BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

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IN THE MATTER OF THE APPLICATION OF ARIZONA-AMERICAN WATER COMPANY, AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE CURRENT FAIR VALUE OF ITS UTILITY PLANT AND PROPERTY AND FOR INCREASES IN ITS RATES AND CHARGES BASED THEREON FOR UTILITY SERVICE BY ITS ANTHEM WATER AND ANTHEM/AGUA FRIA WASTEWATER DISTRICTS	DOCKET NO. WS-01303A-06-____

**DIRECT TESTIMONY
OF
BENTE VILLADSEN
ON BEHALF OF
ARIZONA-AMERICAN WATER COMPANY**

June 16, 2006

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1   **EXECUTIVE SUMMARY**

2   Dr. Bente Villadsen, a senior associate at *The Brattle Group*, files testimony on the

3   cost of capital for Anthem Water district and Anthem/Agua Fria Wastewater district

4   (collectively, "Anthem").

5   Dr. Villadsen selects two benchmark samples, water utilities and gas LDC

6   companies. She estimates the sample companies' cost of equity, associated after-tax

7   weighted-average cost of capital, and the corresponding cost of equity at 40 percent equity.

8   She also reviews recent Arizona water and wastewater decisions. In undertaking her

9   analysis, Dr. Villadsen notes that the overall cost of capital is constant within a broad middle

10 range of capital structures although the distribution of costs and risks among debt and equity

11 holders is not. Because Anthem's requested target of 40 percent equity is lower than the

12 percentage equity among many utilities, its financial risk is higher and the return required

13 by investors increases with the level of risk they carry.

14   Based on the evidence from the samples, Dr. Villadsen estimates a cost of equity for

15 the benchmark samples to be in the range of 11¼ to12¾ percent. In reviewing the samples'

16 cost of equity estimates, Dr. Villadsen determined that the best midpoint estimate for

17 Anthem is between 11¾ and 12 percent. Dr. Villadsen also reviewed recent Arizona

18 decision and found that the decisions when applied to an entity with 40 percent equity

19 corresponds to a cost of equity of approximately 12¼ percent. She therefore finds that

20 Anthem's request for 11.75 percent return on equity at 40 percent equity is reasonable and

21 fully supported by her analysis.

1   I.   INTRODUCTION AND SUMMARY

2   **Q1**.   **Please state your name and address.**

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

4   Cambridge, MA 02138, USA.

5   **Q2**.   **Please describe your job and your educational experience.**

6   A2.   I am a Senior Associate of *The Brattle Group*, ("Brattle"), an economic, environmental and

7   management consulting firm with offices in Cambridge, Washington, San Francisco, London

8   and Brussels. My work concentrates on regulatory finance and accounting. I hold a B.S.

9   and M.S. from University of Aarhus, Denmark and a Ph.D. from Yale University's School

10   of Management.

11   **Q3**.   **What is the purpose of your testimony in this proceeding?**

12   A3.   I have been asked by Arizona-American Water Company ("Arizona-American" or the

13   "Company") to estimate the cost of equity that the Arizona Corporation Commission

14   ("ACC" or the "Commission") should allow Anthem Water and Anthem/Agua Fria

15   Wastewater (collectively "Anthem") an opportunity to earn on the equity financed portion

16   of its rate base.

17   To determine the cost of equity for Anthem, I first estimate the overall cost of capital

18   for two samples of regulated companies using several versions of the discounted cash flow

19   ("DCF") and risk positioning models. Second, I determine the cost of equity that the

1   estimated overall cost of capital gives rise to at Anthem's requested capital structure

2   consisting of 40% equity. Third, I evaluate the relative risk of Anthem and the sample

3   companies to determine the recommended cost of equity for Anthem.

4   **Q4**.   **Please summarize any parts of your background and experience that are particularly**

5   **relevant to your testimony on these matters.**

6   A4.   Brattle's specialties include financial economics, regulatory economics, and the utility

7   industry. I have worked extensively on cost of capital matters for electric, natural gas

8   distribution, pipeline and water utilities in both state and federal jurisdictions. I have

9   previously filed cost of capital testimony before the Arizona Corporation Commission.

10   Additionally, I have significant experience in other areas of rate regulation, credit risk in the

11   utilities industry, energy contracts, and accounting issues. I have filed direct and rebuttal

12   testimony on the equity method of accounting, the classification of debt versus equity, and

13   the distinction between categories of liabilities. Appendix A contains more information on

14   my professional qualifications.

15   **Q5**.   **Please summarize your approach to estimating the cost of capital for Anthem.**

16   A5.   To assess the cost of capital for Anthem, I select two benchmark samples, regulated water

17   utilities and natural gas local distribution companies ("LDC"). These samples are selected

18   to have risks characteristics comparable to those of Anthem. I give the results from the

19   water sample the most weight, but because the water sample suffers from numerous data

1   issues, I use the gas LDC sample as a check on the results from the water sample. For each

2   sample, I estimate the sample companies cost of equity using several versions of the DCF

3   method and of the risk positioning model. Based on data availability and the current state of

4   the water and gas distribution industries I assign the most weight to the risk positioning

5   models.

6   Given the cost of equity estimates for each company and the company market costs

7   of debt and preferred stock, I calculate each firm's overall cost of capital, i.e., its after-tax

8   weighted-average cost of capital ("ATWACC"), using the company market value capital

9   structure. I report the samples' average ATWACC and the cost of equity for a capital

10   structure with 40 percent equity. Thus, I present the cost of equity that is consistent with

11   the samples' market information and Anthem's regulatory capital structure. (By "regulatory

12   capital structure," I mean the capital structure that Anthem proposes in its application.)

13   Focusing on the overall cost of capital rather than its components avoids potential

14   problems of inconsistency between the estimated cost of equity and the level of financial risk

15   at the regulated company's capital structure.

16   **Q6**.   **Please summarize your conclusions regarding Anthem's cost of equity.**

17   A6.   The range for the water utility sample is 12 to 13 percent at 40 percent equity using the long-

18   term risk positioning method. The gas LDC sample has a wider range from 11¼ to 12½

19   percent with a midpoint of 12¼ and 11½ for the sample and subsample, respectively. The

20   corresponding overall after-tax weighted average cost of capital corresponding to the best

1   point estimate is a bit above 7 percent for a range of 6¾ to 7¼ percent for the water utility

2   sample. For the gas LDC sample the after-tax weighted average cost of capital falls in the

3   range of 6½ to 7½ percent. I specify a minimum of plus or minus ¼ percent range for the

4   cost of equity because I do not believe that it is possible to estimate the cost of capital or

5   equity more precisely than that. The cost of equity estimates from the multi-stage

6   discounted cash flow method are a bit lower for the water sample which has a midpoint of

7   about 11¾ percent while the midpoint for the gas LDC sample is about 12 and 13 percent

8   for the subsample and full sample, respectively. The company's request for return on equity

9   of 11.75 is within the range of my risk positioning estimates using the long-term risk

10   positioning model, near the midpoint for the gas LDC sample, and supported by the DCF

11   analysis. In my opinion, the request for 11.75 percent return on equity is therefore very

12   reasonable.

13   **Q7**.   **Why do you need to consider Anthem's regulatory capital structure?**

14   A7.   A firm's cost of equity is a function of both its business risk and its financial risk. The more

15   leveraged a company is the higher its risk. Investors in companies with higher risk require

16   a higher rate of return, so *as a company adds debt, the cost of equity goes up at an ever*

17   *increasing rate.* The higher cost of equity offsets the lower cost of debt, so that the after-tax

18   weighted-average overall cost of capital remains constant over a broad range.

19   That is, the associated capital structure affects an estimated cost of equity estimate

20   just as a life insurance applicant's age affects the required life insurance premium. It is

1   therefore necessary to calculate the cost of equity the sample companies would have had at

2   Anthem's regulatory capital structure to report accurately the market evidence on the cost

3   of equity.

4   **Q8**.   **How is the rest of your testimony organized?**

5   A8.   *Section II* defines the cost of capital and discusses the principles relating the cost of capital

6   and capital structure for a business. *Section III* summarizes the effects of leverage on the

7   cost of equity. *Section IV* presents the methods used to estimate the cost of capital for the

8   benchmark samples and the associated numerical analyses. This section also explains the

9   basis of my conclusions for the benchmark samples' returns on equity and overall costs of

10   capital. *Section V* summarizes the analysis and discusses the recommendation for Anthem.

11   Appendix A lists my qualifications. Appendices B and C support *Section IV* while Appendix

12   D supports *Section III*. Appendices B and C provide details on the risk positioning and DCF

13   approaches, respectively, including the details underlying the numerical analyses. Appendix

14   D discusses the impact of leverage on the cost of capital in more detail. Note that portions

15   of the testimony are repeated in the appendices in order to give the reader the context of the

16   issues before additional technical detail and further discussion are presented.

1 **II. THE COST OF CAPITAL AND RISK**

2 **Q9**.   **Please formally define the "cost of capital."**

3 A9.   The *cost of capital* is *the expected rate of return in capital markets on alternative*

4   *investments of equivalent risk*. In other words, it is the rate of return investors require based

5   on the risk-return alternatives available in competitive capital markets. The cost of capital

6   is a type of opportunity cost: it represents the rate of return that investors could expect to

7   earn elsewhere without bearing more risk.[1]

Figure 1

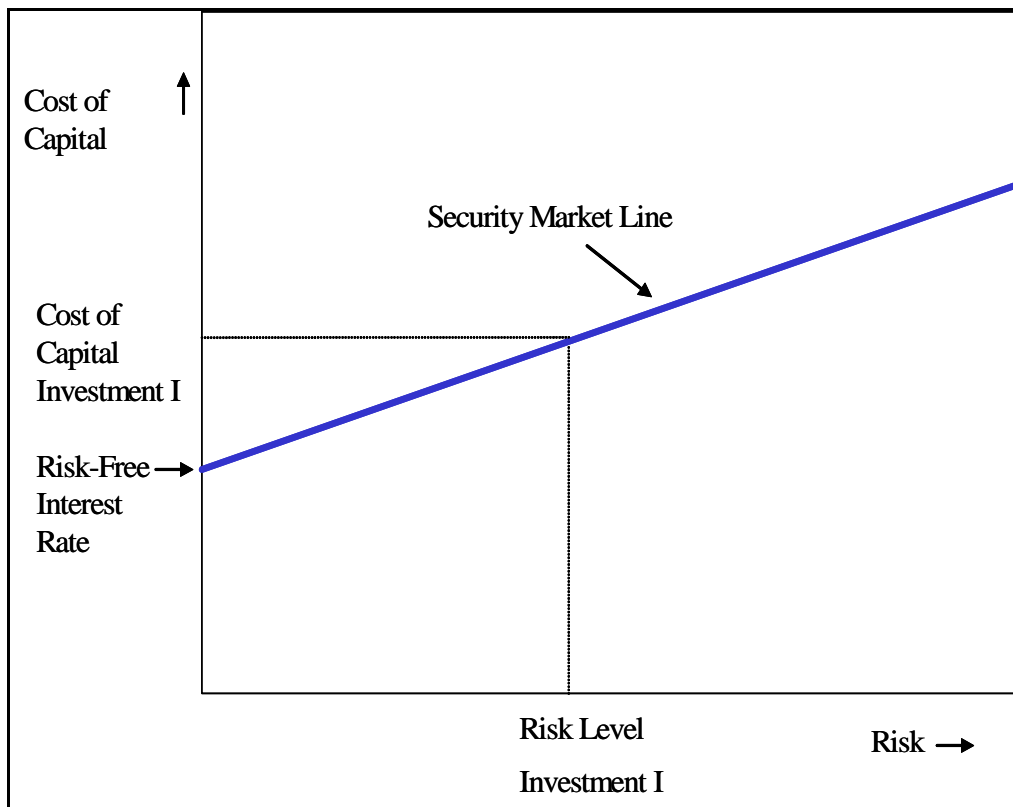[1]   "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected" in this testimony, as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

1   The definition of the cost of capital recognizes a tradeoff between risk and return that

2   is known as the "security market risk-return line," or "security market line" for short. This

3   line is depicted in Figure 1. The higher the risk, the higher the cost of capital. A version of

4   Figure 1 applies for all investments. However, for different types of securities, the location

5   of the line may depend on corporate and personal tax rates.

6   **Q10**. **Why is the cost of capital relevant in rate regulation?**

7   A10. U.S. rate regulation accepts the "cost of capital" as the right expected rate of return on utility

8   investment.[2] From an economic perspective, rate levels that give investors a fair opportunity

9   to earn the cost of capital are the lowest levels that compensate investors for the risks they

10   bear. Over the long run, an expected return below the cost of capital makes customers

11   underpay for service and shortchanges investors. In the long run, such a return denies the

12   company the ability to attract capital, to maintain its financial integrity, and to expect a

13   return commensurate with that of other enterprises attended by corresponding risks and

14   uncertainties. The failure to give investors a fair opportunity to earn the cost of capital can

15   have significant adverse consequences for the utility as well as for customers.

16   Of course, the cost of capital cannot be estimated with perfect certainty, and other

17   aspects of the way the revenue requirement is set may mean investors expect to earn more

---

[2]   To the best of my knowledge, the first paper formally to link 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).

1   or less than the cost of capital even if the allowed rate of return equals the cost of capital

2   exactly. However, a commission that on average sets rates so investors expect to earn the

3   cost of capital treats both customers and investors fairly, and acts in the long-run interests

4   of both groups.

5   **III. THE RELATIONSHIP BETWEEN CAPITAL STRUCTURE AND THE COST OF**
6   **EQUITY**

7   **Q11. Please explain why it is necessary to report the cost of equity adjusted for capital**

8   **structure.**

9   A11. In most jurisdictions in North America, rate regulation focuses on the components of the

10   rates. In other words, the focus of cost of capital estimation is usually to determine the

11   "right" cost of equity and to a lesser degree setting the allowed capital structure. While the

12   overall cost of capital depends primarily on the company's line of business, the distribution

13   of the cost of capital among debt and equity depends on their share in total revenues. Debt

14   holders' share is usually a fixed amount (except in situations of default) while equity holders

15   are residual claimants. Because a company's financial risk depends on its capital structure,

16   the risk shareholders carry increases with the leverage of the company. As shareholders

17   expect to be compensated for increased risk, the required rate of return increases with the

18   company's leverage. The increased risk is caused by the fact that debt has a senior claim on

19   a specified portion of earnings and in bankruptcy on assets. As common equity is the most

20   junior security, it gets what's left after everyone else has been paid. In other words, common

1   equity holders carry all residual risk. However, as explained in more detail in Appendix D,

2   the overall cost of capital is constant within a broad middle range of capital structures

3   although the distribution of costs and risks among debt and equity holders is not.

4   **Q12**. **Please provide an example on how debt adds risk to equity.**

5   A12.   As a simple example, think of an investor who takes money out of his savings account and

6   invests $100,000 in real estate. The future value of the real estate is uncertain. If the real

7   estate market booms, he wins. If the real estate market goes down, he loses. Figure 2 below

8   illustrates this.

9

Buy Real Estate for $100,000 using only Equity
If Real Estate Prices Increase or Fall by 10%, Gain or Lose 10%.

10% Gain in Real Estate Value
10% Gain In Equity Value

$110,000

$90,000

10% Loss in Real Estate Value
10% Loss in Equity Value

Equity

Equity

If Real Estate increases by 10%:
$110,000/$100,000=110%

If Real Estate falls by 10%:
$90,000/$100,000=90%

Changes in Equity Value: +/-10%

Investment   *10% Appreciation or Depreciation*
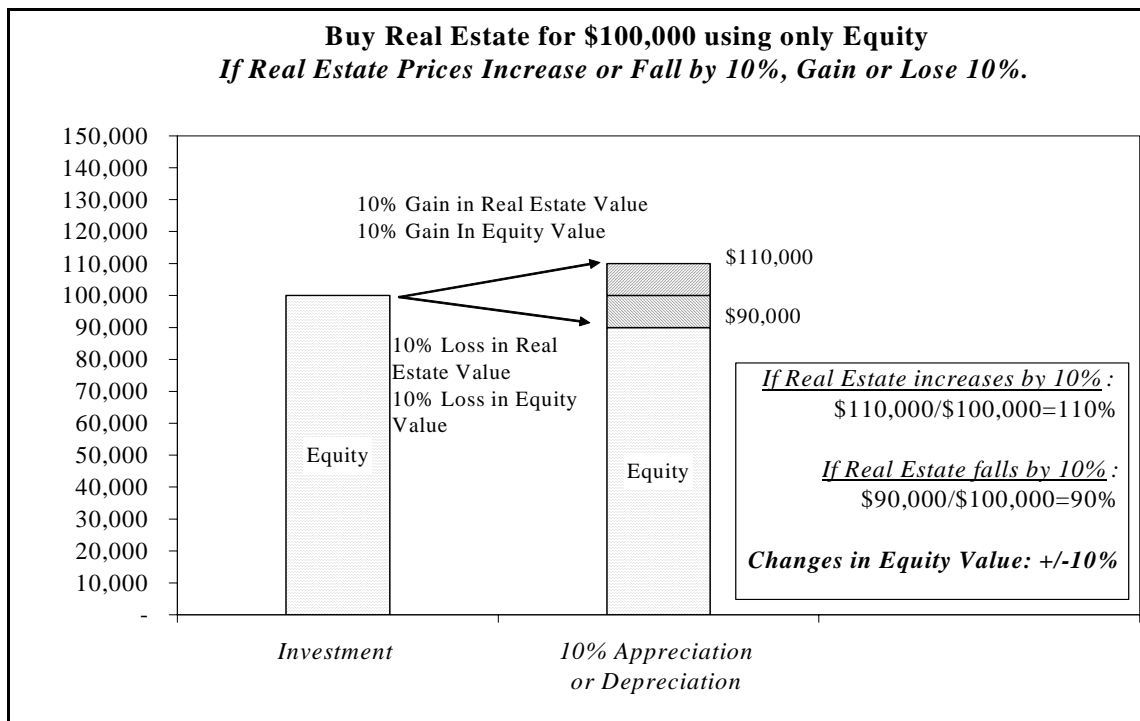
Figure 2

1   In the scenario above, the investor financed his real estate purchase through 100 percent

2   equity. Suppose instead that the investor had financed 50 percent of his real estate

3   investment with a mortgage of $50,000. The mortgage lender does not expect to share in any

4   benefits from increases in real estate values. Neither does the mortgage lender expect to

5   share in any losses from falling real estate values. I.e., the investor carries the entire risk of

6   fluctuating real estate prices. Figure 3 illustrates this effect.

Buy Real Estate for $100,000 with a $50,000 Mortgage
If Real Estate Increase or Fall by 10%, Gain or Lose 20%.

10% Gain in Real Estate Value
20% Gain In Equity Value

$110,000

$100,000

$90,000

10% Loss in Real Estate Value
20% Loss in Equity Value

$50,000

Equity

Mortgage

Equity

Mortgage

If Real Estate increases by 10%:
$110,000 - $50,000 = $60,000
$60,000/$50,000=120%

If Real Estate falls by 10%:
$90,000 - $50,000 = $40,000
$40,000/$50,000=80%

Changes in Equity Value: +/-20%

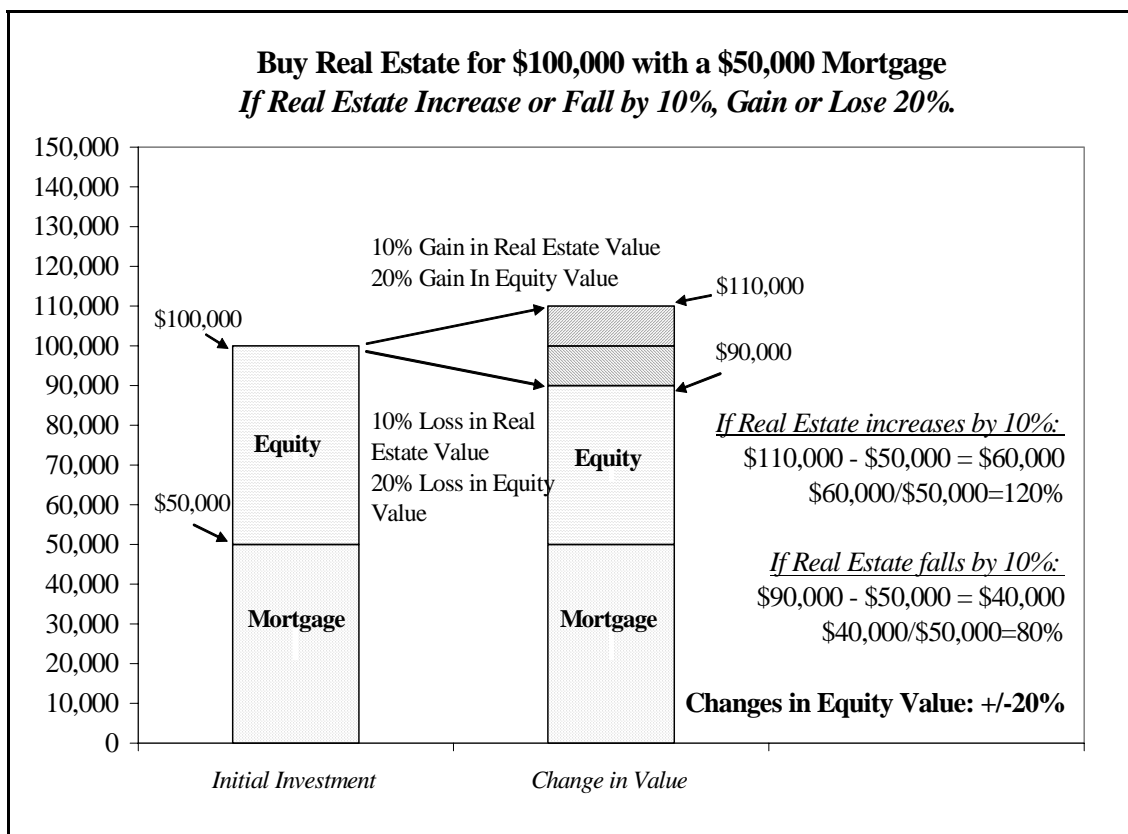*Initial Investment*   *Change in Value*

Figure 3

1   In Figure 3 where the investor financed his purchase through 50 percent equity and 50

2   percent debt, the variability in the investor's equity return is two times greater than that of

3   Figure 2. The entire fluctuation of 10 percent from rising or falling real estate prices falls

4   on the investor's $50,000 equity investment. The lesson from the example is obvious, debt

5   adds risk to equity.

6 **Q13**. **Please explain the implications of the relationship between capital structure and the**

7   **cost of equity for rate regulation.**

8 A13. The risk equity holders carry, and therefore the cost of equity, depends on the capital

9   structure. As illustrated in the example above, as leverage increases, the market risk

10   increases and hence the required return on equity increases.

11 **Q14**. **To assess the magnitude of financial risk for a rate regulated company, should you use**

12   **the market-value or the book-value capital structure?**

13 A14. The market-value capital structure is the relevant quantity for analyzing the cost of equity

14   evidence, which is based on market information.[3]

---

[3]   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. (2005) pp. 504-05. 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.

1   **Q15**.   **Please provide an example that illustrates why market values are relevant.**

2   A15.   Suppose in the example from above that the investor has invested in real estate 10 years ago.

3   Further assume that depreciation has reduced the book value of the real estate from $100,000

4   to $75,000 and assume the investor has paid off 40 percent of his $50,000 mortgage. Thus,

5   the investor has a remaining mortgage of $30,000 (= 60% × $50,000). The book value of

6   the investor's equity investment is therefore $45,000 (= $75,000 - $30,000).

7   What happens now if real estate prices rise or fall 20 percent? To answer that

8   question, we need to know how real estate prices have developed over the past 10 years. If

9   the market value of the real estate now is $200,000 then a 20 percent decrease in the price

10   of real estate ($40,000) is almost equal to the investor's book value equity. However, his

11   market value equity (or net worth) is equal to the value of the real estate minus what he owes

12   on the mortgage. If we assume that the market value of the mortgage equals the unpaid

13   balance ($30,000), then the investor's net worth is calculated as follows:

14   Net Worth   =   Market Value   -   Remaining Mortgage
15   Of Real Estate

16   = $200,000   - $30,000   = $170,000

17   Therefore, the rate of return on equity due to a 20 percent decline in real estate prices is

18   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 underlying those costs risks material errors. The costs of equity estimates of the sample companies at their actual market-value capital structures is not necessarily reflected in the regulatory capital structure. Therefore, it 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 Anthem'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 Arizona-American's

1   marginal tax rate and each company's cost of debt and market-value capital structure to

2   estimate the sample companies' overall cost of capital. I then calculate the sample average

3   overall cost of capital for each equity estimation method for both of the samples. Using the

4   procedure discussed above, I then determine the cost of equity at Anthem's regulated capital

5   structure for each estimation method that is consistent with the sample's overall cost of

6   capital information.

7   **Q17**. **Is the use of market values to calculate the impact of capital structure on the risk of**

8   **equity incompatible with use of a book-value rate base for a regulated company?**

9   A17. No. Investors buy stock at market prices and expect a reasonable return on their investment.

10   Market-based cost of equity estimation methods, such as DCF or CAPM which are

11   frequently used in rate regulation, recognize this and rely on market data. That is, the cost

12   of capital is the fair rate of return on regulatory assets for both investors and customers.

13   Most regulatory jurisdictions in the U.S. measure the rate base using the net book value of

14   assets, not current replacement value or historical cost trended for inflation. But the

15   jurisdictions still apply market-derived measures of the cost of equity to that net book value

16   rate base.

17   The issue here is, what level of risk is reflected in that cost of equity estimate? That

18   risk level depends on the sample company's market-value capital structure, not its book-

19   value capital structure. *That risk level would be different if the sample company's market-*

1   *value capital structure exactly equaled its book-value capital structure, so the estimated cost*

2   *of equity would be different, too.*

3   **Q18. Please sum up the implications of this section.**

4   A18. The market risk, and therefore the cost, of equity depends directly on the market-value

5   capital structure of the company or asset in question. It therefore is impossible to compare

6   validly the measured costs of equity of different companies without taking capital structure

7   into account. Capital structure and the cost of equity are unbreakably linked, and any effort

8   to treat the two as separate and distinct questions violates both everyday experience (e.g.,

9   with home mortgages) and basic financial principles.

