, which increases in value at the maximum rate as quite a lot of debt is added, eventually must reach a broad range where changes in the debt ratio make little difference to firm value, given the research. For Industry 4, debt makes less than a 2 percent difference in the total value of the firm for debt-to-value ratios between 40 and 70 percent. (While these particular values are illustrative, numbers of this order of magnitude are the only ones consistent with the research.)

Q26. What does this imply for the overall cost of capital?

A25. Figure E-3 plots the after-tax weighted-average costs of capital ("ATWACCs") that correspond to the value curves in Figure E-2. This picture just turns Figure E-2 upside down.[26] All the same conclusions remain, except that they are stated in terms of the overall cost of capital instead of the overall firm value. In particular, except for high-risk industries, the overall cost of capital is essentially flat across a broad middle range of capital structures for each industry, which is the only outcome consistent with the research. For Industry 4, for example, the ATWACC changes by less than 15 basis points for debt-to-value ratios between 40 and 70 percent.

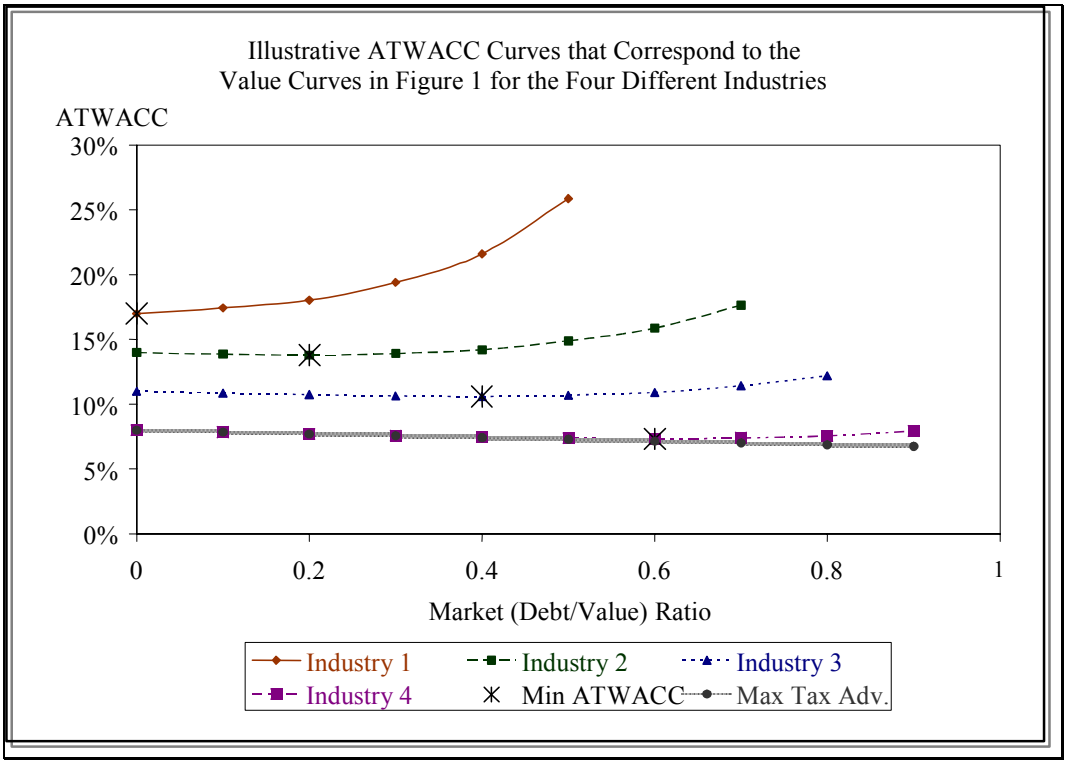

Figure E-3

[26] Note that the actual estimated ATWACC at higher debt ratios will tend to underestimate the ATWACC that corresponds to the value curves in Figure E-2, which are depicted in Figure E-3, and so will tend to overestimate the value of debt to the firm. The reason is that some of the non-tax effects of excessive debt, such as a loss of financial flexibility, may be hard to detect and not show up in cost-of-capital measurement.

Q27. How does this discussion relate to estimation of the right cost of equity for ratemaking purposes?

A26. When an analyst estimates the cost of equity for a sample of companies, s/he does so at the sample's actual market-value capital structure. That is, the sample evidence corresponds to ATWACCs that are already out somewhere in the broad middle range in which changes in the debt ratio have little or no impact on the overall value of the firm or the ATWACC.

An analyst therefore should assume the ATWACCs for the sample companies are literally flat. This assumption always provides the exact tradeoff between the cost of equity and capital structure at the literal minimum of the company's ATWACC curve. The research shows that this minimum is actually a broad, flat region, as depicted above. If the company happens to be somewhat to one side or the other of the literal minimum within this region, the recommended procedure may lead to a small understatement or overstatement of the amount that the cost of equity will change as capital structure changes. The degree of this under- or overstatement, however, is very small compared to the inherent uncertainty in estimating the cost of equity in the first place. Otherwise, the financial research would have found very different results about the existence of a narrowly defined optimal capital structure.

D. COMBINED EFFECTS

Q28. Please summarize the implications for the combined impact of the tax and non-tax effects of debt.

A27. The most profitable firms do not behave as if the precise amount of debt they use makes any material difference to value, and competition does not force them into an alternative decision, as it would if debt were genuinely valuable. The explanation that fits the facts and the research is that within an industry, there is no well-defined optimal capital structure. Use of some debt does convey an advantage in most industries, but that advantage is offset by other costs as firms add more debt. The range of capital structures over which the value of the firm in any industry is maximized is wide and should be

treated as flat. The location and level of that range, however, does vary from industry to industry, just as the overall cost of capital varies from industry to industry. To conclude that more debt does add more value, once the firm is somewhere in the normal range for the industry, is to conclude that corporate management in general is either blind to an easy source of value or otherwise incompetent (and that their competitors let them get away with it).

The finding that there is no narrowly defined optimal capital structure implies that analysts should estimate the ATWACCs for a sample of companies in a given industry and treat the average ATWACC value as independent of capital structure (at least within a broad middle range of capital structures). The right cost of equity for a rate-regulated company in the same industry is the number that yields the same ATWACC at the capital structure used to set the revenue requirement, since that is the cost of equity that (estimation problems aside) the sample companies would have had if their market-value capital structures had been equal to the regulatory capital structure.