10   **Q19. How should a cost of capital analyst implement this principle?**

11   A19. As discussed further in Appendix D, there has been a great deal of financial research on the

12   effects of capital structure on the value of the firm. One of the key conclusions that result

13   from the research is that no narrowly defined optimal capital structure exists within

14   industries, although the typical range of capital structures does vary among industries.[4]

15   Instead, there is a relatively wide range of capital structures within any industry in which

16   fine-tuning the debt ratio makes little or no difference to the value of the firm, and hence to

17   its overall after-tax cost of capital.

---

[4]   An exception is very high-risk industries that should avoid debt entirely, which makes their optimal capital
       structure zero percent debt.

1   Accordingly, analysts should treat the market-value weighted average of the cost of

2   equity and the after-tax current cost of debt, or the "ATWACC" for short,[5] as constant.

3   Sample evidence should be analyzed to determine the sample's average ATWACC, which

4   can be compared across different firms or industries. The economically appropriate cost of

5   equity for a regulated firm is the quantity that, when applied to the *regulatory* capital

6   structure, produces the same ATWACC. That value is the cost of equity that the sample

7   would have had, estimation problems aside, if the sample's market-value capital structure

8   had been equal to the regulatory capital structure in question.

9   **Q20**.   **How do you calculate the cost of equity consistent with the market-determined estimate**

10   **of the sample's average cost fo capital?**

11   A20.   For simplicity assume that all sample companies have only common stock and debt. Then

12   the ATWACC is calculated as

13
$$ATWACC = r_D \times (1\text{-}T_C) \times D + r_E \times E \qquad\qquad (1)$$

14   where r_D is the market cost of debt, r_E is the market cost of equity, $_C$ is the marginal corporate

15   income tax rate, D is the percent debt in the capital structure, and E is the percent equity in

16   capital structure. The cost of equity consistent with the overall cost of capital estimate

---

[5]   This quantity typically is called the "weighted-average cost of capital" or "WACC" in finance textbooks. 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. Accordingly, in regulatory settings it's useful to refer to the textbook WACC as the "ATWACC," or "after-tax weighted-average cost of capital." I follow that practice here.

1   (ATWACC), the market cost of debt and equity, the marginal corporate income tax rate and

2   the amount of debt and equity in the capital structure can be determined by solving equation

3   (1) for r_E.

4   **IV. THE COST OF CAPITAL FOR THE BENCHMARK SAMPLES**

5   **Q21**.   **How is this section of your testimony organized?**

6   A21.   As noted in *Section II*, I estimate the cost of capital using two samples of comparable risk

7   companies. This section first covers matters such as sample selection, market-value capital

8   structure determination, and the sample companies' costs of debt. It then covers estimation

9   of the cost of equity for the sample companies and the resulting estimates of the sample's

10   overall after-tax cost of capital. Next, it analyzes these data to reach a conclusion on the

11   overall cost of capital and the corresponding cost of equity at Anthem's regulatory capital

12   structure for both of the benchmark samples.

13   **A.**   **PRELIMINARY DECISIONS**

14   **Q22**.   **What preliminary decisions are needed to implement the above principles?**

15   A22.   I must select the benchmark samples, calculate the sample companies' market-value capital

16   structures, and determine the sample companies' market costs of debt and preferred equity.

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

2 **Q23**. **Why do you use two samples?**

3 A23. The overall cost of capital for a part of a company depends on the risk of the business in

4   which the *part* is engaged, *not* on the overall risk of the parent company on a consolidated

5   basis.

6   Estimating the cost of capital for Anthem's regulated assets is the subject of this

7   proceeding. The ideal sample would be a number of companies that are publicly traded

8   "pure plays" in the water production, storage, treatment, transmission, distribution and

9   wastewater lines of business.[6] "Pure play" is an investment term referring to companies with

10   operations only in one line of business. Publicly traded firms, firms whose shares are freely

11   traded on stock exchanges, are ideal because the best way to infer the cost of capital is to

12   examine evidence from capital markets on companies in the given line of business.

13   Therefore, for this case, a sample of companies whose operations are concentrated

14   solely in the regulated portion of the water industry would be ideal. Unfortunately, the

15   available sample of "water" utility companies in the U.S. is relatively small and has serious

16   data deficiencies. See *Section IV.C.1* for a description of these deficiencies.

17   To select my sample of comparable water and gas LDC companies, I start with those

18   companies that are listed as a water utility or natural gas (distribution) company in *Value*

---

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

1   *Line*.[7] Usually, I would apply several selection criteria to delete companies with unusual

2   circumstances that may bias the cost of capital estimation and companies whose risk

3   characteristics differ from those of the filing entity. However, the application of such criteria

4   would eliminate almost all the water utilities listed in *Value Line*. Therefore, I do not apply

5   selection criteria to the water utility sample although I do apply my standard criteria to the

6   gas LDC sample. Specifically, if I eliminate all water utilities with annual revenues below

7    $200 million, less than 60 percent regulated revenues, lack of growth rates (from *IBES* or

8   *Value Line*), or lack of a bond rating, I would be left with at most two companies (American

9   States Water and California Water Services). A two company sample is simply too small

10   to provide reliable results. Therefore, I keep all water utilities with data in my water utility

11   sample, but I do report results for a sub sample that earn a large percentage of revenues from

12   regulated activities.

13   **Q24**. **What do you do to overcome the weaknesses of the water utility sample?**

14   A24.   To overcome the weaknesses of the water sample, I select a second sample of regulated

15   utilities: gas LDC companies. Gas LDC companies, like water utilities, are regulated by

16   state regulatory bodies, have large distribution investments, and serve a mix of residential,

17   industrial, and commercial customers.

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[7]   To select the water utility sample I include both the Standard and the Small and Mid-Cap Editions of *Value
      Line Investment Survey and Value Line Investment Survey - Plus Edition.* To select the gas LDC sample I
      include only the Standard Edition of *Value Line Investment Survey.*

1   For the gas LDC sample, I start with *Value Line's* universe of natural gas distribution

2   companies but in this sample, I only include companies with an investment grade bond

3   rating, no recent mergers or acquisitions, no recent dividend cuts, at least 60 percent

4   percentage revenues from regulated operations, and no other activity that could cause the

5   estimation parameters to be biased. Additionally, I require the companies to have necessary

6   data available.

7   **Q25**.   **What is the specific sample selection procedure for the gas local distribution**

8   **companies?**

9   A25.   One reason for using the gas LDC sample is to generate a sample of regulated companies

10   whose primary source of revenues is in the regulated portion of the natural gas industry to

11   provide a check for the results of the water sample. Therefore, I started with the universe

12   of publicly traded natural gas distribution utilities covered by *Value Line Investment Survey*,

13   and eliminated those companies whose revenues from regulated natural gas distribution

14   operations was less than 60 percent. The final sample includes seven companies. I also

15   report results for a subsample of companies characterized by having generated more than 75

16   percent of their revenue from regulated activities. The subsample consists of three

17   companies.[8]   Additional details of the sample selection process for each sample and

18   subsample are described below as well as in Appendix B.

---

[8]   Compared to my earlier testimony filed with the Arizona Corporation Commission, the gas LDC sample has
been reduced from eight to seven companies as KeySpan has announced merger plans.

1   **Q26**.   **If the business risk of the gas LDC sample differs from the water sample, can you still**

2   **rely on the cost of equity estimated for the gas LDC sample?**

3   A26.   Yes. If the business and financial risk of the two samples differ, then a cost of capital analyst

4   can still make use of the information from the more reliable sample to evaluate the reliability

5   of the estimates from the water sample. The inference would be based on information about

6   the relative risk of the two industries.

7   **Q27**.   **Please elaborate on the way two samples with different business and financial risks can**

8   **be compared.**

9   A27.   As mentioned above, the overall cost of capital for a part of a company depends on the risk

10   of the business in which the *part* is engaged, *not* on the overall risk of the parent company

11   on a consolidated basis. According to financial economics, the overall risk of a diversified

12   company equals the market value weighted-average of the risks of its components.

13   Calculating the overall after-tax weighted average cost of capital for each sample

14   company as described above allows the analyst to estimate the average overall cost of capital

15   for the sample. The ATWACC captures both the business risk and the financial risk of the

16   sample companies in one number. This allows comparison of the cost of capital between

17   two samples on a much more informed basis. If the alternative (more reliable) sample is

18   judged to have slightly different risk than the water sample, but the results show wide

19   differences in the ATWACC estimates, the analyst should carefully consider the validity of

20   the water sample estimates, whether they are materially higher or lower than the alternative

1   sample's estimates. Of course, the alternative sample could be the source of the error, but

2   that is less likely because the alternative sample has been selected precisely because of its

3   expected reliability.

4   **Q28**.   **Please compare the characteristics of the water utility sample and the gas LDC sample.**

5   A28.   The two samples differ primarily in that they operate in two different (regulated) industries,

6   but they are very similar in terms of the percentage of revenues from regulated operations

7   and the customers they serve. On average, both samples earn a large percentage of their

8   revenue from regulated activities and serve a mix of residential, industrial, and other

9   customers. In addition, both industries are characterized by large capital investment and

10   both operating a large distribution system. However, the gas LDC sample has fewer of the

11   data and estimation issues identified above for the water sample. Please refer to Appendix

12   B for addition details comparing the two samples.

13   **2.   Market-Value Capital Structure**

14   **Q29**.   **What capital structure information do you require?**

15   A29.   For reasons discussed below and in Appendix D, explicit evaluation of the market-value

16   capital structures of the sample companies is vital for a correct interpretation of the market

17   evidence on the return on equity. This requires estimates of the market values of common

18   equity, preferred equity and debt, and the current market costs of preferred equity and debt.

1 **Q30**. **Please describe how you calculate the market values of common equity, preferred**

2 **equity and debt.**

3 A30. I estimate the capital structure for each sample company by estimating the market values of

4 common equity, preferred equity and debt from the most recent publicly available data. The

5 details are in Appendix B.

6 Briefly, the market value of common equity is the price per share times the number

7 of shares outstanding. For the risk positioning approach, I use the last five trading days of

8 each year to calculate the market value of equity for the year. I then calculate the average

9 capital structure over the corresponding five-year period used to estimate the "beta" risk

10 measures for the sample companies. This procedure matches the estimated beta to the

11 degree of financial risk present during its estimation period. In the DCF analyses, I use the

12 average stock price over 15 trading days ending on the release date of the *IBES* growth rate

13 forecasts utilized.[9]

14 The market value of debt is estimated at its book value. Because debt instruments

15 generally are callable in the U.S., I do not expect the market and book value of debt to differ

16 much. The market value of preferred stock for the samples is also set equal to its book

17 value.

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[9] *IBES* growth rates were as of March 31, 2006 for all companies except Aqua America whose *IBES* estimate
is as of October 17, 2005.

1 **3.   Market Costs of Debt and Preferred**

2 **Q31**. **How do you estimate the current market cost of debt?**

3 A31. The market cost of debt for each company in the DCF analysis is the current yield reported

4   in the Mergent Bond Record for an index of public utility company bonds with the same

5   rating as the sample company.[10] Bond rating information was obtained from Compustat

6   which reports Standard & Poor's bond ratings.[11] Calculation of the after-tax cost of debt

7   uses the Company's estimated marginal income tax rate of 38.6 percent.

8 **Q32**. **How do you estimate the market cost of preferred equity?**

9 A32. For all sample companies, the preferred rating was assumed equal to the company's bond

10   rating. The cost of a company's preferred equity was set equal to the yield on an index of

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

12   Record.

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[10]   In the DCF analysis, the companies' current bond rating was used whereas the average bond rating over the past five years was used in the risk positioning models.

[11]   For some companies in the water utility sample bond ratings were obtained from Moody's (www.moodys.com) or from Standard & Poor's webpage (www.standardandpoors.com). Details are in Workpaper #1 to Table No. BV-10.

1   **B.   COST OF EQUITY ESTIMATION METHODS**

2   **Q33.   How do you estimate the cost of equity for your sample companies?**

3   A33.   Recall that the cost of capital is the expected rate of return in capital markets on alternative

4   investments of equivalent risk. This definition leads me to address three key points in my

5   estimation procedures. First, the cost of capital is an *expected* rate of return, it cannot be

6   directly observed, but must be inferred from available evidence. Second, the cost of capital

7   is determined *in capital markets* (such as the New York Stock Exchange). Therefore, capital

8   market data provide the best evidence from which to draw inferences. Third, the cost of

9   capital depends on the return offered by alternative investments *of equivalent risk.*

10   Consequently, measures of risk that matter in capital markets are part of the evidence that

11   I need to examine.

12   **Q34.   How does the above definition help you estimate the cost of capital?**

13   A34.   The definition of the cost of capital recognizes a tradeoff between risk and expected return;

14   This is the security market line plotted above in Figure 1 above. Cost of capital estimation

15   methods usually take one of two approaches: (1) they establish the location of the security

16   market line and estimate the relative risk of the security, which jointly determine the cost of

17   capital or (2) they try to identify a comparable-risk sample of companies and estimate the

18   cost of capital directly. Looking at Figure 1, the first approach focuses directly on the

19   vertical axis, while the second focuses both on the security's position on the horizontal axis

20   and on the position of the security market line.

1   The first type of approach is more direct, but ignores the wealth of information

2   available on securities not thought to be of precisely comparable risk. The "discounted cash

3   flow" or "DCF" model is an example. The second type of approach, sometimes known as

4   "equity risk premium approach," requires an extra step - - positioning the security market

5   line. Using the second approach allows me to use information from all traded securities

6   rather than just those included in my sample. The capital asset pricing model ("CAPM") is

7   an example. While both approaches can work equally well if conditions are right, one may

8   be preferable to the other under certain circumstances. In particular, approaches that rely on

9   the entire security market line are less sensitive to deviations from the assumptions that

10   underlie the model, all else equal. In this case, I examine both DCF and risk positioning

11   approach evidence for the water utility and gas LDC sample.

1.   The Risk Positioning Approach

Q35. **Please explain the risk positioning method.**

A35. 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

1   security market line depicted in Figure 1: they use information on a large number of traded

2   securities to identify the security market line and derive the cost of capital for the individual

3   security based on that security's relative risk. This reliance on the entire security market line

4   makes the method less vulnerable to the kinds of problems that arise from using one stock

5   at a time (such as the DCF method). The risk positioning approach is widely used and

6   underlies most of the current research published in academic journals on the nature,

7   determinants and magnitude of the cost of capital. The most commonly used version of the

8   formal risk positioning models is the Capital Asset Pricing Model ("CAPM").[12] The

9   equation for the CAPM is:

$$k = r_F + \beta \times MRP \tag{2}$$

11   where k is the cost of capital, r_F is the risk-free interest rate, MRP is the market risk

12   premium, and β is the measure of relative risk.

13   *Section I* of Appendix B to this testimony provides more detail on the principles that

14   underlie the risk positioning approach. *Section II* of Appendix B provides the details of the

15   risk positioning approach empirical estimates I obtain.

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[12]   It is also the most commonly used method to estimate the cost of capital among practitioners. See, for
       example, John R. Graham and Campbell R. Harvey (2001), "The Theory and Practice of Corporate Finance:
       Evidence from the Field," *Journal of Financial Economics* 60, pp. 187-243.

1   **Q36**.   **How are the "more formal" applications of the risk positioning approach**

2   **implemented?**

3   A36.   The first step is to specify the current values of the benchmarks that determine the security

4   market line. The second is to determine the security's, or investment's, relative risk. The

5   third is to specify exactly how the benchmarks combine to produce the security market line,

6   so the company's cost of capital can be calculated based on its relative risk.

7   **a.**   **Security Market Line Benchmarks**

8   **Q37**.   **What benchmarks are used to determine the location of the security market line?**

9   A37.   The essential benchmarks that determine the security market line are the risk-free interest

10   rate and the premium that a security of average risk commands over the risk-free rate. This

11   premium is commonly referred to as the "market risk premium" ("MRP"), *i.e.*, the excess

12   of the expected return on the average common stock over the risk-free interest rate. In the

13   risk positioning approach, the risk-free interest rate and MRP are common to all securities.

14   A security-specific measure of relative risk (beta) is estimated separately and combined with

15   the MRP to obtain the company-specific risk premium.

16   **Q38**.   **What benchmark do you use for the MRP?**

17   A38.   I estimate two versions of the risk positioning model. The first version measures the market

18   risk premium as the risk premium of average-risk common stocks over long-term

19   Government bonds. The second version measures the market risk premium over short-term

1   Treasury bills, which is the usual measure of the MRP used in capital market theories. To

2   determine the cost of capital in a regulatory proceeding, the market risk premium should be

3   used with a *forecast* of the same interest rate (*i.e.*, the short-term or long-term Government

4   bond rate).

5   **Q39**.   **How do you estimate the MRP?**

6   A39.   Appendix B summarizes academic and empirical research on the MRP. However, as

7   discussed in the appendix, there is currently little consensus on the "best practice" for

8   estimating the MRP. (Note: this is not the same thing as saying that all practices are equally

9   good). For example, the leading graduate textbook in corporate finance, expresses the view

10   that a range between 5 to 8 percent is reasonable for the U.S.[13] Ibbotson Associates data from

11   1926 to 2005, the longest period reported, show an MRP average premium of stocks over

12   Treasury bills is 8.5 percent.[14]

13   My testimony considers both the historical evidence and the results of scholarly

14   studies of the factors that affect the risk premium for average-risk stocks in order to estimate

15   the benchmark risk premium investors currently expect. In particular, I rely on historical

16   differences between the S&P 500 Index ("S&P 500") and the risk-free rate.

17   Considering all the evidence, I conclude that S&P 500 stocks of average risk today

---

[13]   Richard A. Brealey, Stewart C. Myers and Franklin Allen, *Principles of Corporate Finance*, 8th ed., New York: McGraw-Hill/Irwin (2005), pp. 151-154.

[14]   Ibbotson Associates, "*SBBI: Valuation Edition 2006 Yearbook.*"

1   command a premium of 8.0 percent over the short-term risk-free rate and 6.5 percent over

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

3   Appendix B.

4   **Q40**.   **How do you determine the risk-free rate you use?**

5   A40.   Ideally, the risk-free rate is the estimated risk-free rate over the period where rates will be

6   in effect. For this proceeding, I use the current yield on long-term Government bonds and

7   30-day T-bills as an estimate for the long-term and short-term risk-free rate, respectively.

8   Using an average of 15 trading days ending April 25, 2006, I obtain a short-term risk-free

9   rate of 4.60% and a long-term risk-free rate of 5.21%, respectively.[15] The yields on both

10   short-term and long-term government securities have increased by more than 50 basis points

11   since the start of 2006 and are more likely to increase than to decrease.[16] Therefore, I believe

12   my risk-free rates, are more likely to underestimate than overestimate the risk-free rate going

13   forward.

14   **b.   Relative Risk**

15   **Q41**.   **What measure of relative risk do you use?**

16   A41.   I examine the "beta" of the stocks in question. Beta is a measure of the "systematic" risk of

---

[15]   See Workpaper #2 to Table No. BV-9.

[16]   The Federal Reserve raised interest rates as recently as May 10, 2006 and stated that "further policy firming may yet be needed to address inflation risks". (Federal Reserve, Press Release, May 10, 2006)

1   a stock — the extent to which a stock's value fluctuates more or less than average when the

2   market fluctuates.

3   The basic idea behind beta is that risks that cannot be diversified away in large

4   portfolios matter more than those that can be eliminated by diversification. Beta is a

5   measure of the risks that *cannot* be eliminated by diversification. This concept is explored

6   further in Appendix B.

7   **Q42**. **What does a particular value of beta mean?**

8   A42. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up

9   or down by 10 percent on average when the market goes up or down by 10 percent. Stocks

10   with betas above 1.0 exaggerate the swings in the market: stocks with betas of 2.0 tend to

11   fall 20 percent when the market falls 10 percent, for example. Stocks with betas below 1.0

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

13   the market rises 10 percent.

14   **Q43**. **How do you estimate beta?**

15   A43. For both samples, I use betas reported by *Value Line* for reasons discussed below.

16   **c.   Cost of Equity Capital Calculation**

17   **Q44**. **How do you combine the preceding steps to estimate the cost of equity?**

18   A44. The most widely used approach to combine a risk measure with the benchmark market risk

1   premium on common stocks to find a risk premium for a particular firm or industry is the

2   Capital Asset Pricing Model. However, the CAPM is only one risk positioning technique.

3   In addition to the CAPM, I rely on an empirical variety of the model. Empirical

4   research has long shown that the CAPM tends to overstate the actual sensitivity of the cost

5   of capital to beta: low-beta stocks tend to have higher risk premia than predicted by the

6   CAPM and high beta stocks tend to have lower risk premia than predicted. A number of

7   variations on the original CAPM theory have been proposed to account for this finding.

8   This finding can be used directly to estimate the cost of capital, using beta to measure

9   relative risk, without simultaneously relying on the CAPM. Here I examine results from

10   both the CAPM and a version of the security market line based on the empirical finding that

11   risk premia are related to beta, but are not as sensitive to beta as the CAPM predicts, to

12   convert the betas into a risk premium. I refer to this latter model as the "ECAPM," where

13   ECAPM stands for *Empirical* Capital Asset Pricing Model. The formula for the ECAPM

14   is

15   $$k = r_F + \alpha + \beta \times (MRP - \alpha) \tag{3}$$

16   where as before k is the cost of capital, r_F is the risk-free interest rate, MRP is the market risk

17   premium, β is the measure of relative risk, and α is the empirical adjustment factor.

18   Research supports values for α of from one to seven percent when using a short-term

19   interest rate. I use baseline values of α of 2 percent for the short-term risk-free rate and 0.5

20   percent for the long-term risk-free rate. I also conduct sensitivity tests for different values

21   of α. For the short-term risk-free rate I use values for α of 1, 2 and 3 percent. For the long-

1   term risk-free rate I use values for α of 0, 0.5 and 1.5 percent. See Appendix B for a more

2   detailed discussion of the ECAPM model and Table B-1 for a summary of the empirical

3   evidence on the size of the required adjustment.

4   **Q45**.   **Why is it appropriate to use the ECAPM model?**

5   A45.   Empirical tests of the CAPM have repeatedly shown that an investment's return is related

6   to systematic risk, but that the increase in return for an increase in risk is *less* than is

7   predicted. The empirical tests have also shown that the theoretical intercept, as measured

8   by the return on Treasury bills, is too low to fit the data. In other words, the empirical tests

9   indicate that the slope of the CAPM is too steep and the intercept is too low. The empirical

10   data support the ECAPM. The ECAPM recognizes the consistent empirical observation that

11   the CAPM underestimates (overestimates) the cost of capital for low (high) beta stocks. The

12   ECAPM corrects the predictions of the CAPM to more closely match the results of the

13   empirical tests. Ignoring the results of CAPM tests would lead to an estimate of the cost of

14   capital that is likely to be less accurate than is possible.

15   **Q46**.   **Is the use of the ECAPM equivalent to adjusting the estimated betas for the sample**

16   **companies?**

17   A46.   No. Fundamentally, this is *not* an adjustment (increase) in beta. This can easily be seen by

18   the fact that the expected return on high beta stocks is lower with the ECAPM than when

19   estimated by the CAPM. The ECAPM model is a recognition that the actual slope of the

1   risk-return tradeoff is flatter than predicted and the intercept higher based upon repeated

2   empirical tests of the model.[17] Even if the beta of the sample companies were estimated

3   accurately, the CAPM would still underestimate the required return for low beta stocks.

4   Even if the ECAPM were used, the costs of equity would be underestimated if the betas were

5   underestimated.

6   **2.   Discounted Cash Flow Method**

7   **Q47**.   **Please describe the discounted cash flow approach.**

8   A47.   The DCF model takes the first approach to cost of capital estimation, i.e., to attempt to

9   estimate the cost of capital in one step. The method assumes that the market price of a stock

10   is equal to the present value of the dividends that its owners expect to receive. The method

11   also assumes that this present value can be calculated by the standard formula for the present

12   value of a cash flow stream:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_T}{(1+k)^T} \qquad (4)$$

15   where "P_0" is the current market price of the stock; "D_i" is the dividend cash flow expected

16   at the end of period I; "k" is the cost of capital; and "T" is the last period in which a dividend

---

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

1   cash flow is to be received. The formula just says that the stock price is equal to the sum of

2   the expected future dividends, each discounted for the time and risk between now and the

3   time the dividend is expected to be received.

4   Most DCF applications go even further, and make very strong (*i.e.*, unrealistic)

5   assumptions that yield a simplification of the standard formula, which then can be rearranged

6   to estimate the cost of capital. Specifically, if investors expect a dividend stream that will

7   grow *forever* at a steady rate, the market price of the stock will be given by a very simple

8   formula,

9
$$P_0 = \frac{D_1}{(k - g)} \tag{5}$$
10

11   where "D_1" is the dividend expected at the end of the first period, "g" is the perpetual growth

12   rate, and "P_0" and "k" are the market price and the cost of capital, as before. Equation (5)

13   is a simplified version of Equation (4) that can be solved to yield the well known "DCF

14   formula" for the cost of capital:

15
$$k = \frac{D_1}{P_0} + g = \frac{D_0 \times (1+g)}{P_0} + g \tag{6}$$
16

17   where "D_0" is the current dividend, which investors expect to increase at rate g by the end

18   of the next period, and the other symbols are defined as before. Equation (6) says that if

19   Equation (5) holds, the cost of capital equals the expected dividend yield plus the (perpetual)

1   expected future growth rate of dividends. I refer to this as the simple DCF model. Of

2   course, the "simple" model is simple because it relies on very strong (*i.e.*, very unrealistic)

3   assumptions.

4   **Q48**.   **Are there other versions of the DCF models besides the "simple" one?**

5   A48.   Yes. There are many variations on the DCF models that may rely on less strong assumptions

6   in that they allow growth rates to vary over time. I consider a variant of the DCF model that

7   uses the companies' individual growth rates during the first five years, converges to a

8   perpetual growth rate in years 6-10 and then uses the GDP growth rate as the perpetual

9   growth rate after year 10 for all companies. This is a variant of the "multi-stage" DCF

10   method. The DCF models are described in detail in *Section I* of Appendix C. (*Section II* of

11   Appendix C provides the details of my empirical DCF results.)

12   **Q49**.   **What are the merits of the DCF approach?**

13   A49.   The DCF approach is conceptually sound if its assumptions are met, but can run into

14   difficulty in practice because those assumptions are so strong, and hence so unlikely to

15   correspond to reality. Two conditions are well known to be necessary for the DCF approach

16   to yield a reliable estimate of the cost of capital: the variant of the present value formula that

17   is used must actually match the variations in investor expectations for the dividend growth

18   path; and the growth rate(s) used in that formula must match current investor expectations.

19   Less frequently noted conditions may also create problems. (See Appendix C for details.)

1   **Q50**.   **Do you agree that estimating the right growth rate is the most difficult part for the**

2   **implementation of the DCF approach?**

3   A50.   Yes. Finding the right growth rate(s) is the usual "hard part" of a DCF application. The

4   original approach to estimation of *g* relied on average historical growth rates in observable

5   variables, such as dividends or earnings, or on the "sustainable growth" approach, which

6   estimates *g* as the average book rate of return times the fraction of earnings retained within

7   the firm. But it is highly unlikely that these historical averages over periods with widely

8   varying rates of inflation and costs of capital will equal current growth rate expectations.

9   This is particularly true for the water sample as many companies in the industry are engaged

10   in merger, acquisition or other restructuring activities.

11   Moreover, the constant growth rate DCF model *requires* that dividends and earnings

12   grow at the same rate for companies that earn their cost of capital on average.[18] It is

13   inconsistent with the theory on which the model is based to have different growth rates in

14   earnings and dividends over the period when growth is assumed to be constant. If the

15   growth in dividends and earnings were expected to vary over some number of years before

16   settling down into a constant growth period, then it would be appropriate to estimate a

---

[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.

1   multistage DCF model. In the multistage model, earnings and dividends can grow at

2   different rates, but *must* grow at the same rate in the final, constant growth rate period. A

3   difference between forecasted dividend and earnings rates therefore is a signal that the facts

4   do not fit the assumptions of the simple DCF model.

5   **Q51. How do you estimate the growth rates you use in your DCF analysis?**

6   A51. I use earnings growth rate forecasts from *IBES* and *Value Line*. Analysts' forecasts are

7   superior to using single variables in time series forecasts based upon historical data as has

8   been documented and confirmed extensively in academic research. Please see *Section I* in

9   Appendix C for a detailed discussion on this issue.

10   **Q52. Are you aware that the Commission Staff typically relies on an average of historical**

11   **growth rates of earnings and dividends as well as forecasts of earnings and dividend**

12   **growth rates to estimate the growth rate for the DCF model?**

13   A52. Yes, but I do not believe that this is the best way to estimate the growth rate for use in the

14   DCF model for the following reasons. First, as mentioned above, the model requires that

15   dividends and earnings grow at the same rate at some point in the future in order to apply the

16   model. The data on historical growth rates do not confirm this condition. Second, analysts

17   have access to historical information and include that information in their forecast of

18   earnings growth rates. In other words, using historical data provides no additional

19   information to that captured in analyst forecasts.

1   Finally, averaging wildly different growth rate estimates in the hopes of having

2   the extremes cancel out calls into question whether the DCF model is applicable at this time

3   to the sample companies.

4   **Q53**. **What about the evidence that analyst earning growth forecasts have been optimistic**

5   **(over estimated earnings and dividend growth) in the past?**

6   A53. Although analyst forecasts have been optimistic on average in the past, this problem is less

7   acute for regulated companies.[19] In addition, the use of a two-stage DCF model that

8   substitutes the forecast growth of GDP mitigates analyst optimism by substituting the GDP

9   growth rate for the potentially optimistic (or pessimistic) earnings forecasts of analysts.

10 **Q54**. **How well are the constant-growth rate conditions necessary for the reliable application**

11   **of the DCF likely to be met for the sample companies at present?**

12 A54. The requisite conditions for the sample companies are not fully met at this time, particularly

13   for the water sample. Of particular concern for this proceeding is the uncertainty about what

14   investors truly expect the long-run outlook for the sample companies to be. The longest time

15   period available for growth rate forecasts of which I am aware is five years. The long-run

16   growth rate (*i.e.*, the growth rate after the water industry settles into a steady state, which

17   may be *beyond* the next five years for this industry) drives the actual results one gets with

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[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.

1   the DCF model. Unfortunately, this implies that unless the company or industry in question

2   is stable, so there is little doubt as to the growth rate investors expect, DCF results in practice

3   can end up being driven by the subjective judgment of the analyst who performs the work.

4   Of the eight companies in the water sample, two have no current long-term *IBES*

5   growth rates, and only four companies have growth forecasts from both *IBES* and *Value*

6   *Line*.[20] The average long-term earnings forecasts vary from a low of 3.5 percent to a high

7   of 12.5 percent. Additionally, the analysts' forecast for individual companies range widely.

8   For example, the median *IBES* growth forecasts for Southwest Water Co is 7.3 percent while

9   the *Value Line* forecast is 28.3 percent. The lack of sufficient analysts following and the

10   large variation in growth forecasts indicate that these forecasts are less reliable than ideal.

11   The growth rates for gas LDC sample vary less from an average of 4.3 to 6.7 percent and

12   are more consistent with the GDP growth forecast of 5.2 percent. However, this sample also

13   includes companies for which analysts' forecasts vary widely. For example, the *IBES*

14   forecast for Cascade Natural Gas is 3.0 percent while the *Value Line* forecast is 10.5

15   percent.[21] Of the seven companies in the gas LDC sample, one has no current *IBES* forecasts

16   and one has only one analyst providing a forecast. Thus, the available data are far from

17   being ideal. As discussed above, the two-stage DCF model adjusts for any over optimistic

18   (or pessimistic) growth rate forecasts by adjusting the 5-year growth rate forecasts of the

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[20]   See Table BV-5 for details.

[21]   See Table No. BV-15.

1   analysts toward the long-term GDP growth rate in the years after year 5. See Appendix C,

2   *Section I* for a discussion of the two-stage model.

3   The DCF growth rates whether estimated from historical data or from analyst

4   forecasts are likely to be affected by the fact that there has been a number of mergers and

5   acquisitions in the water industry in recent years, and the industry is showing signs of

6   becoming globalized.[22] Thus, the industry appears to be moving towards a larger degree of

7   consolidation – at least among the privately held water utilities. The consolidation of the

8   industry may well increase as the industry need significant infrastructure investments to

9   comply with EPA water purification rules, maintain or replace old infrastructure, and deal

10   with increased threats towards the water systems.[23] The uncertainty associated with these

11   factors increases the industry's business risk. Additionally, environmental regulation that

12   impact the industry as standards for water quality evolve over time, and there is potential for

13   new safety and security requirements in the future. The industry has no federal regulator

14   (other than for environmental and health issues), and state public utility commissions

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[22]   Philadelphia Suburban (renamed Aqua America) completed the acquisition of AquaSource for about $195 million in July 2003. During 2005 Aqua America integrated about 30 smaller entities and the company expects to add further entities in 2006. Additionally, American Water Works acquired National Enterprises, Inc., Azurix, and the water and wastewater utility assets of Citizens Utilities. American Water Works, in turn, was acquired by RWE AG on January 10, 2003. Recently, the parent of American Water, RWE, has decided to sell American Water. Domestic energy companies have also invested in the water utility business, although presently many of those investments have or will be sold. Allete has sold its assets in Florida and North Carolina; Indianapolis Water Company was sold by NISource; Suez Lyonnaise des Eaux purchased the remaining shares of United Water Resource that it did not already own; and Thames Water purchased E'Town Corporation. (Sources: *Value Line Investment Survey*, January 30, 2004 and January 27, 2006, *The Business Journal* and company web sites)

[23]   *Value Line Investment Survey* (January 27, 2006) expects infrastructure investments to run into hundreds of millions of dollars during the next decade or two.

1 regulate most investor owned water utilities. Different regulatory bodies may lead to

2 differing regulatory requirements for companies operating in adjacent parts of the country.

3 Taken together, these factors mean that it may be some time before the water industry settles

4 into anything investors will see as a stable equilibrium necessary for the reliable application

5 of the DCF model.

6 Such circumstances imply that a commission may often be faced with a wide range

7 of DCF estimates, none of which can be well grounded in objective data on true long-run

8 growth expectations, *because no such objective data now exist*. DCF for firms or industries

9 in flux is *inherently* subjective with regard to the most important parameter, the long-run

10 growth rate, that drives the answer.

11 In short, the unavoidable questions about the DCF model's strong assumptions cause

12 me to view the DCF method as *inherently* less reliable than the risk positioning approach

13 described above. This is particularly true because of the data problems discussed above.

14 However, because the DCF method has been widely used in the past, I submit DCF evidence

15 in this case. DCF estimates also serve as a check on the values provided by the risk

16 positioning methods.

17 In this proceeding, I give little weight to the DCF results. However, I use the results

18 as a check on the reasonableness of my risk positioning estimates.

C.   THE SAMPLES AND RESULTS

1.   The Water Utility Sample

Q55.   **Earlier you said that the sample of water utilities had serious data weaknesses. Please elaborate on these weaknesses.**

A55.   In attempting to apply the DCF model to the sample, two companies had no long-term growth forecasts from *IBES* and among the remaining six companies, two had no *Value Line* growth forecasts. The lack of data means that the discounted cash flow model only can be applied to six companies. A similar lack of data exists when looking at the companies' bond ratings. For two of the eight companies, neither a Moody's nor a Standard and Poor's ("S&P") bond rating was found.[24]

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, two of the eight water utilities traded less than 5 million shares in 2005 and only four companies traded in excess of 10 million shares in 2005.[25] This compares to an average annual trading volume of about 31 million shares for

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[24]   For two of the six companies with a Moody's or Standard and Poor's bond rating, the bond rating was only found for some years during the most recent 5-year period. The rating for periods for which no bond rating was found was set equal to the rating for later periods. For companies without a bond rating, an A-rating is used in the analysis. The A-rating is consistent with the average for companies listed as water utilities in *Value Line* and followed by either Moody's or Standard and Poor's. Bond ratings were obtained from Compustat, www.standardandpoors.com, www.moodys.com, Mergent Bond Record, and S&P's Bond Rating books.

[25]   Connecticut Water SVC Inc and York Water Co traded less than 5 million shares. American States Water Co, California Water Services GP, Aqua America Inc, and Southwest Water Co traded in excess of 10 million

1 companies in the gas LDC sample.[26] Low trading volume causes concern because there may

2 be a delay between the release of important information and the time that this information

3 is reflected in prices. Such delay is well known to cause beta estimates to be statistically

4 insignificant and possibly biased.

5 In addition to lack of data and the small size of the companies, there are firm-specific

6 events that render the water utility sample less reliable than would be ideal. First, Aqua

7 America (the largest of the companies) has gone through several mergers and acquisitions

8 in recent years. Normally, I would not include companies with significant merger or

9 acquisition activity in a sample because the individual information about the progress of the

10 proposed merger is so much more important for the determination of the company's stock

11 price than day-to-day market fluctuations. In practice, beta estimates for such companies

12 tend to be too low. The growth rates for such companies may also be affected. Second,

13 Southwest Water Co. earns only approximately 40 percent of its revenue from regulated

14 activities. I therefore also report my results for the subsample of companies that do not

15 include Southwest Water Co.

16 It is because of these weaknesses in the water sample that I also utilize a sample of

17 natural gas LDCs. The selection procedure for this sample was summarized earlier and

18 details are provided in Appendix B.

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shares in 2005.

[26] Only Cascade Natural Gas has relative low trading volume at about 9 million shares in 2005.

1   **2.   Risk Positioning Cost of Capital Estimates**

2   **Q56**. **How is your testimony on the risk positioning approach cost of capital estimates**

3   **organized?**

4   A56. This section first describes the input data used in the CAPM and ECAPM models, then

5   reports the resulting cost of equity estimates for the samples. The second section of

6   Appendix B details the empirical analysis.

7   **a.   Interest Rate Forecasts**

8   **Q57**. **How did you determine the expected risk-free interest rate?**

9   A57. I reviewed current constant maturity U.S. Government bond yield data available from the

10   St. Louis Federal Reserve Bank. For the period April 4 to April 25, 2006, the average yield

11   on 30-day Treasury bills was 4.60 percent and the average yield on long-term government

12   bonds was 5.21 percent.[27] As discussed above, risk-free interest rates have increased by

13   almost 50 basis points since the beginning of the year and the Federal Reserve ("Fed")

14   recently raised the federal funds rate to 5 percent. The press releases associated with the

15   increase, the Fed suggested that "further policy firming may yet be needed to address

16   inflation risks ..."[28] Thus, interest rates are, if anything, likely to increase.

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[27]   See Workpaper #2 to Table No. BV-9.

[28]   Federal Reserve Board, Press Release, May 10, 2006.

1   **b.**   **Betas and the Market Risk Premium**

2   **Q58**.   **What beta estimates did you use in your analysis for the samples?**

3   A58.   I rely upon the most recent betas estimated by *Value Line* for both the water sample and for

4   the gas LDC sample.

5   **Q59**.   **Are the beta values reported by *Value Line* adjusted betas?**

6   A59.   Yes. *Value Line* reports betas that are adjusted about 1/3 towards one. For this proceeding,

7   I reverse the *Value Line* adjustment. *Value Line* and many investment firms adjust the

8   estimated betas. This type of adjustment is intended to compensate for sampling errors in

9   the beta estimation, not for the empirical fact that the CAPM tends to overestimate the

10   sensitivity of the cost of capital to beta. I use adjusted betas when the sample companies

11   display statistically significant sensitivity to interest rate changes. Neither of the two

12   samples in this proceeding display such sensitivity at this time, so I reverse the adjustment

13   process to get "unadjusted" beta values. There are, however, evidence that betas are

14   increasing in the utility industry and not least in the water industry. I discuss this in

15   *Appendix B*, Section II.B.

16   **Q60**.   **Please summarize the beta estimates you rely on.**

17   A60.   After reversing the *Value Line* adjustment procedure, the average estimated *Value Line* beta

18   for the water sample is about .53 while the average for the gas LDC sample is about .63.

19   These beta estimates are reported in Workpaper #1 to Tables No. BV-9 and BV-19. During

1   the last few years betas estimates for both water utilities and gas LDC's have increased

2   significantly indicating that the industry's risk is increasing. As additional evidence that

3   betas are increasing and that the unadjusted *Value Line* betas likely underestimate the

4   industry's risk going forward, I estimated 52-week betas for both samples. For both sample,

5   current 52-week betas are higher than are *Value Line* betas and both samples show an

6   increase in betas during the past few years. Graphs depicting the development in 52-week

7   betas are included in Appendix B.

8   **Q61**. **What value do you use for the market risk premium?**

9   A61. For the premium over the short-term risk-free interest rate I use 8.0 percent, while for the

10   premium over the long-term risk-free interest rate I use 6.5 percent, for the reasons discussed

11   before and in Appendix B.

12   **Q62**. **Please explain the method to adjust for differences in capital structure.**

13   A62. Starting with the ATWACC, the cost of equity for any capital structure within a broad range

14   of capital structures can be determined by the following formula:

15   Return on equity = $\dfrac{\text{ATWACC - Return on debt} \times \text{\% debt in capital structure} \times (1\text{- tax rate})}{\text{\% equity in capital structure}}$
16

17   This is the calculation that is displayed in Tables No. BV-11 and BV-21. The tables display

18   the result of converting the sample average ATWACC to a return on equity for a specific

1 capital structure. It is straightforward to determine the cost of equity consistent with capital

2 structure utilizing this method.

3 **c.   Risk Positioning Results**

4 **Q63**. **What are the cost of equity estimates derived from the risk positioning approach for**

5 **the water sample?**

6 A63. Using the long-term interest rate in the two risk positioning models (CAPM and ECAPM),

7 with two values of the ECAPM parameter (0.5% and 1.5%), I obtain three estimates of each

8 sample company's cost of equity (Tables No. BV-9 and BV-19). The cost of equity

9 estimates are combined with the estimates of the company's cost of debt and preferred to

10 calculate the company's ATWACC (Tables No. BV-10 and BV-20). Tables No. BV-11 and

11 BV-21 combines the sample average ATWACC with Anthem's capital structure, cost of

12 debt, and tax rate to obtain the cost of equity at Anthem's 40 percent equity. Panel A shows

13 the cost of equity and ATWACC value for all water sample companies, while Panel B shows

14 the results for the subsample of companies with significant revenue from regulated water

15 utility activities. The cost of equity results are shown below in Table 2 below. Comparable

16 ATWACC results are in Table B-2 at the end of Appendix B.

1

| Table 2: Panel A

**Risk Positioning Cost of Equity
for All Companies
in the Water Utility and Gas LDC Samples** | | |
2
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4
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| --- | --- | --- |
6 | **Using Long-Term Risk-Free Rate** | **Water Utility** | **Gas LDC** |
7 | CAPM | 12.2% | 12.0% |
8 | ECAPM ($\alpha = 0.5\%$) | *12.6%* | *12.3%* |
9 | ECAPM ($\alpha = 1.5\%$) | 13.4% | 12.9% |

10   Source: Tables No. BV-11 and BV-21, Panel A.

11

| Table 2: Panel B

**Risk Positioning Cost of Equity
for Companies with a High Percentage Regulated Revenue
in the Water Utility and Gas LDC Samples** | | |
12
13
14
| --- | --- | --- |
15 | **Using Long-Term Risk-Free Rate** | **Water Utility** | **Gas LDC** |
16 | CAPM | 12.2% | 11.3% |
17 | ECAPM ($\alpha = 0.5\%$) | *12.6%* | *11.5%* |
18 | ECAPM ($\alpha = 1.5\%$) | 13.4% | 12.0% |

19   Source: Table No. BV-11 and BV-21, Panel B.

20   Using the short-term interest rate in the two risk positioning models (CAPM and

21   ECAPM) and using different values for the ECAPM parameter, α, I obtain four estimates

1   of each sample companies' cost of equity. These estimates are also displayed in Tables No.

2   BV-11 and BV-21. As for the long-term interest rate, I summarize the cost of equity results

3   below in Table 3. ATWACC results are displayed in Table B-2 in Appendix B.

Table 3: Panel A **Risk Positioning Cost of Equity for All Companies in the Water Utility and Gas LDC Samples**		
Using Short-Term Risk-Free Rate	**Water Utility**	**Gas LDC**
CAPM	12.5%	12.5%
ECAPM ($\alpha = 1\%$)	*13.3%*	*13.1%*
ECAPM ($\alpha = 2\%$)	14.1%	13.6%
ECAPM ($\alpha = 3\%$)	14.9%	14.1%

14   Source: Tables No. BV-11 and BV-21, Panel A.

Table 3: Panel B		
Risk Positioning Cost of Equity for Companies with a High Percentage Regulated Revenue in the Water Utility and Gas LDC Samples		
Using Short-Term Risk-Free Rate	**Water Utility**	**Gas LDC**
CAPM	12.5%	11.7%
ECAPM ($\alpha = 1\%$)	*13.3%*	*12.2%*
ECAPM ($\alpha = 2\%$)	14.1%	12.7%
ECAPM ($\alpha = 3\%$)	14.9%	13.2%

Source: Table No. BV-11 and BV-21, Panel B.

Q64. **Please summarize your findings from the risk positioning model.**

A64. Focusing on the middle ECAPM ($\alpha = .50\%$ for the long-term model) and $\alpha = 1\%$ for the

short-term model), I find that the water sample's cost of equity of about 12½ percent for the

long-term model and about 13¼ percent for the short-term model. However, it is more

correct to say that the sample results indicate a range of values from about 12 to 13 percent

for the long-term model and a range of 12¾ to 13¾ percent using the short-term model.

Looking at the gas LDC sample, the full sample and the subsample display some differences

with the subsample's cost of equity estimates being 50 to 75 basis points lower than the

estimates for the full sample. Reviewing the middle ECAPM estimates for the full sample

the point estimate is about 12¼ percent while the point estimate for the subsample is about

11½ percent. Thus, the range for the gas LDC sample is 11¼ to 12½ percent. As for the

1   water utility sample, the short-term risk positioning estimates are consistently higher. The

2   gas LDC subsample's results are largely driven by one company (Southwest Gas). Because

3   short-term interest rates have been in significant flux in the past year, I assign the most

4   weight to the long-term model and therefore conclude that the risk-positioning model

5   provides cost of equity estimates in the range of 11¼ to 12¾ percent with a midpoint

6   between 11¾ and 12 percent for the gas LDC sample while the water utility sample

7   estimates are higher and have a midpoint at about 12½ percent. The results from the short-

8   term risk positioning model are consistently higher. I discuss the assessment of Anthem's

9   cost of equity in the concluding section.

10   **3.   The DCF Cost of Capital Estimates**

11   **Q65**. **What steps do you take in your DCF analyses?**

12   A65. Given the above discussion of DCF principles, the steps are to collect the data, estimate the

13   sample companies' costs of equity at their current capital structures, and then to adjust the

14   sample's estimates to Anthem's 40 percent equity ratio.

15   **a.   Growth Rates**

16   **Q66**. **What growth rate information do you use?**

17   A66. For reasons discussed above and in Appendix C, historical growth rates today are not as

18   relevant as forecasted of current investor expectations for these samples. I therefore use

19   rates forecast by security analysts.

1   The ideal in a DCF application would be a detailed forecast of future dividends, year

2   by year well into the future until a true steady state (constant) dividend growth rate was

3   reached, based on a large sample of investment analysts' expectations. I know of no source

4   of such data. Dividends are ultimately paid from earnings, however, and earnings forecasts

5   from a number of analysts are available for a few years. Investors do not expect dividends

6   to grow in lockstep with earnings, but for companies for which the DCF approach can be

7   used reliably (*i.e.*, for relatively stable companies whose prices do not include the option-like

8   values described in Appendix C), they do expect dividends to track earnings over the long-

9   run. Thus, use of earnings growth rates as a proxy for expectations of dividend growth rates

10   is a common practice.

11   Accordingly, the first step in my DCF analysis is to examine a sample of investment

12   analysts' forecasted earnings growth rates from *IBES* and *Value Line* to the degree such

13   forecasts are available. The details are in Appendix C. At present, *Value Line* data run

14   through a 2008-2010 horizon for the water utility companies and through a 2009-2011

15   horizon for the gas LDC companies. This represents an average of about four years for the

16   water utility sample and an average of about five years for the gas LDC sample (from Q1

17   2006 to Q4 2009 and 2010, respectively). *IBES* also provides a long-term earnings growth

18   rate estimates. The longest-horizon forecasted growth rates from these sources underlie the

19   simple DCF model (*i.e.*, the standard perpetual-growth model associated with the "DCF

20   formula," dividend yield plus growth). Unfortunately, the longest growth forecast data only

1   go out four to five years, which is too short a period to make the DCF model completely

2   reliable.

3   **b.   Dividend and Price Inputs**

4   **Q67**.   **What values do you use for dividends and stock prices?**

5   A67.   Dividends are for the 4th quarter of 2005, the most recent dividend information available at

6   the time of estimation.[29] This dividend is grown at the estimated growth rate and divided by

7   the price described below to estimate the dividend yield for the simple DCF model.

8   Stock prices are an average of closing stock prices for the 15-day trading period

9   ending on the day the *IBES* forecast is released. A 15-day stock price average is used to

10   guard against anomalous price changes in any single day.

11   **c.   DCF Results**

12   **Q68**.   **What are the DCF estimates for the samples?**

13   A68.   The data are used in the two versions of the DCF method to get sample company estimates

14   at the sample company's capital structure. The resulting cost of equity at Anthem's 40

15   percent equity capital structure are shown in Table 4 below. The simple DCF model's cost

16   of equity estimates are higher on than the risk positioning approach results. However, the

17   multi-stage DCF's cost of equity estimates are a bit lower than the comparable risk

18   positioning estimates for the water utility sample at about 11¾ percent. The multi-stage

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[29]   The 4th quarter 2005 dividend information was obtained from Compustat.

1   DCF estimates for the gas LDC sample are comparable to the risk positioning estimates for

2   the full sample and a bit higher than the risk positioning estimates for the subsample.

3   Corresponding ATWACC figures are shown in Appendix B.

Table 4: Panel A Discounted Cash Flow Cost of Equity Estimates for All Companies in the Water Utility and Gas LDC Samples		
	Water Utility	**Gas LDC**
Simple DCF Method (Quarterly)	16.8%	13.4%
Multi-Stage DCF Using the Long-Term GDP Forecast as the Perpetual Rate	11.7%	13.1%

Source: Tables No. BV-8 and BV-18.

Table 4: Panel B Discounted Cash Flow After-Tax Weighted-Average Cost of Capital Estimates for Companies with a High Percentage Regulated Revenue in the Water Utility and Gas LDC Samples		
	Water Utility	**Gas LDC**
Simple DCF Method (Quarterly)	17.3%	13.2%
Multi-Stage DCF Using the Long-Term GDP Forecast as the Perpetual Rate	11.8%	12.2%

Source: Tables No. BV-8 and BV-18.

Q69. **Please summarize your findings from the DCF model.**

1   A69.   The results from the multi-stage DCF model are in line with the results from the risk

2   positioning model whereas the simple DCF provides uniformly higher cost of equity

3   estimates. The cost of equity estimates from the multi-stage DCF model is in the range of

4   11½ to 12 percent for the water utility sample and in the range of 12 to 13 percent for the gas

5   LDC sample. As noted for the risk positioning model, there is a fairly large difference

6   between the full sample and the subsample estimates for the gas LDC sample. While growth

7   rates in both the water utility and the gas LDC industry have increased in recent months, the

8   GDP growth forecast from Blue Chip have decreased slightly.[30] While I do not believe the

9   DCF results are fully reliable at this time for these industries, I view the estimates as a

10   confirmation that (1) the gas LDC sample provides more stable results than do the water

11   utility sample and (2) the risk positioning results are reasonable.

12   **V. ANTHEM'S COST OF EQUITY**

13   **Q70**.   **What conclusions do you draw from the above data regarding each sample's cost of**

14   **equity at Anthem's 40 percent equity ratio?**

15   A70.   The estimated costs of equity from the risk positioning model and from the multi-stage DCF

16   model are reasonably in line whereas the cost of equity estimates from the simple DCF

17   model are substantially higher. The simple DCF model that relies on company-specific

18   growth rate forecasts vary significantly among companies and are less reliable because the

---

[30]   Blue Chip forecasted a long-term GDP growth of 5.5 percent in October 2005, but decreased this forecast to
       5.2 percent in March 2006. At the same time *IBES* analysts increased the average growth rate for water
       utilities from 6.6 percent to 6.8 percent from October 2005 to March 2006. *Value Line* also increased its five-
       year growth forecasts for the water utility industry.

1   long-run growth rate forecast drives the results, and there are *no* objective data on the long-

2   run growth rate investors truly expect, *nor* on when the industry is expected to settle down

3   into some sort of stable-growth equilibrium.

4   Although I do not rely upon the DCF model results for the water sample, I believe

5   that DCF cost of capital estimates provide a useful check on the risk positioning results for

6   the gas LDC sample. The consistency of the multi-stage DCF and the risk-positioning cost

7   of equity estimates for (especially the full) gas LDC sample indicate that those estimates are

8   reasonable.

9   **Q71**. **Do you have any comments regarding the results of the risk positioning models?**

10   A71. Yes. The relative risk measure, beta, used in the models is derived from 260 weeks (5 years)

11   of historical data. Ordinarily, using historical data to estimate beta is not a serious problem

12   because the overall business risk of an industry probably does not change rapidly. For an

13   industry undergoing major changes, however, the beta estimates based upon the historical

14   data may not capture the full changes in risk in the industry. This is true even though

15   information on the probability and provisions of industry changes have been available some

16   months ago. However, as explained in Appendix B, such "decoupling" of beta from the

17   market appears to be a common feature of industries undergoing structural changes. This

18   factor also suggests that the risk positioning estimates may be downward biased and is

19   consistent with the information from the DCF models.

1 **Q72.** **Given your view of the current value of the DCF method for this industry, what**

2 **conclusions do you draw from the risk positioning results?**

3 A72. The risk positioning results are summarized above in Tables 2 and 3. Of those results, the

4 CAPM values deserve the least weight, because this method does not adjust for the empirical

5 finding that the cost of capital is less sensitive to beta than predicted by the CAPM (which

6 my testimony considers by using the ECAPM). Conversely, the ECAPM numbers deserve

7 the most weight, because this method adjusts for the empirical findings. Using the long-term

8 model, the cost of equity estimates at a 40 percent equity thickness range from 12.2 to 13.4

9 percent for the water sample and subsample and from 11.3 to 12.9 percent for the gas LDC

10 sample and subsample.

11 Focusing on the middle ECAPM ($\alpha = .50\%$ for the long-term model and $\alpha = 1\%$ for

12 the short-term model), I find that the cost of equity estimates for the water sample are 12.6

13 and 13.3 percent for the long-term and short-term estimate, respectively. For the gas LDC

14 sample's the estimates from the full sample and the subsample differ. Focusing on the full

15 sample, the cost of equity estimates are 12.3 and 13.1 percent for the long-term and short-

16 term estimate, respectively. For the gas LDC subsample, the cost of equity estimates are

17 lower at 11.5 and 12.2 percent for the long-term and the short-term estimate, respectively.

18 However, it is more correct to say that the estimates fall in a range. Focusing on the long-

19 term estimates, a reasonable range is 12 to 13 percent for the water utility sample and 11¼

20 to12½ percent for the gas LDC sample. The midpoint of the corresponding ATWACC is

21 between 7 and 7¼ percent for the water utility sample. The range of reasonable estimates

1   is wider for the gas LDC sample which span 6¾ to 7¼ percent. Because the water sample

2   and water subsample have identical estimates while the gas LDC subsample has significantly

3   lower cost of equity estimates than do the full gas LDC sample, it is difficult to draw a

4   conclusion regarding the impact of having a higher percentage of regulatory revenues. This

5   is particularly so because the results from the gas LDC subsample are driven by one

6   company, Southwest Gas.

7   Based upon the evidence, the midpoint estimates for the cost of equity for the water

8   sample is above 12 percent while the point estimate for the gas LDC sample is between 11¾

9   and 12 percent. However, it is more accurate to say that the cost of equity range is best

10   approximated by a range of 11¼ to 12¾ percent However, I observe that no risk positioning

11   estimate is below 11.3 percent and most estimates are a bit above 12 percent. Therefore, the

12   best point estimate is in the range of 11¾ to 12 percent which is a consistent with the multi-

13   stage DCF cost of equity estimates for the water utility sample and a bit below the

14   comparable cost of equity estimates for the gas LDC sample.

15   As previously noted, in estimating the cost of equity I round to the nearest ¼ percent

16   (25 basis points) because I do not believe that cost of capital estimates can be made more

17   precisely than that. I this case I use a broader range than usual because the estimates fall in

18   a fairly broad range.

1   **Q73**. **Did you consider any other evidence when assessing the reasonableness of Anthem's**

2   **requested 11.75 percent return on equity?**

3   A73.   Yes. I reviewed recent water utility decisions from the Arizona Corporation Commission

4   and compared the rates of return on equity and the capital structures to Anthem's regulatory

5   capital structure.

6   **Q74**. **Please explain this procedure.**

7   A74.   I obtained data on ten recent Arizona decisions on water and wastewater utilities from the

8   Company. This data is summarized in Table 5 below.

Table 5 Capital Structure and Allowed Rate of Return on Equity in Recent Arizona Water Decisions				
	Decision	Date	Common Equity	Allowed Rate of Return
Arizona Water Company	66849	03/2004	66.2%	9.2%
Rio Rico Utilities	67279	10/2004	100.0%	8.7%
Las Quintas Serenas Water Co	67455	01/2005	100.0%	8.1%
Arizona Water Company	68302	11/2005	73.4%	9.1%
Clearwater Utilities	66782	02/2004	100.0%	9.1%
Arizona-American Water	67093	06/2004	39.9%	9.0%
Chaparral City Water	68176	09/2005	58.8%	9.3%
Forest Highlands	67983	07/2005	100.0%	8.1%
Pineview Water	67989	07/2005	51.0%	8.9%
Average			75.7%	8.8%
Average*			63.5%	9.1%

Source: Arizona-American Water.
          * Excludes companies with 100 percent equity and Arizona-American Water.

Anthem's requested target regulatory capital structure consists of 40 percent equity which is significantly lower than that of all but one company in the table. Therefore, Anthem's equity has more financial risk than most of the companies listed in Table 5. Consequently, the allowed return on equity for Anthem needs to be higher. To determine exactly how much higher, I calculate the ATWACC that corresponds to the capital structures and cost of equity in Table 5 using Anthem's current cost of debt and tax rate. I then determine the cost

1   of equity that correspond to the calculated ATWACC at Anthem's 40 percent equity.[31] The

2   result of this calculation is shown in Table 6 below.

3

4

5

Table 6 Rate of Return on Equity that Provides the Same Cost to Customers at Anthem's 40% Equity Ratio as Allowed in Recent Arizona Water Decisions					
Decision	Date	Common Equity	Allowed Rate of Return on Equity	Implied ATWACC	Implied Rate of Return at 40% Equity
66849	03/2004	66.2%	9.2%	7.2%	12.7%
67279	10/2004	100.0%	8.7%	8.7%	16.4%
67455	01/2005	100.0%	8.1%	8.1%	14.9%
68302	11/2005	73.4%	9.1%	7.6%	13.9%
66782	02/2004	100.0%	9.1%	9.1%	17.4%
67093	06/2004	39.9%	9.0%	5.7%	9.0%
68176	09/2005	58.8%	9.3%	6.9%	12.0%
67983	07/2005	100.0%	8.1%	8.1%	14.9%
67989	07/2005	51.0%	8.9%	6.3%	10.4%
Average		75.7%	8.9%	7.5%	13.5%
Average*		63.5%	9.1%	7.0%	12.2%

18 Sources: Columns 1 through 4: Arizona American. Column 5 was calculated using Anthem's current cost
19 of debt and tax rate. Column 6 was calculated using the ATWACC in Column 5 and Anthem's regulatory
20 capital structure, cost of debt, and tax rate.
21 *⁾ Excludes companies with 100 percent equity and Decision 67093.

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[31] In performing this calculation, I assume that the rate base equals net book value. I understand that this in not
     true in Arizona but believe rates are calculated in a manner that produces similar results.

1   **Q75**.   **What are the implications of Table 6?**

2   A75.   Ignoring companies with no debt and Arizona-American Water, the average rate of return

3   on equity was 12.2 percent when measured at 40 percent equity.   Therefore, if the

4   Commission believes that Anthem's overall business risk is similar to that of the companies

5   in Table 5, then Anthem's cost of equity is 12.2 percent.[32]

6   **Q76**.   **Based on the evidence what is your conclusion regarding Anthem's request for a 11.75**

7   **percent return on equity?**

8   A76.   Based on the results from my cost of capital estimation procedures which are confirmed by

9   recent Arizona decisions on water utilities' cost of equity, I conclude that an 11.75 percent

10   return on equity is reasonable at 40 percent equity.

11   **Q77**.   **Does this conclude your testimony?**

12   A77.   Yes.

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[32]   I exclude companies with extreme capital structures from this analysis as I believe the ATWACC is flat only within a broad range of non-extreme capital structures. At extreme levels of debt or equity the ATWACC may be increasing/decreasing in the level of debt. I exclude Arizona-American to avoid comparing Anthem to its parent.

APPENDIX A: QUALIFICATIONS OF BENTE VILLADSEN

Bente Villadsen's work concentrates in the areas of finance and accounting. Her work has included analyses of the cost of capital, cost-of-service rate making, credit issues in the electric industry, valuations of power contracts, accounting disclosure, accounting principles, mark-to-market accounting, gain-of-sale accounting, and accounting for hybrid securities. Her recent work has included rate-regulated companies' allowed rates of return in the U.S. and Canada as well as mark-to-market valuation in the electric industry, a contract dispute in the petroleum industry and matters related to income tax disputes.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management. 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 and at Washington University in St. Louis. Dr. Villadsen also worked as a consultant for Risø National Laboratories in Denmark.

REPRESENTATIVE EXPERIENCE

ENERGY AND PUBLIC UTILITY FINANCE

- Dr. Villadsen has filed testimony on cost of capital for a regulated water utility and has significant experience in estimating the cost of capital for U.S. and Canadian utilities and pipelines. The work has been used in connection with the companies' rate hearings for the Federal Energy Regulatory Commission, the Canadian National Energy Board, state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies, and water utilities.

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

- She was part of a team evaluating the capital structure and cost of capital for a Canadian crown corporation.

- Bente Villadsen is currently involved in the valuation of long-term power contracts in the electric industry and in evaluating the impact of assumptions and models on financial information.

- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluated 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 flow 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).

- Dr. Villadsen is evaluating the appropriate regulatory framework and rates a utility should be able to charge for providing access to its facilities to outside companies.

ACCOUNTING AND CORPORATE FINANCE

- Dr. Villadsen filed testimony and rebuttal testimony in an arbitration proceeding between two major oil companies involved in a contract dispute. The testimony pertained to the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities.

- Currently, she is working on two 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 and the application of accounting principles.

- Dr. Villadsen 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 and the accounting treatment of security sales.

- She 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 has modeled the cash flow of several companies to estimate the impact of specific (energy) contracts or to determine the impact of specific loans and

to assess the companies viability going forward.

• 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 cost 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.

PUBLICATIONS

"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), published by the Edison Electric Institute (dated January 2005, issued 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.

PRESENTATIONS

"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, 2000.

"Computational Methods and Theoretical Accounting Research," Big 10 Doctoral Consortium,

1999.

TESTIMONY

Direct Testimony before the Arizona Corporation Commission on Cost of Capital for Mohave Water and Mohave Wastewater district, a subsidiary of Arizona-American Water Company, Docket No. WS-01303A-06-0014, January 2006.

Affidavit and rebuttal affidavit in an arbitration proceeding on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, August and November, 2004.

**APPENDIX B: EQUITY RISK PREMIUM APPROACH METHODOLOGY:
DETAILED PRINCIPLES AND RESULTS**

TABLE OF CONTENTS

1   **Q1**.   **What is the purpose of this appendix?**

2   A1.   The appendix reviews the principles underlying the risk premium methodology and discusses

3   the estimation of parameters. It also provides information on sample selection, input

4   parameters, and the resulting cost of capital estimates.

5   **I. THE EQUITY RISK PREMIUM APPROACH**

6   **Q2**.   **How do you organize this section of the appendix?**

7   A2.   First, the appendix reviews the basics of the equity risk premium approach. Second, it

8   discusses the individual components of the model: the risk premium, the relative risk of the

9   company or line of business in question, the appropriate choice of interest rate, and the

10   combination of these elements in a particular equity risk premium model. The appendix

11   also provides details on the choice of parameters in the ECAPM model and details the

12   ATWACC results obtained from the application of the risk positioning methodology.

13   **A.   THE EQUITY RISK PREMIUM MODEL**

14 **Q3**.   **Please describe the equity risk premium model.**

15 A3.   The equity risk premium approach estimates the cost of equity as the sum of a current or

16   forecast interest rate and a risk premium. (The model is sometimes referred to as the "risk

17   premium" or the "risk positioning" approach.)

18   Formal applications of the equity risk premium method implement theoretical finance

19   models of cost of capital. Such models use information on securities to identify the security

20   market line (Figure 1 in the body of the testimony) and derive the cost of capital for an

1   individual security based on that security's relative risk. This equity risk premium approach

2   is widely used and underlies most of the current scholarly research on the nature,

3   determinants and magnitude of the cost of capital.

4   **Q4**.   **How are the "theoretical finance models" implemented?**

5   A4.   The key parameters that determine the security market line are the risk-free interest rate, the

6   premium that a security of average risk commands over the risk-free rate, and a measure of

7   the relative risk of the security being examined. The premium that a security of average risk

8   commands over the risk-free rate is commonly referred to as the "market risk premium"

9   ("MRP"). It is measured as the excess of the expected return on the average common stock

10   over the risk-free interest rate. In the equity risk premium approach the risk-free interest rate

11   and MRP are common to all securities. The security-specific measure of relative risk (beta)

12   is estimated separately and combined with the MRP to obtain the company-specific risk

13   premium.

14   In principle, there may be more than one factor affecting the expected stock return,

15   each with its own security-specific measure of relative risk and its own benchmark risk

16   premium. For example, "multi-factor" models and the "arbitrage pricing theory" are

17   common in the academic literature. These models estimate the cost of capital as the sum of

18   a risk-free rate and several security-specific risk premiums. However, none of these

19   alternative models has emerged as "the" improvement to use instead of the original,

20   single-factor model. Therefore, I use the traditional single-factor model in this testimony.

1   Thus, the required elements in my implementation of the equity risk premium

2   approach are the market risk premium, an objective measure of relative risk, the risk-free

3   rate that corresponds to the measure of the market risk premium, and a specific method to

4   combine these elements into an estimate of the cost of capital.

5   **B.   MARKET RISK PREMIUM**

6   **Q5**.   **Why is a risk premium necessary?**

7   A5.   Experience (*e.g.*, the U.S. market's October Crash of 1987) demonstrates that shareholders,

8   even well diversified shareholders, are exposed to enormous risks. By investing in stocks

9   instead of risk-free Government bills, investors subject themselves not only to the risk of

10   earning a return well below those they expected in any year but also to the risk that they

11   might lose much of their initial capital. This is why investors demand a risk premium.

12   In regulatory proceedings, both a long-term and a short-term version of the Capital

13   Asset Pricing Model ("CAPM") are often reported. The first version measures the market

14   risk premium as the risk premium of average risk common stocks over the long-term risk-

15   free rate. The second version measures the risk premium relative to a short-term risk-free

16   rate, which is the usual measure of the "market risk premium" used in capital market

17   theories.

18   **Q6**.   **How do you estimate the MRP?**

19   A6.   There is presently little consensus on "best practice" for estimating the MRP. For example,

20   the latest edition of the leading graduate textbook in corporate finance, after recommending

1   use of the arithmetic average realized excess return on the market for many years (which for

2   a while was noticeably over 9 percent), now reviews the current state of the research and

3   expresses the view that the a range between 5 to 8 percent is reasonable for the U.S.[1]

4   Ibbotson Associates show an average MRP of stocks over Treasury bills of 8.5 percent.

5   For the period 1926 to 2005, the longest period for which data are available, Ibbotson

6   Associates show an average MRP of stocks over Treasury bills of 8.5 percent,[2] but most of

7   the recent scholarly research on the MRP suggests that the expected MRP is below the

8   historically realized MRP.

9   I consider both the historical evidence and the results of scholarly studies of the

10   factors that affect the risk premium for average-risk stocks in order to estimate the

11   benchmark risk premium investors currently expect.

12   **Q7.** **Please summarize the recent literature on the MRP and the conclusions you draw from**

13   **it?**

14   A7. The new research challenges the conventional wisdom of using the arithmetic average

15   historical excess returns to estimate the MRP. However, after reviewing the issues in the

16   debate, I remain skeptical for several reasons that the market risk premium has declined

17   substantially in the U.S.

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[1] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance,* McGraw-Hill, 8th edition, 2005, pp. 151-154.

[2] Ibbotson Associates, *SBBI: Valuation Edition*, 2006 Yearbook.

1   First, despite eye-catching claims like "equity risk premium as low as three percent,"[3]

2   and "the death of the risk premium,"[4] not all recent research arrives at the same conclusion.

3   In his presidential address to the American Finance Association in 2001, Professor

4   Constantinides seeks to estimate the unconditional equity premium based on average

5   historical stock returns.[5] (Note that this address was based upon evidence just before the

6   major fall in market value.) He adjusts the average returns downward by the change in

7   price-earnings ratio because he assumes no change in valuations in an unconditional state.

8   His estimates for 1926 to 2000 and 1951 to 2000 are 8.0 percent and 6.0 percent,

9   respectively, over the 3-month T-bill rate. In another published study in 2001, Professors

10   Harris and Marston use the DCF method to estimate the market risk premium for the U.S.

11   stocks.[6] Using analysts' forecasts as a proxy for investors' expectation, they conclude that

12   over the period 1982-1998 the MRP **over the long-term risk-free rate** is 7.14 percent. As

13   yet another example, a paper by Drs. Ibbotson and Chen (2003) adopts a supply side

14   approach to estimate the forward looking long-term sustainable equity returns and equity risk

15   premium based upon economic fundamentals. Their equity risk premium **over the long-**

16   **term risk-free rate** is estimated to be 3.97% in geometric terms and 5.90% on an arithmetic

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[3]   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.

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

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

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

1   basis. They conclude their paper by stating that their estimate of the equity risk premium

2   is "far closer to the historical premium than being zero or negative."[7]

3   Second, Professor Ivo Welch surveyed a large group of financial economists in 1998

4   and 1999. The average of the estimated MRP was 7.1 percent in Prof. Welch's first survey[8]

5   and 6.7 percent in his second survey which was based on a smaller number of individuals.

6   However, a more recent survey by Prof. Welch reported only a 5.5 percent MRP.[9] In

7   characterizing these results Prof. Welch notes that "[T]he equity premium consensus forecast

8   of finance and economics professors seems to have dropped during the last 2 to 3 years, a

9   period with low realized equity premia."[10]

10   The above quotation from Prof. Welch emphasizes the caution that must attend

11   survey data even from knowledgeable survey participants: the outcome is likely to change

12   quickly with changing market circumstances. I do not believe that regulatory commissions

13   should attempt to keep pace with such rapidly changing opinions.

14   Third, some of the evidence for negative or close to zero market risk premium simply

15   does not make sense. Despite the relatively high valuation levels, stock returns remain much

16   more volatile than Treasury bond returns. I am not aware of any empirical or theoretical

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[7]   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.

[8]   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.

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

[10] *Ibid.*, p. 8.

1   evidence showing that investors would rationally hold equities and not expect to earn a

2   positive risk premium for bearing the risk.

3   Fourth, I am unaware of a convincing theory for why the future MRP should have

4   substantially declined. At the height of the stock market bubble in the U.S., many claimed

5   that the only way to justify the high stock prices would be if the MRP had declined

6   dramatically,[11] but this argument is heard less frequently now that the market has declined

7   substantially. All else equal, a high valuation ratio such as price-earnings ratio implies a low

8   required rate of return, hence a low MRP. However, there is considerable debate about

9   whether the high level of stock prices (despite the burst of the internet bubble in the last few

10   years) represents the transition to a new economy or is simply an "irrational exuberance,"

11   which cannot be sustained for the long term. If the former case is true, then the MRP may

12   have decreased permanently. Conversely, the long-run MRP may remain the same even if

13   expected market returns in the short-term are smaller.

14   Another common argument for a lower expected MRP is that the U.S. experienced

15   very remarkable growth in the 20th century that was not anticipated at the start of the

16   century. As a result, the average realized excess return is overestimated meaning the

17   standard method of estimating the MRP would be biased upward. However, one recent

18   study by Profs. Jorion and Goetzmann[12] finds, under some simplifying assumptions, that the

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[11] See Robert D. Arnott and Peter L. Bernstein (2002), "What Risk Premium is 'Normal'?", *Financial Analysts Journal* 58:64-85, for an example.

[12] Jorion, P., and W. Goetzmann (1999), "Global Stock Markets in the Twentieth Century," *Journal of Finance* 54:953-980.

1   so-called "survivorship bias" is only 29 basis points.[13] Furthermore, "[I]f investors have

2   overestimated the equity premium over the second half of the last century, Constantinides

3   (2002) argues that 'we now have a bigger puzzle on our hands'" Why have investors

4   systematically biased their estimates over such a long horizon?[14]

5   A number of recent studies that argue that the MRP is variable and depends on a

6   broad set of economic circumstances. For example, Mayfield (2004) estimates the MRP in

7   a model that explicitly accounts for investment opportunities. He models the process that

8   governs market volatility and finds that the MRP varies with investment opportunities which

9   are linked to market volatility. Thus, the MRP varies with investment opportunities and

10   about half of the measured MRP is related to the risk of future investment opportunities.

11   Based on this approach Mayfield estimates the U.S. MRP to be 5.6 percent when measured

12   since 1940.[15]

13   To sum up the above, I cite two passages from Profs. Mehra and Prescott's review

14   of the theoretical literature on equity premium puzzle:[16]

15   Even if the conditional equity premium given current market conditions is
16   small, and there appears to be general consensus that it is, this in itself does
17   not imply that it was obvious either that the historical premium was too high

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[13]   Dimson, Marsh, and Staunton (2003), "Global Evidence on the Equity Risk Premium," *Journal of Applied Corporate Finance* 15, pp. 27-38, 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.

[14]   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

[15]   E. Scott Mayfield (2004), "Estimating the Market Risk Premium," *Journal fo Financial Economics* 73, pp. 465-496.

[16]   Mehra and Prescott, *op cit* p. 926.

1   or that the equity premium has diminished.

2   In the absence of this [knowledge of the future], and based on what we
3   currently know, we can make the following claim: over the long horizon the
4   equity premium is likely to be similar to what it has been in the past and the
5   returns to investment in equity will continue to substantially dominate that
6   in T-bills for investors with a long planning horizon.

7   **Q8**.   **Is there other scholarly discussion of the value of the MRP?**

8   A8.   Yes. Another line of research was pursued by Steven N. Kaplan and Richard S. Ruback.

9   They estimate the market risk premium in their article, "The Valuation of Cash Flow

10   Forecasts: An Empirical Analysis."[17] Professors Kaplan and Ruback compare published

11   cash flow forecasts for management buyouts and leveraged recapitalization over the 1983

12   to 1989 period against the actual market values that resulted from these transactions. One

13   of their results is an estimate of the market risk premium over the long-term Treasury bond

14   yield that is based on careful analysis of actual major investment decisions, not realized

15   market returns. Their median estimate is 7.78 percent and their mean estimate is 7.97

16   percent.[18] This is considerably higher than my estimate of 6.5 percent. Even if the maturity

17   premium of Treasury bonds over Treasury bills were only 1 percent, well below the best

18   estimate of 1.5 percent the resulting estimate of the market risk premium over Treasury bills

19   is higher than my estimate of 8.0 percent.

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

[18]   *Ibid*, p. 1082.

1   **Q9**.   **Do you consider evidence other than the academic articles discussed above?**

2   A9.   Yes. As noted above, Ibbotson Associates reports long-run realized equity premiums. For

3   the longest period available, from 1926 to 2005, Ibbotson Associates data show that the

4   average premium of stocks over Treasury bills is 8.5 percent. For the "post-War" period,

5   1947-2005,[19] the market risk premium was 8.4 percent. I exclude 1946 from the period

6   because its economic statistics are heavily influenced by the War years.[20] From an economic

7   perspective is was not really a "post-War" year. The average premium of stocks over the

8   income returns on long-term Government bonds is 7.1 percent for the 1926 to 2005 period

9   and 7.0 percent for the 1947 to 2005 period.

10   **Q10**.   **What is your conclusion regarding the MRP?**

11   A10.   Historically, realized returns over the Treasury bill was the standard method to estimate the

12   MRP. However, the estimation of the MRP is currently controversial. There is no

13   consensus on its value nor even how to estimate it. Given all of the information, I estimate

14   the risk premium for average risk stocks to be 8.0 percent over Treasury bills and 6.5 percent

15   over long-term Government bonds.

16

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[19]   Ibbotson Associates SBBI Valuation Edition 2005 Yearbook, Appendix A.

[20]   During this period, the annual inflation reached 18 percent.

1   **C.**   **RELATIVE RISK**

2   **Q11**.   **How do you measure relative risk?**

3   A11.   The risk measure I examine is the "beta" of the stocks in question. Beta is a measure of the

4   "systematic" risk of a stock — the extent to which a stock's value fluctuates more or less

5   than average when the market fluctuates. It is the most commonly used measure of risk in

6   capital markets theories.

7   **Q12**.   **Please explain beta in more detail.**

8   A12.   The basic idea behind beta is that risks that cannot be diversified away in large portfolios

9   matter more than those that can be eliminated by diversification. Beta is a measure of the

10   risks that *cannot* be eliminated by diversification.

11   Diversification is a vital concept in the study of risk and return. (Harry Markowitz

12   won a Nobel Prize for work showing just how important it was.) Over the long run, the rate

13   of return on the stock market has a very high standard deviation, on the order of 15-20

14   percent per year since 1926.[21] However, many individual stocks have much higher standard

15   deviations than this. The stock market's standard deviation is "only" about 15-20 percent

16   because when stocks are combined into portfolios, some of the risk of individual stocks is

17   eliminated by diversification. Some stocks go up when others go down, and the average

18   portfolio return — positive or negative — is usually less extreme than that of individual

19   stocks within it.

---

[21]   This compares to a standard deviation of about 3 percent per year on Treasury bills (again since 1926).

1   In the limiting case, if the returns on individual stocks were completely uncorrelated

2   with one another, the formation of a large portfolio of such stocks would eliminate risk

3   entirely. That is, the market's long-run standard deviation would be not 15-20 percent per

4   year, but virtually zero.

5   The fact that the market's actual annual standard deviation is so large means that, in

6   practice, the returns on stocks *are* correlated with one another, and to a material degree. The

7   reason is that many factors that make a particular stock go up or down also affect other

8   stocks. Examples include the state of the economy, the balance of trade, and inflation. Thus,

9   some risk is "non-diversifiable."   Single-factor equity risk premium models derive

10   conditions in which all of these factors can be considered simultaneously, through their

11   impact on the market portfolio. Other models derive somewhat less restrictive conditions

12   under which several of them might be individually relevant.

13   The basic idea behind all of these models is that risks that cannot be diversified away

14   in large portfolios matter more than those that can be eliminated by diversification, because

15   there are a large number of large portfolios whose managers actively seek the best

16   risk-reward tradeoffs available. Of course, undiversified investors would like to get a

17   premium for bearing diversifiable risk, but they cannot.

18   **Q13**.   **Why not?**

19   A13.   Well-diversified investors compete away any premium rates of return for diversifiable risk.

20   Suppose a stock were priced especially low because it had especially high diversifiable risk.

21   Then it would seem to be a bargain to well diversified investors. For example, suppose an

1   industry is subject to active competition, so there is a large risk of loss of market share.

2   Investors who held a portfolio of all companies in the industry would be immune to this risk,

3   because the loss on one company's stock would be offset by a gain on another's stock. (Of

4   course, the competition might make the whole industry more vulnerable to the business

5   cycle, but the issue here is the diversifiable risk of shifts in market share among firms.)

6   If the shares were priced especially low because of the risk of a shift in market

7   shares, investors who could hold shares of the whole industry would snap them up. Their

8   buying would drive up the stocks' prices until the premium rates of return for diversifiable

9   risk were eliminated. Since all investors pay the same price, even those who are not

10   diversified can expect no premium for bearing diversifiable risk.

11   Of course, substantial non–diversifiable risk remains, as the October Crash of 1987

12   demonstrates. Even an investor who held a portfolio of all traded stocks could not diversify

13   against that type of risk. Sensitivity to such market–wide movements is what beta measures.

14   That type of sensitivity, whether considered in a single- or multi-factor model, determines

15   the risk premium in the cost of equity.

16   **Q14**. **What does a particular value of beta signify?**

17   A14. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk: it goes up

18   or down by 10 percent on average when the market goes up or down by 10 percent. Stocks

19   with betas below 1.0 moderate the swings in the market: stocks with betas of .75 tend to fall

20   only 7.5 percent when the market falls 10 percent. Stocks with betas above 1.0 are more

21   volatile than the market.

1   **Q15**.   **How is beta measured?**

2   A15.   The usual approach to calculating beta is a statistical comparison of the sensitivity of a

3   stock's (or a portfolio's) return to the market's return. Several investment services report or

4   sell beta estimates, including *Value Line Investment Survey*. Betas are not always calculated

5   the same way, and therefore must be used with a degree of caution. However, the basic point

6   that a high beta indicates a risky stock remains valid and has long been widely accepted by

7   both financial theorists and investment professionals.

8   **Q16**.   **Are there circumstances when the "usual approach" should not be used?**

9   A16.   There are at least two cases where the standard estimate of beta should be viewed

10   skeptically.

11   First, companies in serious financial distress seem to "decouple" from their normal

12   sensitivity to the stock market. The stock prices of financially distressed companies tend to

13   change based more on individual news about their particular circumstances than upon overall

14   market movements. Thus, a risky stock could have a low estimated beta if the company was

15   in financial distress.

16   Second, similar circumstances seem to arise for companies "in play" during a merger

17   or acquisition. Once again, the individual information about the progress of the proposed

18   takeover is so much more important for that stock than day-to-day market fluctuations that,

19   in practice, beta estimates for such companies seem to be too low.

20   Other circumstances that may cause a company's stock to decouple include an

21   industry restructuring or major changes in a company's supply or output markets.

1   **Q17**. **How reliable is beta as a risk measure?**

2   A17.   Scholarly studies have long confirmed the importance of beta for a stock's required rate of

3   return. It is widely regarded as the best single risk measure available. The merits of beta as

4   a single measure of risk have been challenged by widely publicized work by Professors

5   Eugene F. Fama and Kenneth R. French.[22] However, despite the early press reports of their

6   work as signifying that "beta is dead," it turns out that beta is still a potentially important

7   explanatory factor (albeit one of several) in their work. Thus, beta remains alive and well

8   as the best single measure of relative risk.

9   **D.   INTEREST RATE FORECAST**

10   **Q18**. **What interest rates do your procedures require?**

11   A18.   Modern capital market theories of risk and return use the short-term risk-free rate of return

12   as the starting benchmark. My measures of the MRP incorporate this approach, since they

13   represent the excess of the expected return on the market over the 30-day U.S. Treasury bill

14   rate and over the long-term U.S. Government bond rate. Accordingly, implementation of

15   my procedures requires use of a forecast of the 30-day Treasury bill rate and the long-term

16   Government bond rate. As a proxy for a forecasted risk-free rate, I use the average over the

17   most recent 15 trading days ending April 25, 2006. The result is 4.60 percent for the short-

18   term risk-free rate and 5.21 percent for the long-term risk-free rate. Interest rates have

19   increased significantly in recent months and the Federal Reserve raised interest rates as

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

1   recent as May 10, 2006. In the associated press release, the Federal reserve indicated that

2   "further policy firming may yet be needed to address inflation risks".[23]   In addition, the

3   public debt is at an all time high and the trade deficit is by historical standards very high.[24]

4   Therefore, I believe interest rates are more likely to increase than to decrease going forward.

5   (See Workpaper #2 to Table No. BV-9 for interest rate details)

6   **E.   COST OF CAPITAL MODELS**

7   **Q19**.   **How do you combine the above components into an estimate of the cost of capital?**

8   A19.   By far the most widely used approach to estimation of the cost of capital is the "Capital

9   Asset Pricing Model," and I do calculate CAPM estimates. However, the CAPM is only one

10   equity risk premium approach technique, and I also use another.

11   **Q20**.   **Please start with the CAPM, by describing the model.**

12   A20.   As noted above, the modern models of capital market equilibrium express the cost of equity

13   as the sum of a risk-free rate and a risk premium. The CAPM is the longest-standing and

14   most widely used of these theories. The CAPM states that the cost of capital for investment

15   I (*e.g.*, a particular common stock) is given by the following equation:

16       $$k_i = r_f + \beta_i \times \text{MRP} \qquad\qquad\qquad\qquad (\text{B-1})$$

17   where k_i is the cost of capital for investment I, r_f is the risk-free interest rate, β_i is relative

---

[23]   Federal Reserve, Press Release, May 10, 2006.

[24]   See http://www.publicdebt.treas.gov/opd/opdhisto4.htm and the U.S. Census Bureau.

1   risk measure for investment *I*, and MRP is the market risk premium. The CAPM relies on

2   the empirical fact that investors price risky securities to offer a higher expected rate of return

3   than safe securities do. It says that the security market line starts at the risk-free interest rate

4   (i.e., the return on a zero-risk security, the y-axis intercept in Figure 1 in the body of my

5   testimony, equals the risk-free interest rate). It further says that the risk premium over the

6   risk-free rate equals the product of beta and the risk premium on a value-weighted portfolio

7   of all investments, which by definition has average risk.

8   **Q21**.   **What other equity risk premium approach model do you use?**

9   A21.   Empirical research has long shown that the CAPM tends to overstate the actual sensitivity

10   of the cost of capital to beta: low-beta stocks tend to have higher risk premia than predicted

11   by the CAPM and high-beta stocks tend to have lower risk premia than predicted. A number

12   of variations on the original CAPM theory have been proposed to explain this finding. The

13   difference between the CAPM and the type of relationship identified in the empirical studies

14   is depicted in Figure B-1.

1
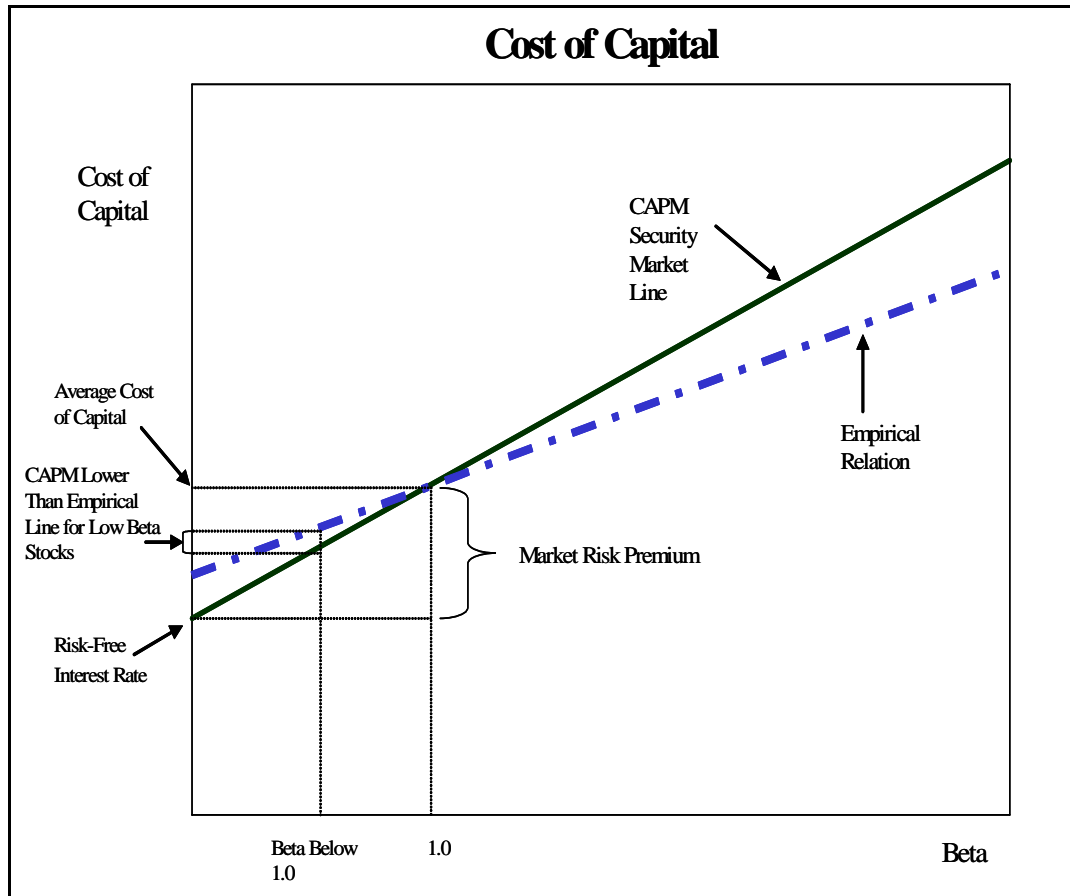
Cost of Capital

Figure B-1

2   The second model makes use of these empirical findings. It estimates the cost of capital

3   using the equation

4     $$k_i = r_f + \alpha + \beta_i \times (MRP - \alpha) \tag{B-2}$$

5   where as before, k_i is the cost of capital for investment I, r_f is the risk-free interest rate, α is

6   the empirical adjustment factor, β_i is the measure of relative risk, and MRP is the market risk

7   premium. I refer to the model in (B-2) as the Empirical CAPM or ECAPM.

1   Research supports values for α of from one to seven percent when using a short-term

2   interest rate. I set alpha (α) equal to 1, 2, and 3 percent which are values somewhat lower

3   than that estimated empirically. For the long-term risk-free rate models, I set alpha equal

4   to both 0.5 percent and 1.5 percent, but I rely more heavily on the 0.5 percent results. The

5   use of a long-term risk-free rate incorporates some of the desired effect of using the ECAPM.

6   That is, the long-term risk-free rate version of the Security Market Line has a higher

7   intercept and a flatter slope than the short-term risk-free version which has been tested.

8   Thus, it is likely that a lesser adjustment is needed for the long-term risk-free rate than for

9   the short-term risk-free rate. A summary of the empirical evidence on the magnitude of

10   alpha is provided in Table B-1 at the end of this appendix.

11   **II. EMPIRICAL EQUITY RISK PREMIUM RESULTS**

12   **Q22**. **How is this part of the appendix organized?**

13   A22. This section presents the full details of my equity risk premium approach analyses, which

14   are summarized in the body of my testimony. This section discusses the sample selection

15   process, calculation of the market value capital structures, and the forecasts of the short-term

16   and the long-term risk-free interest rates. Next, it addresses the beta estimates, and the

17   estimates of the MRP used. Finally, it reports the CAPM and ECAPM results for the

18   samples' After-Tax Weighted-Average Cost of Capital (ATWACC), and describes the results

19   of adjusting for differences between the samples' and Anthem's capital structures.

1   **A.**   **PRELIMINARY MATTERS**

2   **1.**   **WATER UTILITY SAMPLE**

3   **Q23**.   **How do you select your water utility sample companies?**

4   A23.   The overall cost of capital for a part of a company depends on the risk of the business in

5   which the *part* is engaged, *not* on the overall risk of the parent company on a consolidated

6   basis. According to financial theory, the overall risk of a diversified company equals the

7   market value weighted-average of the risks of its components.

8   Estimating the cost of capital for Anthem's regulated assets is the subject of this

9   proceeding. The ideal sample would be a number of companies that are publicly traded

10   "pure plays" in the water production, storage, treatment, transmission, distribution or waste

11   water line of business. "Pure play" is an investment term referring to companies with

12   operations only in one line of business. Publicly traded firms, firms whose shares are freely

13   traded on stock exchanges, are ideal because the best way to infer the cost of capital is to

14   examine evidence from capital markets on companies in the given line of business.

15   To construct a sample of comparable companies, I started with the universe of

16   companies classified as water utility companies in *Value Line*.[25] Normally, I would apply

17   several selection criteria to eliminate companies with unique circumstances that may affect

18   the cost of capital estimates. For example, in most industries, I would eliminate companies

19   with low annual revenues, no or non-investment grade bond ratings, lack of *IBES* or

20   Compustat data, all companies with announced dividend cuts, and companies involved in

---

[25]   Including both the Standard and the Small and Mid-Cap Editions of *Value Line Investment Survey and Value Line Investment Survey - Plus Edition.*

1   significant merger, acquisition, or divesture activities over the last five years (2001 to today).

2   However, applying these procedures to the eight companies followed by *Value Line* would

3   result in a sample of at most two companies.[26] I therefore use all eight companies in my

4   analysis. I report results for both the full sample and for a subsample of companies that earn

5   a high percentage of revenues from regulated water activities. Southwest Water Company

6   earned less than 40 percent of its revenues from regulated water activities in 2005 and is

7   therefore not included in this "highly regulated" sample. Companies in the subsample

8   earned at least 89 percent of their revenue from regulated water utility activities in 2005.

9   Table No. BV-2 reports operating revenue shares from different lines of business in

10   2005 for these companies. (Table No. BV-1 provides an index to the other tables.)

11   **Q24**.   **Why do you usually eliminate companies currently involved in a merger from your**

12   **samples?**

13   A24.   The stock prices of companies involved in mergers are often more affected by news relating

14   to the merger than to movements in the stock market. In other words, the stock price

15   "decouples" from its normal relationship to the stock market (the economy) which is the

16   basis upon which a company's relative risk is calculated. Instead the stock price of a merger

17   candidate is more affected by the latest speculation on the terms and probability of the

18   merger.

---

[26]   All but California Water and American States Water would be eliminated for lack of revenues, trading
       volume, or data.

1   **Q25**.   **What are the water sample's data problems?**

2   A25.   First, of the eight companies followed by *Value Line*, three companies (Connecticut Water,

3   Middlesex Water, and York Water) have 2005 revenues below $100 million. The stock of

4   small companies frequently exhibit "thin trading" which means that their stock trades

5   infrequently. This is confirmed as several of the water utilities have relative low trading

6   volume.[27] As a result, the measured beta is likely to be downward biased. Further, no bond

7   rating was found for two companies, SJW Corp and Southwest Water. (see Workpaper #1

8   to Table No. BV-10 for bond rating details).

9   Second, several companies lack long-term earnings forecasts. I do not include

10   Connecticut Water Service Inc. and SJW Corp. in the sample when applying the forward-

11   looking Discounted Cash Flow ("DCF") method because of a lack of recent earnings

12   forecasts. However, I do include both Connecticut Water and SJW Corp. in the risk

13   positioning method. To sum up, at most two companies have significant revenue, a bond

14   rating for five years and IBES long-term growth forecast.

15   Third, the water industry has seen substantial merger activity in recent years. For

16   example, Aqua America integrated about 30 smaller entities and the company expects to add

17   further entities in 2006. The company completed the acquisition of AquaSource for about

18    $195 million in July 2003, and during 2004 Aqua America completed 29 acquisitions.

19   Additionally, American Water Works acquired National Enterprises, Inc., Azurix, and the

---

[27]   Connecticut Water Svc Inc and York Water Co traded less than 5 million shares. Only American States Water
Co, California Water Services Gp, Aqua America Inc, and Southwest Water Co traded in excess of 10 million
shares in 2005.

1   water and wastewater utility assets of Citizens Utilities. American Water Works, in turn,

2   was acquired by the RWE AG on January 10, 2003. Recently, RWE announced plans to sell

3   American Water. Domestic energy companies have also invested in the water utility

4   business, although presently many of those investments have or will be sold. Allete has sold

5   its assets in Florida and North Carolina; Indianapolis Water Company was sold by NISource;

6   Suez Lyonnaise des Eaux purchased the remaining shares of United Water Resource that

7   it did not already own; and Thames Water purchased E'Town Corporation. California Water

8   Services purchased Ka'anpali Water Corporation in 2003 and Southwest Water Co. acquired

9   a Texas utility consisting of 86 water systems and 11 wastewater systems in 2004. [28]

10   These factors may all potentially affect the cost of equity estimates in not completely

11   predictable ways. Because of the substantial data problems and lack of publicly traded water

12   utilities, I am forced to rely on a sample with significant data problems or a sample with at

13   most two companies (American States Water and California Water Services).

14   **2.   GAS LOCAL DISTRIBUTION COMPANY SAMPLE**

15   **Q26**.   **How do you select your gas local distribution company sample?**

16   A26.   To select this sample, I started with the universe of publicly traded gas distribution utilities

17   covered by *Value Line*. This resulted in an initial group of 16 companies.[29] I then eliminated

18   companies by applying additional selection criteria designed to eliminate companies with

---

[28]   Sources: *Value Line Investment Survey*, January 30, 2004 and January 28, 2005, *The Business Journal, http://ir.calwatergroup.com,* and company web sites.

[29]   The 16 companies are from *Value Line Investment Survey's* Standard Edition.

1   unique circumstances which may bias the cost of capital estimates. The final sample consists

2   seven gas local distribution ("gas LDC") companies. Table No. BV-12 reports operating

3   revenue shares from regulated activities for these companies for 2005.

4   **Q27**.   **What are the selection criteria you applied?**

5   A27.   I eliminated all companies whose regulated revenues are not greater than 60 percent of total

6   revenues because one goal for this sample was for the sample companies to derive the

7   majority of their revenues from regulated activities. I also eliminated all companies whose

8   Standard & Poor's bond rating was less than BBB per Compustat and companies with large

9   mergers during the most recent five year period. The screen for merger activity is any

10   mention of merger activity in the analyst report section of *Value Line* or sizeable mergers

11   found during a search of the companies' web pages.[30] To guard against measurement bias

12   caused by "thin trading," I also restricted the sample to companies with total operating

13   revenues greater than $300 million in 2005.[31] Finally, I require that the companies have

14   historical monthly return data available from Compustat for the relevant period.

15   **Q28**.   **What companies were eliminated from the gas LDC sample because their share of**

16   **revenue from distribution activities is not above 60 percent?**

---

[30]   For purposes of sample selection, a sizeable merger is defined to be one which would exceed 25 percent of the total capitalization of the company at the time of the merger announcement.

[31]   As reported by *Value Line* on March 17, 2006.

1   A28.   New Jersey Resources was eliminated from the sample because its revenue share from

2   natural gas distribution is not above 60%.

3   **Q29.**   **Were any other companies eliminated?**

4   A29.   Yes. AGL Resources, Atmos Energy, KeySpan, Piedmont Natural Gas and Southern Union

5   were eliminated for recent or current merger activities. SEMCO Energy was eliminated

6   because of dividend cuts and a low bond rating. Nicor Inc. was eliminated from the sample

7   because of its 2003 restatement of earnings for 1999-2001, and because Nicor settled

8   regulatory compliance issues with the Federal Energy Regulatory Commission ("FERC")

9   in 2003.[32] UGI Corp. was eliminated because it primarily sells propane which is non-

10   regulated.

11   **Q30.**   **Do you report results for a subsample?**

12   A30.   Yes. To ensure the results are not biased by companies earning substantial revenues from

13   non-regulated activities, I report results from a subsample of companies that earn at least 75

14   percent of their revenues from regulated gas activities. This subsample consists of three

15   companies: Cascade Natural Gas, Northwest Natural Gas, and Southwest Gas.

16   **Q31.**   **Please compare the characteristics of the water utility sample and the gas LDC sample.**

17   A31.   Both samples consists of companies with substantial capital investments in distribution

---

[32]   Nicor announced on Oct. 29, 2002 that its earnings for 1999-2001 would be revised downwards by $15-35
       million. On March 4, 2003, Nicor released its restated earnings for 1999-2001 along with 2002 earnings.

1   facilities. Also, both samples earned a large percentage of their revenue from regulated

2   activities and serve a mix of residential, industrial, and other customers. I.e., both samples

3   consists primarily of state regulated distribution companies with a comparable customer mix.

4   However, the gas LDC sample has fewer of the data and estimation issues identified above

5   for the water sample.

6   For both the water/wastewater industry and the gas distribution industry,

7   environmental compliance costs and infrastructure investments are of importance. Many gas

8   LDC companies discuss environmental clean-up requirements in their 10-K. Similarly,

9   regulatory requirements from federal and local authorities through, for example, the Clean

10   Water Act of 1974 and EPA enforcement will likely require the water and wastewater

11   industry to invest substantial amounts in environmental infrastructure going forward.[33]

12   **Q32. What do you conclude from the comparison of the water utility and the gas LDC**

13   **samples?**

14   A32. The two samples differ primarily in that they operate in two different (regulated) industries,

15   but they are very similar in terms of the percentage of revenues from regulated operations

16   and the customers they serve. The gas LDC sample provides a reasonable comparison

17   sample for the water utility industry but without the substantial data issues.

---

[33]   According to *Value Line Investment Survey*, Water Utility Industry, January 28, 2005, updates to the infrastructure of water utilities are likely to grow into hundreds of millions of dollars over the next decade or two.

1 **3.   OTHER PRELIMINARY MATTERS**

2 **Q33**. **What capital structure information do you require?**

3 A33.   For reasons discussed in my testimony and explained in detail in Appendix D, an explicit

4 evaluation of the market-value capital structures of the sample companies versus the capital

5 structure used for rate making is vital for a correct interpretation of the market evidence.

6 This requires estimates of the market values of common and preferred equity and debt, and

7 the current market costs of preferred equity and debt.

8 **Q34**. **How do you calculate the market-value capital structures of the sample companies?**

9 A34.   I estimate the capital structure for each company by estimating the market values of common

10 equity, preferred equity and debt from publicly available data. The calculations are in Panels

11 A to H of Tables No. BV-3 and BV-13 for the water and gas LDC sample, respectively.

12 The market value of equity is straightforward: the price per share times the number

13 of shares outstanding. The market value of debt is set equal to its book value because debt

14 generally is callable in the U.S. The market value of preferred equity is also set equal to its

15 book value because preferred equity makes up a very small portion (less than 1 percent) of

16 the market value capital structures of the companies in the two samples.

17 For purposes of assessing financial risk to common shareholders, I add an adjustment

18 for short-term debt to the debt portion of the capital structure. This adjustment is used only

19 for those companies whose short-term (current) liabilities (net of the current portion of long-

20 term debt) exceed their short-term (current) assets. I add an amount equal to the minimum

21 of the difference between short-term liabilities and short-term assets or the amount of short-

1   term debt. The reason for this adjustment is to recognize that when current liabilities exceed

2   current assets, a portion of the companies long-term assets are being financed, in effect, by

3   short-term debt. The output of these schedules is the market debt-to-value and preferred

4   equity-to-value ratios. Table No. BV-3 and Table No. BV-13 report such calculations using

5   the values at year end for the years 2001 to 2005. The overall cost of capital calculation for

6   the risk positioning estimates rely on the average of the market value capital structure

7   computed for the years 2001 through 2005. The DCF capital structure uses stock prices as

8   of March 31, 2006 and balance sheet information for year-end 2005.

9   **Q35**. **How do you estimate the current market cost of debt?**

10   A35. I use the current yields on indices of comparably rated utility bonds. The cost of debt for

11   each company in the DCF analysis is the current yield reported by *Mergent Bond Record* for

12   an index of bonds rated carrying the same rating as the company in question.[34] For the risk

13   positioning method, the cost is the current yield corresponding to the five-year average debt

14   rating for each company. The debt ratings for the companies in both samples are obtained

15   from Compustat when available. If no rating was found in Compustat, S&P's website,

16   Moody's website, or S&P's Bond Guide was used. Calculation of the after-tax cost of debt

17   uses Anthem's estimated marginal income tax rate of 38.6 percent.

18   **Q36**. **How do you estimate the current market cost of preferred equity?**

---

[34]   For the purpose of assigning bond yields, I assume that S&P bond ratings are comparable to Moody's which
       underlies the yields reported in Mergent Bond Record.

1   A36.   It is set equal to the yield on an index of comparably rated preferred stock. The sample

2   companies are assumed to have the same preferred and bond rating.

3   **B.   BETAS AND THE MARKET RISK PREMIUM**

4   **1.   BETA ESTIMATION PROCEDURES**

5   **Q37**.   **Which betas do you use in your risk positioning models?**

6   A37.   I obtained beta estimates from Value Line Investment Survey.[35]

7   **Q38**.   **How does Value Line estimate the reported betas?**

8   A38.   *Value Line* estimates the reported betas using weekly data for a five year period. As the

9   market index, *Value Line* uses the New York Stock Exchange. Also, Value Line reports so-

10   called adjusted betas. I.e., the betas reported by Value Line are calculated as follows:

11    $$\beta_{\text{Value Line}} = .67 \times \beta + .35 \qquad\qquad\qquad (\text{B-3})$$

12   where β is the standard beta estimate. To obtain standard betas, I reverse *Value Line's*

13   adjustment to obtain standard betas, β. *Value Line's* and many investment firms adjust the

14   estimated betas using a procedure similar to the one described in equation (B-3). This type

15   of adjustment is intended to compensate for sampling errors in the beta estimation. It adjusts

16   betas below one upwards and betas above one downwards.

---

[35]   For the water utility sample, *Value Line* betas as of January 27, 2006 were used. For the gas LDC sample, *Value Line* betas as of March 17, 2006.

1   **Q39**. **Please summarize the beta estimates you rely on.**

2   A39.   After reversing the *Value Line* adjustment procedure, the average estimated *Value Line* beta

3   for the water sample is about .53 while the average for the gas LDC sample is about .63. The

4   beta estimates for the sample companies are reported in Workpaper #1 to Tables No. BV-9

5   and BV-19.

6   **Q40**. **Are there any problems with betas at this point in time?**

7   A40.   Yes. Beta estimates are still impacted by the bubble in the stock market and tend to have

8   low statistical significance. Additionally, utility stock betas have been inclining rapidly in

9   recent months indicating that the industry is changing. This indicate the current betas

10   (relying on 260 weeks of data) likely are downward biased.[36] This is confirmed in Figure

11   B-2 below which shows rolling 52-week betas for the water utility and gas LDC samples.

12   These betas are "rolling betas" which means that each betas is based on the previous 52

13   weeks of return data. Specifically, the sample companies' weekly returns were regressed on

14   the weekly S&P 500 return. In this way, the changes in the estimated betas can be tracked

15   through time. These betas were estimated over the period July, 2002 through April 2006.

16   The figure shows that both water utility and gas LDC betas have increased significantly over

17   the past few years and recently, the water utility sample's betas have increased a great deal.

18   There likely are effects from (i) changes in the industry such as consolidation and increased

19   uncertainty regarding infrastructure investments, and (ii) low trading volumes which makes

---

[36]   During the past year or so, Value Line has increased its beta estimates for the water utility and gas LDC
       samples by an average of .06 and .05, respectively.

1   the beta estimates less stable than in industries that have higher trading volumes. Regardless

2   of the reason, the figure shows that the risk of the industry in increasing.

**52-Week Betas from 7/24/02 through 4/26/06
For the US LDC Sample and Water Sample**
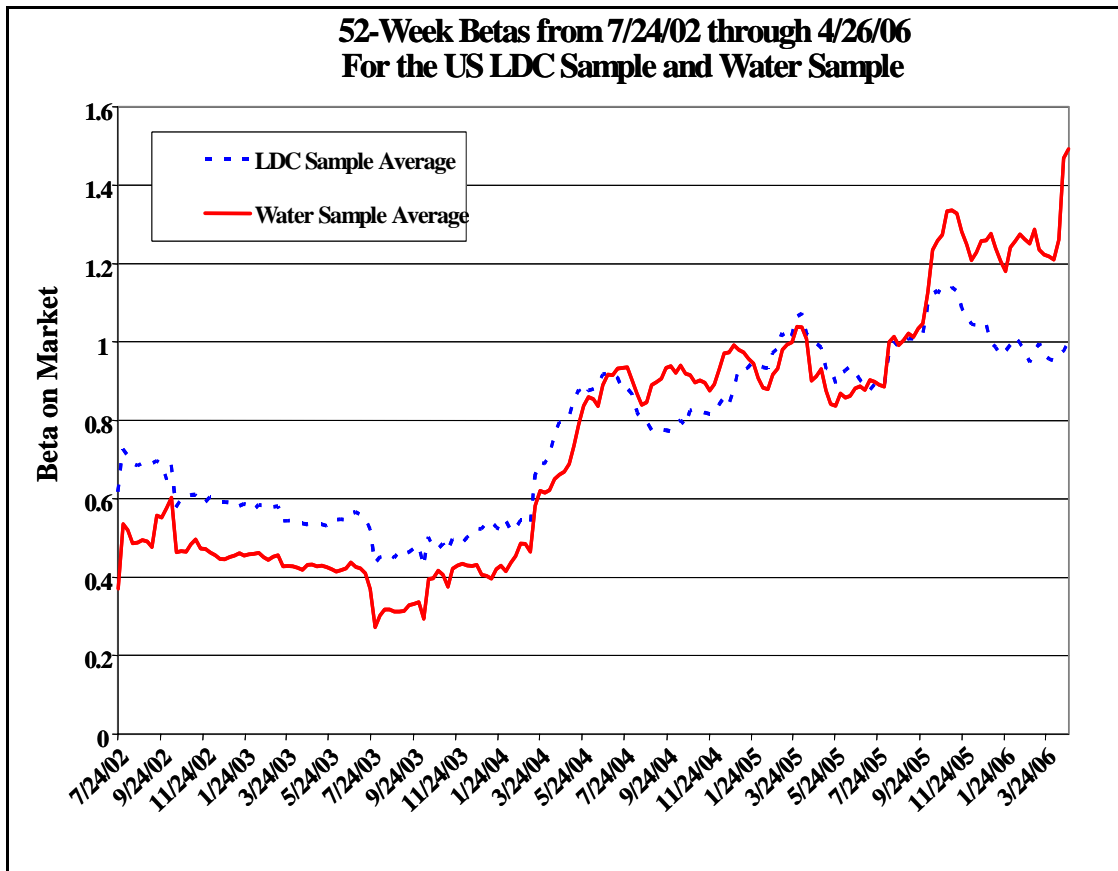
Figure B-2

3   **Q41**. What beta values do you use in your analysis?

4   A41.   After reversing the adjustment process discussed above, the current estimated *Value Line*

5   betas range from 0.22 to 0.67 for the water sample and from 0.45 to 0.75 for the gas LDC

6   sample. The average is .53 and .63 for the water utility and gas LDC sample, respectively

7   (See Workpaper #1 to Tables No. BV-9 and No. BV-19).

1   **2.   MARKET RISK PREMIUM ESTIMATION**

2   **Q42. Given all of the evidence, what MRP do you use in your analysis?**

3   A42.   It is clear that market return information is volatile and difficult to interpret, but based on the

4   collective evidence, the MRP I use for the short-term risk-free rate is 8 percent and for the

5   long-term risk-free rate is 6.5 percent.

6

7   **D.   COST OF CAPITAL ESTIMATES**

8   **Q43. Based on these data, what are the values you calculate for the overall cost of capital and**

9   **the corresponding cost of equity for the water utility sample?**

10   A43.   Panels A and B of Table No. BV-9 present the cost of equity results using the equity risk

11   positioning method at the sample companies' market value capital structures. The table

12   contains two panels, Panel A for the long-term risk-free rate and Panel B for the short-term

13   risk-free rate.

14   **Q44. What does the water utility sample market data imply about cost of equity at Anthem's**

15   **40 percent equity ratio?**

16   A44.   The return on equity and the overall cost of capital for the various equity risk positioning

17   methods are reported in Table No. BV-10, Panels A to G. Panels A through C utilize the

18   long-term risk-free rate while Panels D through G use the short-term risk free rate. Panel

19   A reports the CAPM results using the long-term risk-free rate, while Panels B and C report

20   the ECAPM cost of equity results for the ECAPM parameters of 0.5 and 1.5 percent,

21   respectively. Panel D reports the CAPM estimates using the short-term risk free rate. Panels

1   E, F and G report ECAPM results using ECAPM parameters of 1, 2 and 3 respectively.

2   Focusing on the middle version of the ECAPM, Panel B of Table No. BV-10 (ECAPM with

3    $a = 0.5\%$) shows the results using the long-term risk-free rate version of the model. For this

4   table, the costs of equity estimates for the water sample companies range from 7.1 to 9.7

5   percent for capital structures that average 68 percent equity. The sample average ATWACC

6   is 7.2 percent for both the full sample and for the subsample.[37]

7   In each panel, column eight reports the overall cost of capital for each company. The

8   last two rows of each panel report the sample averages. The first is for all companies in the

9   water sample (average [a]), and the second is for the subsample of companies with

10   significant revenue from regulated water activities (average [b]). The sample average

11   ATWACCs from each panel of Table No. BV-10 are reproduced in column one of Table No.

12   BV-11 which reports the cost of equity estimates for each of the risk positioning estimates

13   that is consistent with the sample information and the capital structure of Anthem. Panel A

14   of Table No. BV-11 reports the results for all sample companies. Panel B of the table

15   summarizes the results for the subsample of companies that have a large percentage of

16   revenues from regulated activities. The sample average ATWACCs are summarized in

17   Table B-2 at the end of this appendix. The costs of equity at a 40 percent equity ratio are

18   displayed in Tables 2 and 3 of my testimony.

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[37]   Note that these cost of equity estimates rely on unadjusted *Value Line* betas which are lower than current estimates based on weekly returns.

1   **Q45**.   **What cost of equity values do you calculate for the gas LDC sample?**

2   A45.   The cost of equity estimates for the gas LDC sample are displayed on Panels A and B of

3   Table No. BV-19. Panel A uses the long-term risk-free rate, and Panel B uses the short-term

4   risk-free rate.

5   **Q46**.   **What does the gas LDC sample market data imply about the cost of equity at Anthem's**

6   **40 percent equity ratio?**

7   A46.   The cost of equity and the overall cost of capital for the various equity risk positioning

8   methods are reported in Table No. BV-20 for the gas LDC sample. Panels A through C

9   utilize the long-term risk-free rate. Panel A again reports the CAPM cost of equity results

10   while Panels B and C report the ECAPM cost of equity results for the 0.5 and 1.5 percent

11   adjustment factors, respectively. Panels D through G to Table BV-20 utilize the short-term

12   risk-free rate. Panel D report the CAPM cost of equity results, while Panels E, F and G

13   report the ECAPM overall cost of capital results using 1, 2 and 3 percent adjustment factors.

14   In each panel, column eight reports the overall cost of capital for each company. The last

15   two lines of each panel report the sample averages for the full sample and the subsample of

16   companies with an average of more than 75 percent of revenue for the last five years from

17   regulated activities. Panel B of Table No. BV-20 shows the estimates using the middle

18   version of the ECAPM (a = 0.5%) for the companies in the gas LDC sample. Using the long

19   -term risk-free rate, the model results in costs of equity of 8.4 to 10.2 percent for capital

20   structures that average about 59 percent equity for the full sample and 53 percent for the

21   subsample. The sample average ATWACC is 7.1 percent for the full sample and 6.8 percent

1   for the subsample. However, the subsample results is heavily influenced by one company,

2   Southwest Gas. If Southwest Gas was dropped from the subsample, the results would be

3   comparable to those from the full gas LDC sample.

4   The sample average ATWACC from each panel of Table No. BV-20 is reproduced

5   in column one of Table No. BV-21 which reports the cost of equity estimates for each of the

6   risk positioning estimates. Panel A reports the results for all sample companies. As with the

7   water sample, Panel B reports the averages using only those companies that have a large

8   percentage of revenue from regulated activities. The sample average ATWACCs and

9   corresponding costs of equity at a 40 percent equity ratio are displayed in Tables 2 and 3 of

10   my testimony. I discuss the implications of the equity risk positioning results in the main

11   body of my testimony.

Table No. B-1
Empirical Evidence on the Alpha (α) Factor in ECAPM[*]

Author	Alpha (α) Estimate	Period relied upon
Black (1993)[1]	1% for betas between zero and .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 (unbiased, efficient, consistent). 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] Black, Jensen and Scholes 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 estimation results estimate alpha at 4.4%.

[5] Pettengill, Sundaram and Mathur rely on total returns for the period 1936 through 1990 to estimate the alpha parameter 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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Fama, Eugene F. and James D. MacBeth, "Risk, Returns and Equilibrium: Empirical Tests," *Journal of Political Economy*, September 1972, pp. 607-636.

Fama, Eugene F. and Kenneth R. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance*, Vol. 47, June 1992, pp. 427-465.

Litzenberger, Robert H. and Krishna Ramaswamy, "The Effect of Personal Taxes and Dividends on Capital Asset Prices, Theory and Empirical Evidence," *Journal of Financial Economics*, June 1979, pp. 163-195.

Litzenberger, Robert H. and Krishna Ramaswamy and Howard Sosin, "On the CAPM Approach to Estimation of a Public Utility's Cost of Equity Capital," *The Journal of Finance*, Vol. 35, No. 2, May 1980, pp. 369-387.

Pettengill, Glenn N., Sridhar Sundaram and Ike Mathur, "The Conditional Relation between Beta and Returns," *Journal of Financial and Quantitative Analysis*, Vol. 30, No. 1, March 1995, pp. 101-116.

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Table B-2: Risk Positioning After-Tax Weighted-Average Cost of Capital Panel A: for All Companies in the Water Utility and Gas LDC Samples		
	Water Utility	**Gas LDC**
Using Long-Term Risk-Free Rate		
CAPM	7.0%	7.0%
ECAPM ($\alpha = 0.5\%$)	*7.2%*	*7.1%*
ECAPM ($\alpha = 1.5\%$)	7.5%	7.3%
Using Short-Term Risk-Free Rate		
CAPM	7.1%	7.1%
ECAPM ($\alpha = 1\%$)	*7.5%*	*7.4%*
ECAPM ($\alpha = 2\%$)	7.8%	7.6%
ECAPM ($\alpha = 3\%$)	8.1%	7.8%

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12   Source: Tables No. BV-11 and BV-21, Panel A.

Table B-2: Risk Positioning After-Tax Weighted-Average Cost of Capital Panel B: for Companies with a High Percentage Regulated Revenue		
	Water Utility	**Gas LDC**
Using Long-Term Risk-Free Rate		
CAPM	7.0%	6.6%
ECAPM ($\alpha = 0.5\%$)	*7.2%*	*6.7%*
ECAPM ($\alpha = 1.5\%$)	7.5%	7.0%
Using Short-Term Risk-Free Rate		
CAPM	7.1%	6.8%
ECAPM ($\alpha = 1\%$)	*7.5%*	*7.0%*
ECAPM ($\alpha = 2\%$)	7.8%	7.2%
ECAPM ($\alpha = 3\%$)	8.1%	7.4%

Source: Tables No. BV-11 and BV-21, Panel B.

**APPENDIX C: DISCOUNTED CASH FLOW METHODOLOGY:
DETAILED PRINCIPLES AND RESULTS**

TABLE OF CONTENTS

SECTION   **PAGE**

1   **Q1**.   **What is the purpose of this appendix?**

2   A1.   In this appendix, I review the principles underlying the discounted cash flow or "DCF"

3   methodology and discuss the estimation of parameters. I also provide information on any

4   differences between the samples used in the risk positioning method and in the DCF method,

5   and on the resulting cost of capital estimates. Parts of the appendix intentionally repeat parts

6   of the direct testimony to ensure the reader has a complete discussion in one place.

7   **I. DISCOUNTED CASH FLOW METHODOLOGY PRINCIPLES**

8   **Q2**.   **How is this section of the appendix organized?**

9   A2.   First, I discuss the general principles underlying the DCF approach. Second, I review the

10   strengths and weaknesses of the DCF model. Third, I discuss the methods applicability to

11   companies in the water and gas distribution industry at the current time.

12   **A.   SIMPLE AND MULTI-STAGE DISCOUNTED CASH FLOW MODELS**

13   **Q3**.   **Please summarize the DCF model.**

14   A3.   The DCF model assumes that the current stock price is the discounted sum of future cash

15   payments that accrue to shareholders. The method also assumes that this present value can

16   be calculated by the standard formula for the present value of a cash flow stream:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \dots + \frac{D_T}{(1+k)^T} \qquad \text{(C-1)}$$

1

1   where "P_0" is the current market price of the stock; "D_t" is the dividend cash flow expected

2   at the end of period t; "k" is the cost of capital; and "T" is the last period in which a dividend

3   cash flow is to be received. The formula just says that the stock price is equal to the sum of

4   the expected future dividends, each discounted for the time and risk between now and the

5   time the dividend is expected to be received.

6   Most DCF applications go even further, and make very strong (*i.e.*, unrealistic)

7   assumptions that yield a simplification of the standard formula, which then can be rearranged

8   to estimate the cost of capital. Specifically, if investors expect a dividend stream that will

9   grow *forever* at a steady rate, the market price of the stock will be given by a very simple

10   formula,

11   where "D_1" is the dividend expected at the end of the first period, "g" is the perpetual growth

12   rate, and "P_0" and "k" are the market price and the cost of capital, as before. Equation (C-3)

13   is a simplified version of Equation (C-2) that can be solved to yield the well known "DCF

14   formula" for the cost of capital:

$$k = \frac{D_1}{P_0} + g = \frac{D_0 \times (1+g)}{P_0} + g \qquad\qquad \text{(C-2)}$$

15   where "D_0" is the current dividend, which investors expect to increase at rate g by the end

16   of the next period, and the other symbols are defined as before. Equation (C-3) says that if

17   Equation (C-2) holds, the cost of capital equals the expected dividend yield plus the

18   (perpetual) expected future growth rate of dividends. I refer to this as the simple DCF

19   model. Of course, the "simple" model is simple because it relies on very strong (*i.e.*, very

20   unrealistic) assumptions.

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

1 A4. Yes. There are many variations on the DCF models that may rely on less strong assumptions

2   in that they allow growth rates to vary over time. I consider a variant of the DCF model that

3   uses the companies' individual growth rates during the first five years, converges to a

4   perpetual growth rate in years 6-10 and then uses the GDP growth rate as the perpetual

5   growth rate after year 10 for all companies. This is a variant of the "multi-stage" DCF

6   method. More formally, the "multi-stage" DCF approach solves the following equation for

7   k:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + ...+ \frac{D_T + P_{TERM}}{(1+k)^T} \qquad \text{(C-3)}$$

8   The terminal price, P_{TERM} is estimated as

9   where T is the last of the periods in which a near term dividend forecast is made and g_{LT} is

$$P_{TERM} = \frac{D_{T+1}}{(k - g_{LT})} \qquad \text{(C-4)}$$

10   the long-term growth rate. Thus, Equation (C-4) defers adoption of the very strong perpetual

11   growth assumptions that underlie Equation (C-2) — and hence the simple DCF formula,

12   Equation (C-3) — for as long as possible, and instead relies on near term knowledge to

13   improve the estimate of k. I examine both the simple and multi-stage DCF results.

14 **Q5. What are the merits of the DCF model?**

15 A5. The DCF approach is conceptually sound if its assumptions are met but can run into

16   difficulty in practice because those assumptions are so strong, and hence so unlikely to

17   correspond to reality. Two conditions are well-known to be necessary for the DCF approach

18   to yield a reliable estimate of the cost of capital: the variant of the present value formula,

1   Equation (C-1), that is used must actually match the variations in investor expectations for

2   the dividend growth path; and the growth rate(s) used in that formula must match current

3   investor expectations. Less frequently noted conditions may also create problems.

4   The DCF model assumes that investors expect the cost of capital to be the same in

5   all future years. Investors may not expect the cost of capital to be the same, which can bias

6   the DCF estimate of the cost of capital in either direction.

7   The DCF model only works for companies for which the standard present value

8   formula works. The standard formula does *not* work for options (*e.g.*, puts and calls on

9   common stocks), and so it will not work for companies whose stocks behave as options do.

10   Option-pricing effects will be important for companies in financial distress, for example,

11   which implies the DCF model will *understate* their cost of capital, all else equal.

12   It is too early to throw out the standard formula, if for no other reasons than that the

13   evidence is still controversial and no one has offered a good replacement. But the evidence

14   suggests that it must be viewed with more caution than financial analysts have traditionally

15   applied. Simple models of stock prices may not be consistent with the available evidence

16   on stock market volatility.

17   **Q6**.   **Do you agree that estimating the right growth rate is the most difficult part for the**

18   **implementation of the DCF approach?**

19   A6.   Yes. Finding the right growth rate(s) is indeed the usual "hard part" of a DCF application.

20   The original approach to estimation of g relied on average historical growth rates in

21   observable variables, such as dividends or earnings, or on the "sustainable growth"

22   approach, which estimates g as the average book rate of return times the fraction of earnings

1   retained within the firm. But it is highly unlikely that historical averages over periods with

2   widely varying rates of inflation, interest rates and costs of capital, such as in the relatively

3   recent past, will equal current growth rate expectations. Moreover, the constant growth rate

4   DCF model *requires* that dividends and earnings grow at the same rate. It is inconsistent for

5   dividends to grow at a rate that differs from the growth in earnings because it would mean

6   that dividends are becoming an ever increasing or decreasing percentage of earnings.

7   Most cost of capital experts rely on earnings growth rates, not dividend growth rates,

8   for several reasons. First, although the model is derived from dividend growth rates, the

9   more fundamental parameter is earnings growth because dividends are paid from earnings.

10   Second, analyst forecasts of dividend growth rates are generally not available, but earnings

11   growth forecasts are. Third, a better approach than relying on historical information is to use

12   the growth rates currently expected by investment analysts, if an adequate sample of such

13   rates is available. Analysts' forecasts are superior to time series forecasts based upon single

14   variable historical data as has been documented and confirmed extensively in academic

15   research.[1]

16   If this approach is feasible and if the person estimating the cost of capital is able to

17   select the appropriate version of the DCF formula, the DCF method should yield a

18   reasonable estimate of the cost of capital for companies not in financial distress and without

19   material option-pricing effects (always subject to recent concerns about the applicability of

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[1]   Lawrence D. Brown and Michael S. Rozeff (1978), "The Superiority of Analysts 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 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.

1   the basic present value formula to stock prices). However, for the DCF approach to work,

2   the basic stable-growth assumption must become reasonable and the underlying stable-

3   growth rate must become determinable *within the period for which forecasts are available*.

4   **Q7**.   **What is the so called "optimism bias" in the earnings growth rate forecasts of security**

5   **analysts and what is its effect on the DCF analysis?**

6   A7.   Optimism bias is related to the observed tendency for analysts to forecast earnings growth

7   rates that are higher than are actually achieved. This tendency to over estimate growth rates

8   is perhaps related to incentives faced by analysts that provide rewards not strictly based upon

9   the accuracy of the forecasts. To the extent optimism bias is present in the analysts' earnings

10   forecasts, the cost of capital estimates from the DCF model would be too high.

11   **Q8**.   **Does optimism bias mean that the DCF estimates based upon analysts' earnings**

12   **forecasts are completely unreliable?**

13   A8.   No. The effect of optimism bias is least likely to affect DCF estimates for large, rate

14   regulated companies in stable segments of an industry. Furthermore, the magnitude of the

15   optimism bias (if any) for regulated companies is not clear. Chan, Karceski, and Lakonishok

16   (2000)[2] sort companies on the basis of the size of the *IBES* forecasts to test the level of

17   optimism bias. Utilities constitute 25 percent of the companies in lowest quintile, and by one

18   measure the level of optimism bias is 4.0 percent. However, the 4.0 percent figure does not

19   represent the complete characterization of the results in the paper. Table IX of the paper

20   shows that the median *IBES* forecast for the first (lowest) quintile averages 6.0 percent. The

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

1   realized "Income before Extraordinary Items" is 2.0 percent (implying a four percent upward

2   bias in *IBES* forecasts), but the "Portfolio Income before Extraordinary Items" is 8.0 percent

3   (implying a two percent downward bias in *IBES* forecasts).

4   The difference between the "Income before Extraordinary Items" and "Portfolio

5   Income before Extraordinary Items" is whether individual firms or a portfolio are used in

6   estimating the realized returns. The first is a simple average of all firms in the quintile while

7   the second is a market value weighted-average. Although both measures of bias have their

8   own drawbacks according to the authors,[3] the Portfolio Income measure gives more weight

9   to the larger firms in the quintile such as regulated utilities. In addition, the paper

10 demonstrates that "analysts' forecasts as well as investors' valuations reflect a wide-spread

11 belief in the investment community that many firms can achieve streaks of high growth in

12 earnings."[4] Therefore, it is not clear how severe the problem of optimism bias may be for

13 regulated utilities or even whether there is a problem at all.

14   Finally, the multi-stage DCF model also adjusts for any over optimistic (or

15 pessimistic) growth rate forecasts by substituting the long-term GDP growth rate for the 5-

16 year growth rate forecasts of the analysts in further out years.

17 **Q9**. **Please describe the multi-stage DCF model you use.**

18 A9. The multi-stage model I use is presented in equation (C-4) above and assumes that the long-

19 term perpetual growth rate for all companies in the two samples is the forecast long-term

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

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

1   growth rate of the GDP.[5] This model allows growth rates to differ across companies during

2   the first ten years before settling down to a single long-term growth rate. The growth rate

3   for the first five years is the long-term growth rate provided in analysts' reports. After year

4   five, the growth rate is assumed to converge linearly to the GDP growth rate. In other

5   words, the growth rate in year 6 is adjusted by 1/6th of the difference between each

6   company's 5-year growth rate forecast and the GDP forecast. The growth rates in years 7

7   to 10 are adjusted by an additional 1/6th so that the earning growth rate pattern converges

8   on the long-term GDP growth rate forecast.

9   **Q10.** **Why do you assume that the long-term growth rate of the sample companies will**

10   **converge to the long-term growth rate of GDP?**

11   A10. Recall that the DCF model assumes that dividends grow at a constant rate literally forever.

12   If the growth rate of earnings (and therefore, dividends) were greater than (less than) the

13   long-term growth rate of the economy, mathematically it would mean that the company (and

14   the industry) would become an ever increasing (or decreasing) proportion of the economy.

15   Therefore, the most logical assumption is that the company's earnings grow at the same rate

16   as the economy on average over the long run.

17   **Q11.** **How well are the conditions needed for DCF reliability met at present?**

18   A11. The requisite conditions for the sample companies are not fully met at this time. Of

19   particular concern for this proceeding is the uncertainty about what investors truly expect

20   the long-run outlook for the sample companies to be. The longest time period available for

---

5   See Blue Chip Economic Indicators, March 10, 2006.

1   growth rate forecasts of which I am aware is five years. The long-run growth rate (*i.e.*, the

2   growth rate after an industry settles into a steady state) drives the actual results one gets with

3   the DCF model. Unfortunately, this implies that unless the company or industry in question

4   is stable, so there is little doubt as to the growth rate investors expect, DCF results in practice

5   can end up being driven by the subjective judgment of the analyst who performs the work.

6   Uncertainty in an industry implies that a commission may often be faced with a wide

7   range of DCF numbers, none of which can be well grounded in objective data on true long-

8   run growth expectations, *because no such objective data now exist*. DCF for firms or

9   industries in flux is *inherently* subjective with regard to a parameter (the long-run growth

10   rate) that drives the answer one gets.

11   In short, the unavoidable questions about the DCF model's strong assumptions cause

12   me to view the DCF method as *inherently* less reliable than risk positioning approach

13   described above. However, because the DCF method has been widely used in the past and

14   in other forums when the industry's economic conditions were different from today's, I

15   submit DCF evidence in this case. DCF estimates also serve as a check on the values

16   provided by the risk positioning approach methods.

17   **B.   CONCLUSIONS ABOUT DCF**

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

19   A12.   The unavoidable questions about the DCF model's strong assumptions — whether the basic

20   present value formula works for stocks, whether option pricing effects are important for the

21   company, whether the right variant of the basic formula has been found, and whether the true

22   growth rate expectations have been identified — cause me to view the DCF method as less

1   reliable than the equity risk premium approach.

2   **II. EMPIRICAL DCF RESULTS**

3   **Q13**.   **How is this part of the appendix organized?**

4   A13.   This section presents the details of my DCF analyses, which are summarized in my direct

5   testimony. The first part describes some preliminary matters, such as differences from the

6   samples used in the risk positioning method, calculation of sample capital structures, etc.

7   Then it turns to the details of the DCF estimates themselves.

8   In particular, implementation of the simple DCF models described above requires an

9   estimate of the current price, the dividend, and near-term and long-run growth rate forecasts.

10   The simple DCF model relies only on a single growth rate forecast, while the multi-stage

11   DCF model employs both near-term and long-run growth rate forecasts. The remaining parts

12   of this section describe each of these inputs in turn.

13   **A.   PRELIMINARY MATTERS**

14   **Q14**.   **In the discussion of "preliminary matters" in *Appendix B* you discuss sample selection**

15   **and the capital structure/cost of capital data you need to complete your risk premium**

16   **analyses. What, if anything, is different when you use the DCF method?**

17   A14.   First, the sample companies to which the DCF approach is applied differ slightly for the

18   water utility sample due to the availability of earnings forecasts. Two companies in the water

19   utility sample, Connecticut Water Services and SJW Corp, do not currently have long-term

20   growth forecasts from *IBES* and are therefore excluded from the DCF analysis. In addition,

21   the timing of the market value capital structure calculations is different in the DCF method

1   and in the equity risk premium method. The equity risk premium method relies on the

2   average capital structure over the past five years while the DCF approach uses only current

3   data, so the relevant market value capital structure measure is the most recent that can be

4   calculated. This capital structure is reported in columns 1- 3 of Table No. BV-4 for the

5   water utility sample and Table No. BV-14 for the gas LDC sample.

6   **B.   GROWTH RATES**

7   **Q15**. **What growth rates do you use?**

8   A15. For reasons discussed above, historical growth rates today are useless as forecasts of current

9   investor expectations for the water industry or the gas LDC sample. I therefore use rates

10   forecasted by security analysts.

11   The ideal in a DCF application would be a detailed forecast of future dividends, year

12   by year well into the future, based on a large sample of investment analysts' expectations.

13   I know of no source of such data. Dividends are ultimately paid from earnings, however,

14   and earnings forecasts are available for a few years. Investors do not expect dividends to

15   grow in lockstep with earnings, but for companies for which the DCF approach can be used

16   reliably (*i.e.*, for relatively stable companies whose prices do not include the option-like

17   values described previously), they do expect dividends to track earnings over the long-run.

18   Thus, use of earnings growth rates as a proxy for expectations of dividend growth rates is

19   a common practice.

20   Accordingly, the first step in my DCF analysis is to examine a sample of investment

21   analysts' forecasted earnings growth rates from the Institutional Brokers Estimate System

22   ("*IBES*") and from *Value Line* for both samples. Neither *IBES* nor *Value Line* provide

1   analysts' forecast for all companies in the water utility sample. *IBES* provides a (recent)

2   long-term growth forecast for six of the eight companies in the water utility sample. *IBES*

3   does not provide recent long-term earnings growth rates forecasts for Connecticut Water

4   Services or SJW Corp. Also, the consensus forecast from *IBES* is based on one analyst's

5   forecast for Middlesex Water. Value Line does not provide a long-term growth forecast for

6   Middlesex Water Co. or York Water Co. Among the gas LDC companies, *IBES* does not

7   currently provide a long-term earnings forecast for Laclede Group Inc. and only one analyst

8   provides a long-term earnings forecast for Cascade Natural Gas. *Value Line* provide long-

9   term growth rates for all companies in the gas LDC sample. *IBES* and *Value Line* projected

10   earnings growth rates for the companies in the water utility and the gas LDC samples are in

11   Tables No. BV-5 and BV-15, respectively. The tables report *IBES* long-term growth

12   forecast in column one, the number of analysts providing *IBES* growth forecasts in column

13   two, *Value Line* growth forecasts are in column five, and column six combines *IBES* and

14   *Value Line* growth forecasts. The combined growth forecasts weight the *IBES* forecasts by

15   the number of analysts providing a forecasts and the *Value Line* forecast by one.[6]

16   In the simple DCF, I use the five-year average annual growth rate as the perpetual

17   growth rate.[7] In the multi-stage DCF model, I implement the combined *IBES* and *Value Line*

18   growth rates for the first five years while I rely on the long-term GDP growth as an estimate

19   of the perpetual earnings for the two samples.[8] I report the yearly growth rates for the multi-

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[6]   I treat the *Value Line* forecasts as though they overlap exactly with the forecasts from *IBES*. These growth
       rates underlie my simple and multi-stage DCF analyses.

[7]   This growth rate is in column 6 in Table No. B-5 for the water sample and in Table No. BV-15 for the gas
       LDC sample.

[8]   *Value Line* currently provides forcasts for the 2006 to 2010 and for the 2007 to 2011 horizon for the water
       utility and gas LDC sample, respectively. I treat the forecast as if it provides a five year forecast for both
       samples.

1   stage DCF model in Table No. BV-6, Panel B for the water sample and Table No. BV-16,

2   Panel B for the gas LDC sample.

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

4   A16.   No. While forecasted growth rates are the quantity required in principle, the forecasts need

5   to go far enough out into the future so that it is reasonable to believe that investors expect

6   a stable growth path afterwards. As can be seen in Table No. BV-5 for the water utility

7   sample and in Table No. BV-15 for the gas LDC sample, the growth rate forecasts vary

8   widely from company to company. For example, the *IBES* growth forecast for Southwest

9   Water is 7.3 percent while the *Value Line* growth forecast is 28.3 percent.[9] While the

10   differences between *IBES* and *Value Line* forecasts are lower for the gas LDC sample there

11   are still some variation.[10] Also, for some companies, the five-year growth rate forecasts are

12   significantly above or below the long-term GDP growth rate indicating lack of stability in

13   growth rates. Overall, the growth rates indicates that some companies and maybe the

14   industries have yet to reach a stable equilibrium which is required for the correct application

15   of the DCF method.

16   It is clear that much longer detailed growth rate forecasts than currently available

17   from *IBES* and *Value Line* would be needed to implement the DCF model in a completely

18   reliable way for these two samples at this time; however, the general stability of the 5-year

19   growth rate forecasts for the gas LDC sample indicates a higher degree of reliability than for

20   the water sample at this time. I submit DCF evidence in this case for both the water utility

21   sample and the gas LDC sample as a check on the equity risk premium approach estimates.

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[9]   See Table No. BV-5.

[10]   See Table No. BV-15.

1 **C.   DIVIDEND AND PRICE INPUTS**

2 **Q17**. **What values do you use for dividends and stock prices?**

3 A17. Dividend payments are for the 4th quarter of 2005 as reported by Compustat. This dividend

4 is grown at the estimated growth rate and divided by the price described below to estimate

5 the dividend yield for the simple and multi-stage DCF models.

6 Stock prices are the average of the closing stock prices for the 15 trading days ending

7 on the day the *IBES* forecasts were released. For both the water sample and the gas LDC

8 sample, the 15-days end on March 31, 2006. Using these dates insure that the information

9 in growth rates and stock prices are contemporaneous. I use a 15-day average as a

10 compromise. Using a longer period would be inconsistent with the principles that the DCF

11 model relies on the current stock price. The DCF approach assumes the stock price is the

12 present value of future expected dividends. Stock prices six months or a year ago reflect

13 expectations at that time, which are different from those that underlie the current *IBES* and

14 *Value Line* forecasts. At the same time, use of an average over a brief period as opposed to

15 a single day helps guard against a company's price on a particular day price being unduly

16 influenced by mistaken information, differences in trading frequency, and the like.

17 The closing stock price is used because it is at least as good as any other measure of

18 the day's outcome, and may be better for DCF purposes. In particular, if there were any

19 single price during the day that would affect investors' decisions to buy or sell a stock, I

20 would suspect that it would be each day's closing price, not the high or low during the day.

21 The daily price changes reported in the financial pages, for example, are from close to close,

22 not from high to high or from low to low.

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

2   **Q18**.   **What cost of equity estimates do these data yield?**

3   A18.   The cost of equity results for the simple and multi-stage DCF models are shown in Table No.

4   BV-6 for the water utility sample and in Table No. BV-16 for the gas LDC sample. Panel

5   A reports the results for the simple DCF method and Panel B reports the results for the multi-

6   stage DCF method using the long-term GDP growth rate as the perpetual growth rate.

7   **Q19**.   **What information is provided in Table No. BV-7 and Table No. BV-17?**

8   A19.   In these tables, the capital structure, cost of equity estimates, and cost of debt estimates are

9   combined to obtain the overall cost of capital for each sample company. The results are

10   presented in Table No. BV-7 for the water utility sample and in Table No. BV-17 for the gas

11   LDC sample. Panel A relies on the simple DCF cost of equity results, and Panel B relies on

12   the multi-stage DCF cost of equity results.

13   For both samples, I also report the average for the subsample of companies that have

14   a large percentage of revenue from regulated activities.[11]

15   **Q20**.   **What do the values in Table No. BV-8 and Table No. BV- 18 imply about the cost of**

16   **equity for the sample companies at Anthem's 40 percent equity ratio?**

17   A20.   The overall after-tax weighted-average cost of capital from both DCF methods are reported

18   in column one of Table No. BV-8 and Table No. BV-18. Column 6 of the tables reports the

19   cost of equity consistent with Anthem's requested 40 percent equity thicknesses and the

20   samples' average weighted-average cost of capital. The sample average ATWACCs are

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[11]   In the subsample, the 2005 revenues from regulated businesses is above 75 percent for both samples. (See
        Table No. BV-2 and Table No. BV-12.)

1   displayed in Table C-1 at the end of this appendix. The costs of equity at a 40 percent equity

2   ratio are displayed in Table 4 of my direct testimony.

3   The implications of these numbers are discussed in my direct testimony, along with

4   the findings of the equity risk premium approach.

Table C-1
Discounted Cash Flow After-Tax Weighted-Average Cost of Capital Estimates
Panel A: for All Companies
in the Water Utility and Gas LDC Samples

	Water Utility	**Gas LDC**
Simple DCF Method (Quarterly)	8.9%	7.5%
Multi-Stage DCF Using the Long-Term GDP Forecast as the Perpetual Rate	6.8%	7.4%

Source: Tables No. BV-8 and BV-18.

Table C-1
Discounted Cash Flow After-Tax Weighted-Average Cost of Capital Estimates
Panel B: for Companies with at least 75 Percent Regulated Revenue
in the Water Utility and Gas LDC Samples

	Water Utility	**Gas LDC**
Simple DCF Method (Quarterly)	9.1%	7.4%
Multi-Stage DCF Using the Long-Term GDP Forecast as the Perpetual Rate	6.9%	7.0%

Source: Tables No. BV-8 and BV-18.

APPENDIX D: EFFECT OF DEBT ON THE COST OF EQUITY

TABLE OF CONTENTS

1   **Q1**.   **What is the purpose of this appendix?**

2   A1.   In this appendix, I provide details on the effects of debt on the cost of equity. First, I

3   summarize a fairly large body of financial research on capital structure. Second, I elaborate

4   on the example used in the main testimony.

5   **I. AN OVERVIEW OF THE ECONOMIC LITERATURE**

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

7   A2.   The economic literature focuses on the effects of debt on the value of a firm. The standard

8   way to recognize one of these effects, the impact of the fact that interest expense is tax-

9   deductible, is to discount the all-equity after-tax operating cash flows generated by a firm

10   or an investment project at a weighted average cost of capital, typically known in textbooks

11   as the "WACC." The textbook WACC equals the *market*-value weighted average of the cost

12   of equity and the *after-tax*, *current* cost of debt. However, rate regulation in North America

13   has a legacy of working with another weighted-average cost of capital, the *book*-value

14   weighted average of the cost of equity and the *before-tax*, *embedded* cost of debt. To

15   distinguish the concepts, I refer to the after-tax weighted-average cost of capital as

16   ATWACC.

17   **Q3**.   **How is this section of the appendix organized?**

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

1   **A.   TAX EFFECTS**

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

3   A4.   Three seminal papers are vital for this literature. The first assumes no taxes and risk-free

4   debt. The second adds corporate income taxes. The third adds personal income taxes.

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

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

7   A5.   The "base case," no taxes and no costs to excessive debt, was worked out in a classic 1958

8   paper by Franco Modigliani and Merton Miller, two economists who eventually won Nobel

9   Prizes in part for their body of work on the effects of debt.[1] Their 1958 paper made what is

10   in retrospect a very simple point: if there are no taxes and no risk to the use of excessive

11   debt, use of debt will have no effect on a company's operating cash flows (i.e., the cash

12   flows to investors as a group, debt plus equity combined). If the operating cash flows are

13   the same regardless of whether the company finances mostly with debt or mostly with

14   equity, then the value of the firm cannot be affected at all by the debt ratio. In cost of capital

15   terms, this means the overall cost of capital is constant regardless of the debt ratio, too.

16   In the base case, issuing debt merely divides the cash flows into two pools, one for

17   bondholders and one for shareholders. If the divided pools have different priorities in claims

18   on the cash flows, the risks and costs of capital will differ for each pool. But the risk and

---

[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.

1   overall cost of capital of the entire firm, the sum of the two pools, is constant regardless of

2   the debt ratio. Thus,

3    $$r^*_1 = r_{A1} \qquad\qquad \text{(D-1a)}$$

4   where r^*_1 is the overall after-tax cost of capital at any particular capital structure and r_{A1} is

5   the all-equity cost of capital for the firm. (The "1" subscripts distinguish the case where

6   there are no taxes from subsequent equations that consider first corporate and then both

7   corporate and personal taxes.) With no taxes and no risk to debt, the overall cost of capital

8   does not change with capital structure.

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

10   is

11    $$r_{E1} \times (E/V) + r_D \times (D/V) = r^*_1 \qquad\qquad \text{(D-1b)}$$

12   with the overall cost of capital ®*) on the *right* side, as the *independent* variable, and the

13   costs of equity (r_E) and debt (r_D) on the left side, as *dependent* variables determined by the

14   overall cost of capital and by the capital structure (i.e., the shares of equity (E) and debt (D)

15   in overall firm value)[2] that the firm happens to choose. Note that if equation (D-1a) were

16   correct, the equation that solved it for the cost of equity would be,

17    $$r_{E1} = r^*_1 + (r^*_1 - r_D) \times (D/E) \qquad\qquad \text{(D-1c)}$$

---

[2]   For simplicity, I assume, the firm has only debt and equity, so $V = E + D$.

1   Note also that (D/E) gets exponentially higher in this equation as the debt-to-value

2   ratio increases.[3] I.e., the cost of equity increases exponentially with leverage.

3   **2.   Corporate Tax Deduction for Interest Expense**

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

5   A6.   If corporate taxes exist with risk-free debt (and if only taxes at the corporate level matter,

6   not taxes at the level of the investor's personal tax return), the initial conclusion changes.

7   Debt at the corporate level reduces the company's tax liability by an amount equal to the

8   marginal tax rate times interest expense. All else equal, this will add value to the company

9   because more of the operating cash flows will end up in the hands of investors as a group.

10   That is, if only corporate taxes mattered, interest would add cash to the firm equal to the

11   corporate tax rate times the interest expense. This increase in cash would increase the value

12   of the firm, all else equal. In cost of capital terms, it would reduce the overall cost of capital.

13   *How much* the value of the firm would rise and *how far* the overall cost of capital

14   would fall would depend in part on how often the company adjusts its capital structure, but

15   this is a second-order effect in practice. (The biggest effect would be if companies could

16   issue riskless perpetual debt, an assumption Profs. Modigliani and Miller explored in 1963,

---

[3]   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 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.

1   in the second seminal paper;[4] this assumption could *not* be true for a real company.) Prof.

2   Robert A. Taggart provides a unified treatment of the main papers in this literature and

3   shows how various cases relate to one another.[5] Perhaps the most useful set of benchmark

4   equations for the case where only corporate taxes matter are:

5   $$r^*_2 = r_{A2} - r_D \times t_C \times (D/V) \tag{D-2a}$$

6   $$r_{E2} \times (E/V) + r_D \times (D/V) \times (1 - t_C) = r^*_2 \tag{D-2b}$$

7   which imply for the cost of equity,

8   $$r_{E2} = r_{A2} + (r_{A2} - r_D) \times (D/E) \tag{D-2c}$$

9   where the variables have the same meaning as before but the "2" subscripts indicate the case

10 that considers corporate but not personal taxes.

11   Note that Equation (D-2a) implies that when only corporate taxes matter, the overall

12 after-tax cost of capital declines steadily as more debt is added, until it reaches a minimum

13 at 100 percent debt (i.e., when $D/V = 1.0$). Note also that Equation (D-2c) still implies an

14 exponentially increasing cost of equity as more and more debt is added. In fact, except for

15 the subscript, Equation (D-2c) looks just like Equation (D-1c).

16   However, whether any value is added and whether the cost of capital changes at all

17 also depends on the effect of taxes at the personal level.

---

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

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

1   **3.   Personal Tax Burden on Interest Expense**

2   **Q7**.   **How do personal taxes affect the results?**

3   A7.   Ultimately, the purpose of investment is to provide income for consumption, so personal

4   taxes affect investment returns. For example, in the U.S., municipal bonds have lower

5   interest rates than corporate bonds with a similar rating because their income is taxed less

6   heavily at the personal level. In general, capital appreciation on common stocks is taxed less

7   heavily than interest on corporate bonds because (1) taxes on unrealized capital gains are

8   deferred until the gains are realized, and (2) the capital gains tax rate is lower. Dividends

9   are taxed less heavily than interest, also, under current tax law.[6] The effects of personal

10   taxes on the cost of common equity are hard to measure, however, because common equity

11   is so risky.

12   Professor Miller, in his Presidential Address to the American Finance Association,[7]

13   explored the issue of how personal taxes affect the overall cost of capital. The paper pointed

14   out that personal tax effects could offset the effect of corporate taxes entirely.

15 **Q8**.   **Is it likely that the effect of personal taxes will completely neutralize the effect of**

16   **corporate taxes?**

---

[6]   This provision was recently extended to 2010.

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

1   A8.   I do not believe so, although the likelihood of such a result would be increased if the current

2   federal tax reductions on dividends and capital gains became permanent rather than expiring

3   in 2010. However, personal taxes are important even if they do not make the corporate tax

4   advantage on interest vanish entirely. Capital gains and dividend tax advantages definitely

5   convey some personal tax advantage to equity, and even a partial personal advantage to

6   equity reduces the corporate advantage to debt.

7   The Taggart paper explores the case of a partial offset, also. With personal taxes, the

8   risk-free rate on the security market line is the after-personal-tax rate, which must be equal

9   for risk-free debt and risk-free equity.[8] Therefore, the pre-personal-tax risk-free rate for

10   equity will generally not be equal to the pre-personal-tax risk-free rate for debt. In

11   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

12   and t_E and t_D are the personal tax rates for equity and debt, respectively. In terms of the cost

13   of debt, the Taggart paper's results imply that a formal statement of these effects can be

14   written as:[9]

---

[8]   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.

[9]   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 (D-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.

1 $$r^*_3 = r_{A3} - r_D \times t_N \times (D/V) \tag{D-3a}$$

2 $$r_{E3} \times (E/V) + r_D \times (D/V) \times (1 - t_C) = r^*_3 \tag{D-3b}$$

3 which imply

4 $$r_{E3} = r_{A3} + \{r_{A3} - r_D \times [(1 - t_D)/(1 - t_E)]\} \times (D/E) \tag{D-3c}$$

5 Suppose, for example, that $t_C = 0.35$ percent, $t_E = 7.7$ percent and $t_D = 40$ percent. Then

6 $[(1 - t_D)/(1 - t_E)] = 0.65 = (1 - t_C)$. That condition corresponds to Miller's 1977 paper, in which

7 the net personal tax advantage of equity fully offsets the net corporate tax advantage of debt.

8 Note also that in that case, $t_N = 0$.[10] Therefore, if the personal tax advantage on equity fully

9 offsets the corporate tax advantage on debt, Equation (D-3a) confirms that the overall after-

10 tax cost of capital is a constant.

11 However, it is unlikely that the personal tax advantage of equity fully offsets the

12 corporate tax advantage of debt. If taxes were all that mattered (i.e., if there were no other

13 costs to debt), the overall after-corporate-tax cost of capital would still fall as debt was

14 added, just not as fast.

15 Finally, note that the overall after-tax cost of capital, Equation (D-3b), still uses the

16 corporate tax rate even when personal taxes matter. Equations (D-2b) and (D-3b) both

17 correspond to the usual formula for the ATWACC. Personal taxes affect the way the cost

18 of equity changes with capital structure -- Equation (D-3c) -- but not the formula for the

19 overall after-tax cost of capital given that cost of equity.

---

[10] In the above example, $t_N = \{[0.35 + 0.077 - 0.4 - (0.35 \times 0.077)] / (1.0 - 0.077)\} = 0.0/0.923 = 0$.

1   **B.   NON-TAX EFFECTS**

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

3   A9.   If debt is truly valuable, firms should use as much as possible, and competition should drive

4   firms in a particular industry to the same, optimal capital structure for the industry. If debt

5   is harmful on balance, firms should avoid it. Neither picture corresponds to what we actually

6   see. A large economic literature has evolved to try to explain why.

7   Part of the answer clearly are the costs of excessive debt. Here the results cannot be

8   reduced to equations, but they are no less real for that fact. As companies add too much

9   debt, the costs come to outweigh the benefits. Too much debt reduces or eliminates financial

10   flexibility, which cuts the firm's ability to take advantage of unexpected opportunities or

11   weather unexpected difficulty. Use of debt rather than internal financing may be taken as

12   a negative signal by the market.

13   Even if the company is generally healthy, more debt increases the risk that the

14   company cannot use all of the interest tax shields in a bad year. As debt continues to grow,

15   this problem grows and others may crop up. Management begins to worry about meeting

16   debt payments instead of making good operating decisions. Suppliers are less willing to

17   extend trade credit, and a liquidity shortage can translate into lower operating profits.

18   Ultimately, the firm might have to go through the costs of bankruptcy and reorganization.

19   Collectively, such factors are known as the costs of "financial distress."[11]

---

[11]   In addition to legal and administrative costs of financial distress, firms in financial distress incur indirect
    costs as management divert attention away from the firm's main business, conflicts arise between
(continued...)

1   The net tax advantage to debt, if positive, is affected by costs such as a growing risk

2   that the firm might have to bear the costs of financial distress. First, the expected present

3   value of these costs offsets the value added by the interest tax shield. Second, since the

4   likelihood of financial distress is greater in bad times when other investments also do poorly,

5   the possibility of financial distress will increase the risks investors bear. These effects

6   increase the variability of the value of the firm. Thus, firms that use too much debt can end

7   up with a higher overall cost of capital than those that use none.

8   Other parts of the answer include the signals companies send to investors by the

9   decision to issue new securities, and by the type of securities they issue. Other threads of

10   the literature explore cases where management acts against shareholder interests, or where

11   management attempts to "time" the market by issuing specific securities under different

12   conditions. For present purposes, the important point is that no theory, whether based on

13   taxes or on some completely different issue, has emerged as "the" explanation for capital

14   structure decisions by firms. Nonetheless, despite the lack of a single "best" theory, there

15   is a great deal of relevant empirical research.

16   **Q10**.   **What does that research show?**

17   A10.   The research does not support the view that debt makes a material difference in the value of

18   the firm, at least not once a modest amount of debt is in place. If debt were truly valuable,

---

[11] (...continued)
     shareholders and creditors, suppliers and others restrict their dealings with the company, etc.

1   competitive firms should use as much as possible without producing financial distress, and

2   competitive firms that use less debt ought to be less profitable. The research shows exactly

3   the opposite.

4   For example, Kester[12] found that firms in the same industry in both the U.S. and

5   Japan do not band around a single, "optimal" capital structure, and the most profitable firms

6   are the ones that use the *least* debt. This finding comes despite the fact that both countries

7   at the time (unlike the U.S. currently) had fully "classical" tax systems, in which dividends

8   are taxed fully at both the corporate and personal level. Wald[13] confirms that high

9   profitability implies low debt ratios in France, Germany, Japan, the U.K., and the U.S.

10   Booth *et al.* find the same result for a sample of developing nations.[14] Fama and French[15]

11   analyze over 2000 firms for 28 years (1965-1992, inclusive) and conclude, "Our tests thus

12   produce no indication that debt has net tax benefits."[16] A recent paper by Graham[17] carefully

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

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

[14] 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 ..."

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

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

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

1   analyzes the factors that might have led a firm not to take advantage of debt. It confirms that

2   a large proportion of firms that ought to benefit substantially from use of additional debt,

3   including large, profitable, liquid firms, appear not to use it "enough."

4   This research leaves us with only three options: either (1) apparently good, profit-

5   generating managers are making major mistakes or deliberately acting against shareholder

6   interests, (2) the benefits of the tax deduction on debt are less than they appear, or (3) the

7   non-tax costs to use of debt offset the potential tax benefits. Only the first of these

8   possibilities is consistent with the view that the tax deductibility of debt conveys a material

9   cost advantage. Moreover, if the first explanation were interpreted to mean that otherwise

10   good managers are acting against shareholder interests, either deliberately or by mistake, it

11   would require the additional assumption that their competitors (and potential acquirers) let

12   them get away with it.

13   **Q11.** **Are there any explanations in the financial literature for this puzzle other than stupid**

14   **or self-serving managers at the most profitable firms?**

15   A11. Yes. For example, Stewart C. Myers, a leading expert on capital structure, made it the topic

16   of his Presidential Address to the American Finance Association.[18] The poor performance

17   of tax-based explanations for capital structure led him to propose an entirely different

18   mechanism, the "pecking order" hypothesis. This hypothesis holds that the net tax benefits

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[18] 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 and Investment Decisions When Firms Have
Information Investors Do Not Have," *Journal of Financial Economics* 13:187-222.

1   of debt (i.e., corporate tax advantage over personal tax disadvantage) are at most of a second

2   order of importance relative to other factors that drive actual debt decisions.[19] Similarly,

3   Baker and Wurgler (2002)[20] observe a strong and persistent impact that fluctuations in

4   market value have on capital structure. They argue that this impact is not consistent with

5   other theories. The authors suggest a new capital structure theory based on market timing --

6   capital structure is the cumulative outcome of attempts to time the equity market.[21] In this

7   theory, there is no optimal capital structure, so market timing financing decisions just

8   accumulate over time into the capital structure outcome. (Of course, this theory only makes

9   sense if investors do not recognize what managers are doing.)

10   **Q12.** **Do inter-firm differences within an industry explain the wide variations in capital**

11   **structure across the firms in an industry?**

12   A12. No. This view is contradicted by the empirical research. As mentioned before, it has long

13   been found that the most profitable firms in an industry, i.e., those in the best position to take

14   advantage of debt, use the least.[22] Graham (2000) carefully examines differences in firm

15   characteristics as possible explanations for why firms use "too little" debt and concludes that

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[19]   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.

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

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

[22]   For example, Kestler, *op. cit.* and Wald, *op. cit.*

1   such differences are *not* the explanation: firms that ought to benefit substantially from more

2   debt by all measurable criteria, if the net tax advantage of debt is truly valuable, voluntarily

3   do not use it.[23]

4   Nor does the research support the view that firms are constantly trying to adjust their

5   capital structures to optimal levels. Additional research on the pecking order hypothesis

6   demonstrates that firms do not tend towards a target capital structure, or at least do not do

7   so with any regularity, and that past studies that seemed to show the contrary actually lacked

8   the power to distinguish whether the hypothesis was true or not.[24] In the words of the

9   Shyam-Sunder - Myers paper p. 242, "If our sample companies did have well-defined

10   optimal debt ratios, it seems that their managers were not much interested in getting there."

---

[23]   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? Optimal Dynamic Capital Structure from Shareholder and Manager Perspectives," Working Paper, December 27, 2003 (forthcoming in the *Journal of Financial and Quantitative Analysis*), 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 the traditional static analysis (of the sort used by Graham).

[24]   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.

1   **II. EXPANDED EXAMPLE**

2   **Q13**. **What topics do you cover in this section?**

3   A13.   The discussion in my testimony did not detail the impact of different starting points for the

4   level of debt not did it address income earned on the investment, interest expense, or taxes.

5   This section covers these topics. First, it discusses how the level of debt affects the cost of

6   equity detail. Second, it discusses the effect of earning and income on the investment and

7   interest expenses. Third, it addresses tax effects.

8

9   **A.   DETAILS OF DIFFERENT LEVELS OF DEBT**

10 **Q14**. **What happens if the investor finances the real estate purchase with 0 percent, 30**

11   **percent, 50 percent or 70 percent debt?**

12 A14.   Table D-1 below calculates the return on equity at each level of debt when real estate prices

13   increases by 10 percent.

Table D-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 rate of return to bear more risk and debt magnifies equity's risk at an ever increasing rate. Therefore, the required 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.

1   **B.**   **THE IMPACT OF INCOME AND INTEREST**

2   **Q15**.   **How does earning income from the investment and paying interest on debt affect the**

3   **results?**

4   A15.   In the following, I ignore income taxes which I deal with in Section C. Assume the investor

5   is receiving income, e.g., rent, from the real estate. Specifically, assume the investor

6   receives $500 per month in income after all non-interest expenses ($6,000 per year). Also,

7   assume that the expected appreciation is 5 percent per year, so the expected market value is

8          $105,000 after one year. Then the expected rate of return from the real estate with all equity

9   financing is:

$$\begin{array}{ccc} \text{Expected Return} \\ \text{on Equity} & = & \dfrac{\text{Expected Net Income} + \text{Expected Appreciation}}{\text{Initial Investment}} \\ \text{@ 0\% Debt} \end{array}$$

$$= \quad \frac{\$6,000 + (\$105,000 - \$100,000)}{\$100,000} \quad = \quad 11\%$$

17   Now suppose that the mortgage interest rate were 5 percent. Then at a mortgage equal to 50

18   percent, or $50,000, interest expense would be ($50,000 x 0.05), or $2,500. The expected

19   equity rate of return would be

1 | Expected Return | | Expected (Net Income + Appreciation) - Interest Expense
2 | on Equity $=$ | --
3 | @ 50% Debt | | Initial *Equity* Investment

$$\begin{aligned}4 \quad\quad\quad &= \frac{\$6,000 + \$5,000 - \$2,500}{\$50,000} = 17\%\\6\end{aligned}$$

7   The expected return on equity is higher as is the risk carried by equity.

8   **Q16.** **Can you provide a more general illustration?**

9   A16. Yes. Figure D-1 uses these assumptions at different mortgage levels to plot both (i) the

10   expected rate of return on the equity in the real estate, and (ii) the realized rate of return on

11   that equity in a year if the real estate value increases by 10 percent more than the expected

12   5 percent rate (i.e., if the value increases by 15 percent) or by 10 percent less than expected

13   (i.e., if it decreases by 5 percent).[25]

---

[25] 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.

Expected Return on Investor's Equity in the Real Estate Increases as Mortgage Proportion Changes, But So Does the Risk
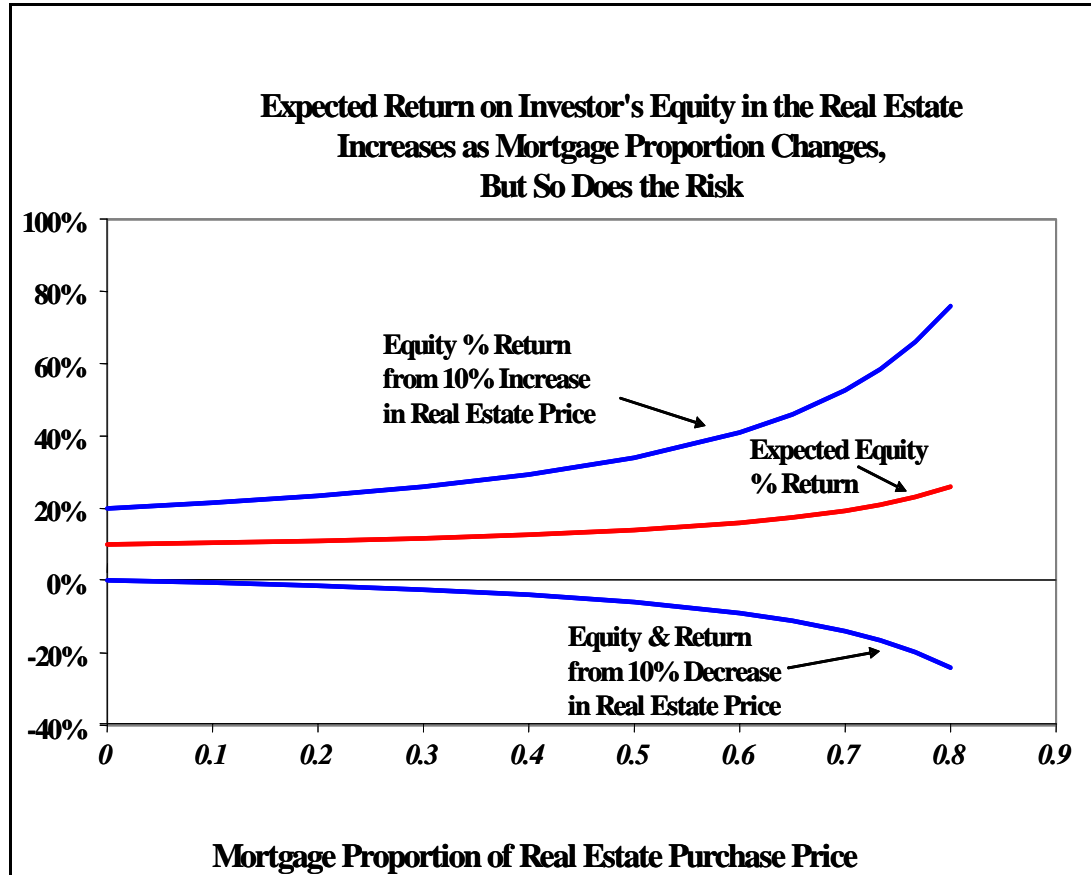
Figure D-1

1

2   The expected rate of return on equity increases at an increasing rate as the investor finances

3   more and more of the real estate through loans (e.g., with a mortgage). Since equity bear all

4   the risk of increases or decreases in real estate values (absent financial distress or

5   bankruptcy), the amount of risk the buyer bears grows at an ever increasing rate at the

6   mortgage percentage increases, too.

1   **Q17.** **What are the implications of this example?**

2   A17.   Any time an individual or a company uses debt to finance part an investment, the same risk

3   magnifies. For example, if an investor buy stocks "on margin" -- by borrowing part of the

4   money used to buy the stock -- the expected rate of return will be higher as will the risks the

5   investor carries. As an everyday example, imagine investing your retirement savings in a

6   stock portfolio bought with as much margin as possible. If you were lucky, you could end

7   up living very well in retirement. But you would be taking a lot of risk of the opposite

8   outcome, since your portfolio could decline by more than 100 percent of your initial

9   investment.

10   The same risk-magnifying effects happen when companies borrow to finance part of

11   their investments.

12   **C.   THE EFFECT OF TAXES**

13   **Q18.** **What is the impact of taxes?**

14   A18.   Analyzing the net effect of taxes in capital structure decisions by corporations is an

15   important part of the financial research. (Other parts of that research address such issues as

16   the risk of financial distress or bankruptcy, and the signals corporations send investors by

17   the choice of how to finance new investments.) The bottom line is that taxes complicate the

18   picture without changing the basic conclusion.

19   **Q19.** **Please describe the potential impact of taxes.**

1 A19. Interest expense is tax-deductible for corporations. That increases the pool of cash the

2   corporation gets to keep out of its operating earnings (i.e., its earnings before interest

3   expense). With no debt, 100 percent of operating income is subject to taxes. With debt, only

4   the equity part of the operating income is subject to taxes.

5   All else equal, the extra money kept from operating income increases the value of the

6   corporation. The standard way to recognize that increase in value is to use an after-tax

7   weighted-average cost of capital as a discount rate when valuing a company's operating cash

8   flows.

9 **Q20**. **Do personal taxes affect the value of debt, too?**

10 A20. Yes, but in the other direction. One offset to debt's tax benefits at the corporate level is its

11   higher tax burden at the personal level. Investors care about the money they get to keep after

12   all taxes are paid, and while the corporation saves taxes by opting for debt over equity,

13   individuals pay more taxes on interest than on capital gains from equity (and for now, on

14   dividends as well).

15 **Q21**. **Are there factors other than taxes matter?**

16 A21. Absolutely. "All else" does not remain equal as more debt is added. The more debt, the

17   more the non-tax effects of debt offset the tax benefits. Other costs include such effects as

18   a loss of flexibility, the possibility of sending negative signals to investors, and a host of

19   costs and risks associated with the danger of financial distress.

1   **Q22**. **Does the tradeoff between the tax and non-tax effects of debt mean that firms have**

2   **well-defined, optimal capital structures?**

3   A22. No, this sort of "tradeoff" model does not explain actual corporate behavior. A substantial

4   body of economic research confirms that real-world corporations act as if, after a moderate

5   amount of debt is in place, the tax benefits of debt are not worth debt's other costs. In

6   country after country and in industry after industry, the most profitable corporations in an

7   industry tend to use the least debt. The research on this point is quite thorough, and the

8   finding that the most profitable companies tend to use the least debt in a given industry is

9   robust. Yet these are the companies with the most operating income to shield from taxes,

10   who would benefit most if interest tax shields were truly valuable net of debt's other costs.

11   They also presumptively are the best-managed on average (else why are they the most

12   profitable?).

13   This means it is unrealistic to suppose that more debt is always better, or that greater

14   tax savings due to higher interest expense always add value to the firm on balance.

15   **Q23**. **If the tradeoff model doesn't explain capital structure decisions by firms, is there a**

16   **model that does?**

17   A23. No single model as (yet) emerged as 'the" explanation of capital structure. However, several

18   alternative models attempt to model the tradeoff (e.g., the "pecking order" hypothesis and

19   "agency cost" explanations).

1   **Q24.** **What does the absence of an agreed theory of capital structure in the financial**

2   **literature imply about the overall effect of debt on the value of the firm?**

3   A24.   The findings of the financial literature mean that within an industry, there is no well-defined

4   optimal capital structure. The use of some debt does convey some value advantage in most

5   industries, but that advantage is offset by other costs as firms add more debt.[26] The range

6   of capital structures over which the value of the firm in any industry is maximized is wide

7   and should be treated as flat. The location and level of that range, however, does vary from

8   industry to industry, just as the overall cost of capital varies from industry to industry.

9   Figure D-2 illustrates the picture that emerges from the research. This figure shows

10   the present value of an investment in each of four different industries. For simplicity, the

11   investment is expected to yield $1.00 per year forever. For firms in relatively high-risk

12   industries (Industry 1 in the graph, the lowest line), the $1.00 perpetuity is not worth much

13   and any use of debt decreases firm value. For firms in relatively low-risk industries

14   (Industry 4 in the graph), the perpetuity is worth more and substantial amounts of debt make

15   sense. Industries 2 and 3 are intermediate cases.

---

[26] 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.

1   The maximum net rate at which taxes can increase value in this figure equals 20

2   percent of interest expense, representing a balance between the corporate tax advantage to

3   debt and the personal tax disadvantage. The figure plots the maximum possible impact of

4   taxes on value as a separate line, starting at the all-equity value of the lowest-risk industry
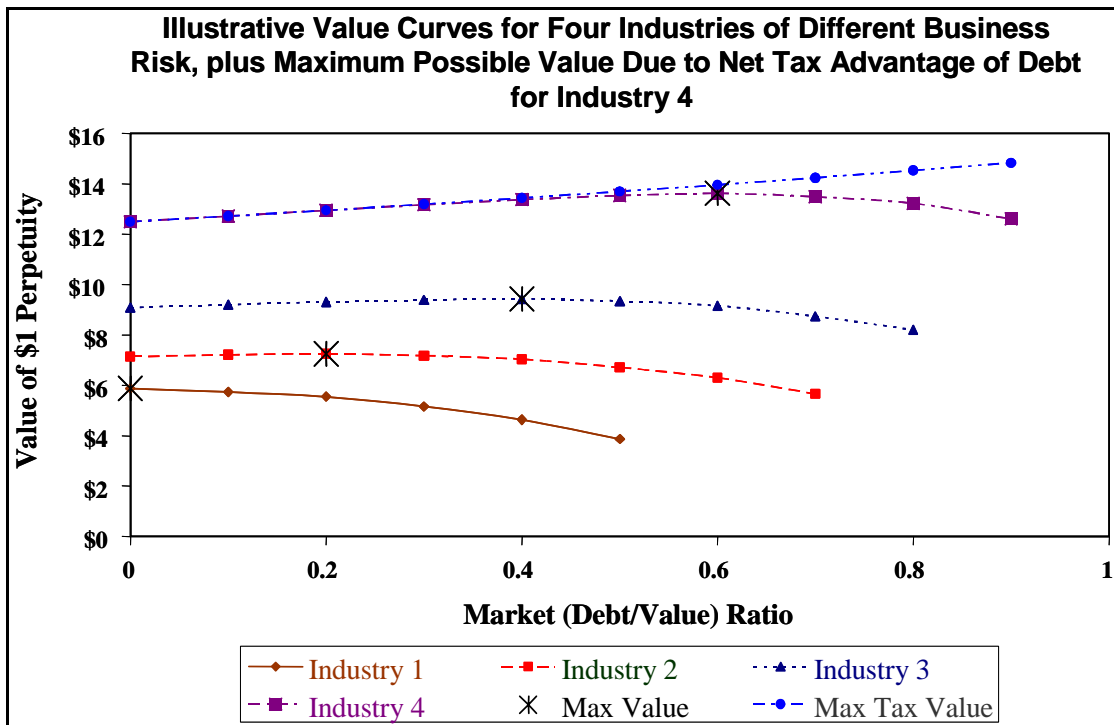
5   (Industry 4).

Figure D-2

6   Figure D-2 identifies a particular point as the maximum value on each of the four

7   curves. However, the research shows that reliable identification of this maximum point,

8   except in the extreme case where no debt should be used, is impossible. In accord with the

9   research, the graph is prepared so that in none of the industries does a change in capital

1   structure make much difference near the top of the curve. Even Industry 4, which increases

2   in value at the maximum rate as quite a lot of debt is added, eventually must reach a broad

3   range where changes in the debt ratio make little difference to firm value, given the research.

4   For Industry 4, debt makes less than a 2 percent difference in the total value of the firm for

5   debt-to-value ratios between 40 and 70 percent. (While these particular values are

6   illustrative, numbers of this order of magnitude are the only ones consistent with the

7   research.)

8   **Q25**. **What does this imply for the overall cost of capital?**

9   A25. Figure D-3 plots the after-tax weighted-average costs of capital ("ATWACCs") that

10   correspond to the value curves in Figure D-2. This picture just turns Figure D-2 upside

11   down.[27] All the same conclusions remain, except that they are stated in terms of the overall

12   cost of capital instead of the overall firm value. In particular, except for high-risk industries,

13   the overall cost of capital is essentially flat across a broad middle range of capital structures

14   for each industry, which is the only outcome consistent with the research. For Industry 4,

15   for example, the ATWACC changes by less than 15 basis points for debt-to-value ratios

16   between 40 and 70 percent.

---

[27] Note that the actual estimated ATWACC at higher debt ratios will tend to underestimate the ATWACC
that corresponds to the value curves in Figure D-2, which are depicted in Figure D-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
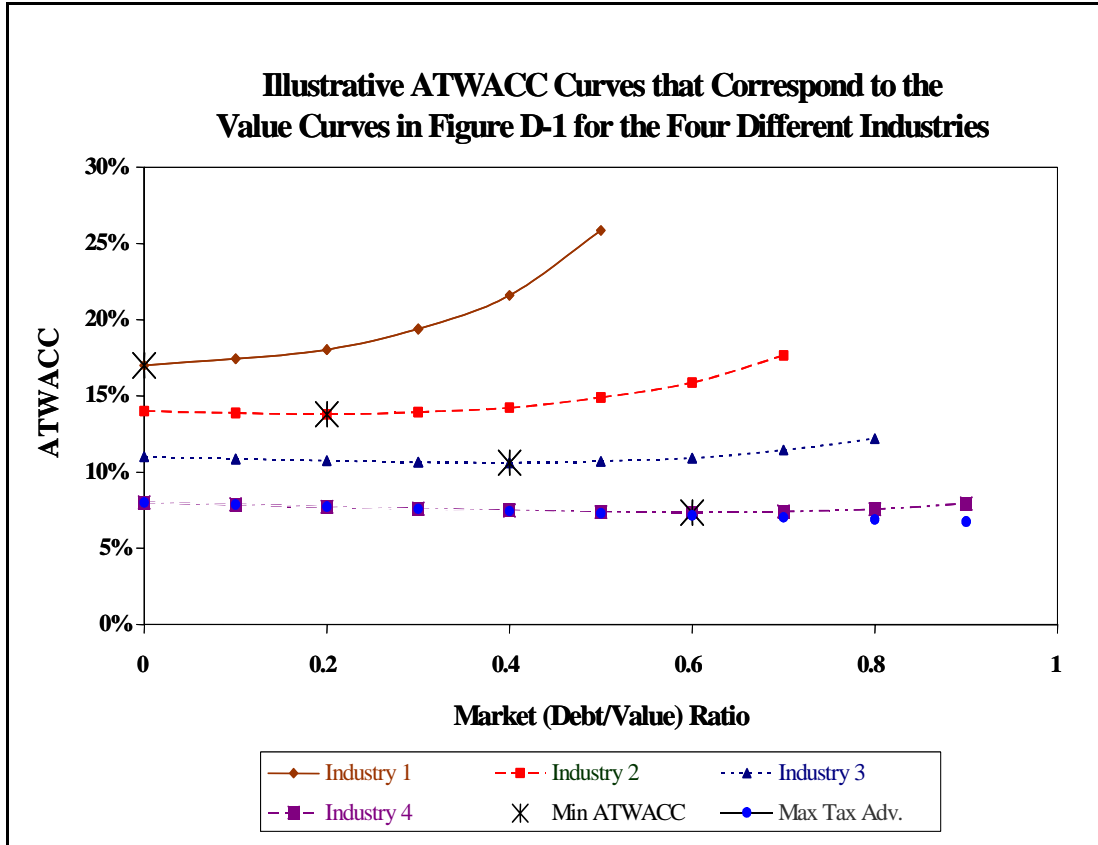measurement.

**Illustrative ATWACC Curves that Correspond to the
Value Curves in Figure D-1 for the Four Different Industries**

Figure D-3

1 **Q26**. **How does this discussion relate to estimation of the right cost of equity for ratemaking**

2 **purposes?**

3 A26. When an analyst estimates the cost of equity for a sample of companies, s/he does so at the

4 sample's actual market-value capital structure. That is, the sample evidence corresponds to

5 ATWACCs that are already out somewhere in the broad middle range in which changes in

6 the debt ratio have little or no impact on the overall value of the firm or the ATWACC.

1   An analyst therefore should assume the ATWACCs for the sample companies are

2   literally flat. This assumption always provides the exact tradeoff between the cost of equity

3   and capital structure at the literal minimum of the company's ATWACC curve. The

4   research shows that this minimum is actually a broad, flat region, as depicted above. If the

5   company happens to be somewhat to one side or the other of the literal minimum within this

6   region, the recommended procedure may lead to a small understatement or overstatement

7   of the amount that the cost of equity will change as capital structure changes. The degree

8   of this under- or overstatement, however, is very small compared to the inherent uncertainty

9   in estimating the cost of equity in the first place. Otherwise, the financial research would

10   have found very different results about the existence of a narrowly defined optimal capital

11   structure.

12   **D.   COMBINED EFFECTS**

13   **Q27**. **Please summarize the implications for the combined impact of the tax and non-tax**

14   **effects of debt.**

15   A27.   The most profitable firms do not behave as if the precise amount of debt they use makes any

16   material difference to value, and competition does not force them into an alternative

17   decision, as it would if debt were genuinely valuable. The explanation that fits the facts and

18   the research is that within an industry, there is no well-defined optimal capital structure. Use

19   of some debt does convey an advantage in most industries, but that advantage is offset by

20   other costs as firms add more debt. The range of capital structures over which the value of

1   the firm in any industry is maximized is wide and should be treated as flat. The location and

2   level of that range, however, does vary from industry to industry, just as the overall cost of

3   capital varies from industry to industry. To conclude that more debt does add more value,

4   once the firm is somewhere in the normal range for the industry, is to conclude that corporate

5   management in general is either blind to an easy source of value or otherwise incompetent

6   (and that their competitors let them get away with it).

7   The finding that there is no narrowly defined optimal capital structure implies that

8   analysts should estimate the ATWACCs for a sample of companies in a given industry and

9   treat the average ATWACC value as independent of capital structure (at least within a broad

10   middle range of capital structures). The right cost of equity for a rate-regulated company in

11   the same industry is the number that yields the same ATWACC at the capital structure used

12   to set the revenue requirement, since that is the cost of equity that (estimation problems

13   aside) the sample companies would have had if their market-value capital structures had

14   been equal to the regulatory capital structure.