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Addendum StartPage: 0

APPLICATION OF CENTERPOINT	§	BEFORE THE STATE OFFICE
ENERGY HOUSTON ELECTRIC, LLC	§	OF
FOR AUTHORITY TO CHANGE RATES	§	ADMINISTRATIVE HEARINGS

OFFICE OF PUBLIC UTILITY COUNSEL'S RESPONSE TO CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC'S THIRD REQUEST FOR INFORMATION

The Office of Public Utility Counsel ("OPUC") submits this response to CenterPoint Energy Houston Electric, LLC's ("CenterPoint Houston") Third Request for Information that was received on June 10, 2019. Pursuant to State Office of Administrative Hearings Order No. 2, OPUC's response is timely filed within four calendar days of receipt of CenterPoint Houston's discovery request. OPUC stipulates that all parties may treat this response as if it were filed under oath.

Dated: June 14, 2019

<div style="text-align:right">

Respectfully submitted,

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3-1.   Please refer to the Direct Testimony of Anjuli Winker. If not provided as part of Ms. Winker's workpapers, please produce the documents cited in the following footnotes:

a.   1
b.   7
c.   9
d.   10
e.   11
f.   12
g.   13
h.   15
i.   16
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n.   62

RESPONSE:

For the document responsive to subpart b, please see Attachment CEHE-OPUC 3-1b.

For the document responsive to subpart c, please see the Direct Testimony of Anjuli Winker at footnote 9, which includes a hyperlink to the referenced document.

For all other responsive documents, please see the Workpapers to the Direct Testimony of Anjuli Winker.

Prepared By: Anjuli Winker
Sponsored By: Anjuli Winker

Attachment 3-1b

fluctuate (inversely) with market interest rates.[1.15] However, certain forms of preferred stock (e.g., convertible preferred) have features that resemble common equity. Preferred equity is generally *less* risky than common equity, but *riskier* than debt instruments.

- **Debt capital:** The cost of debt capital is the expected return to debt (e.g., bond) investors. Usually referred to as simply cost of debt. Note that the cost of debt is estimated prior to the tax effect (without regard to the tax shield). Debt capital is generally *less* risky than preferred equity and common equity.

- **Weighted average cost of capital (WACC):** The cost of capital to the overall business is commonly called the WACC. WACC represents the market-capitalization-weighted cost of capital for both equity holders (both common and preferred) and debt holders. WACC is sometimes referred to as "blended cost of capital", or simply "overall cost of capital". WACC is typically estimated on an after-tax basis, as explained later in this chapter.

Cost of Capital Input Assumptions

Data and methodology in the Valuation Handbook can be used to estimate the cost of common equity capital. Estimating the costs of the other components of the capital structure – preferred equity capital and debt capital – is typically more straightforward than estimating the cost of common equity capital. This is because the cost of capital (risk) of fixed-income securities (bonds) and fixed-income-like securities (preferred stocks) are usually directly observable in the market, while the cost of equity capital is not. We discuss these components only briefly here.[1.16]

Estimating the Cost of Preferred Equity Capital

If the capital structure includes preferred equity capital and it is publicly traded, the market yield (dividend ÷ market price) can be used as the cost of that component. If the preferred security does not trade publically or trades infrequently, the current market yield for preferred stocks with comparable features and risk can be used as a proxy. Standard & Poor's integrates debt and preferred stock in the same rating scale, according to its published criteria.[1.17] According to this publication, preferred stock is rated generally below subordinated debt. When the corporate credit rating on a company is investment grade, its preferred stock is generally rated two notches below the corporate credit rating. When the corporate credit rating is below investment grade, the preferred stock is rated at least three notches (i.e., one full rating category) below the corporate credit rating. Other adjustments may be appropriate. Moody's also uses similar criteria when assigning a preferred stock rating. It is noted that separate rating criteria would apply, if dealing with hybrid securities.[1.18]

[1.15] The price of preferred equity will fluctuate as similar-risk investments' yields vary. Because of the similarities of certain preferred equities and bonds, these preferred equities' prices will tend to fluctuate with the generic concept of "interest rates".

[1.16] To learn more about the cost of preferred capital and debt capital, see Pratt and Roger J. Grabowski, op.cit.: Chapter 20, "Other Components of a Business's Capital Structure".

[1.17] Source: Standard & Poor's "Criteria – Corporates – General: 2008 Corporate Criteria: Rating Each Issue", published originally on April 15, 2008, and republished on January 1, 2016. According to this document, prior to 1999, Standard & Poor's used a separate preferred stock scale. In February 1999, the debt and preferred stock scales were integrated.

[1.18] Source: Moody's "Rating Methodology – Updated Summary Guidance for Notching Bonds, Preferred Stocks and Hybrid Securities of Corporate Issuers", published on February 2007. To access this document, visit https://www.moodys.com/sites/products/AboutMoodysRatingsAttachments/2006400000430106.pdf.

3-2.   Please refer to the Direct Testimony of Anjuli Winker at page 27, lines 4-10.

        a.   Is Ms. Winker aware of any prior base rate case in which the Commission has approved the use of the sustainable retained earnings growth method to establish the return on equity of a regulated utility?

        b.   If the answer to subpart (a) is yes, please provide citations to all such cases, including the docket number and the date of the order in which the Commission approved the use of the sustainable retained earnings growth method to establish the return on equity of a regulated utility.

RESPONSE:

a.   In general, Ms. Winker is aware that the Commission has not adopted a specific methodology to be used to determine the return on equity ("ROE") for an electric utility. However, one of the models that the Commission often relies on when determining a utility's ROE is the Discounted Cash Flow ("DCF") model. For example, the Commission relied on the DCF model in Docket No. 46449, which is the most recently litigated base rate proceeding before the Commission. In that case, the rate of return testimony filed by OPUC presented a DCF model that incorporated sustainable retained earnings growth.

Ms. Winker is also aware of the Commission's decision in Docket No. 33309, which adopted the blended ROE recommended by the Administrative Law Judges. The blended ROE included results from a DCF model incorporating sustainable retained earnings growth.

b.   *Application of Southwestern Electric Power Company for Authority to Change Rates*, Docket No. 46449, Order on Rehearing at Finding of Fact ("FOF") No. 159 (Mar. 19, 2018).

Application of AEP Texas Central Company for Authority to Change Rates, Docket No. 33309, Order on Rehearing at 26 and FOF No. 55 (Mar. 4, 2008).

Id., Proposal for Decision at 53.

Prepared By: Anjuli Winker
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3-3. Please refer to the Direct Testimony of Anjuli Winker at page 28, lines 11-12.

    a. Please describe all bases for Ms. Winker's contention that the book value growth rate produces more accurate growth estimates for calculating the sustainable earnings growth rate.

    b. Please produce all documents on which Ms. Winker relies for her contention that the book value growth rate produces more accurate growth estimates for calculating the sustainable earnings growth rate.

RESPONSE:

a. Ms. Winker's contention is based on her periodic review of the book value growth rates of the companies tracked by *Value Line* during her 10 years of experience as a financial analyst in the utility industry.

b. Please see the Workpapers to the Direct Testimony of Anjuli Winker for copies of the most recent book value growth rates reviewed by Ms. Winker.

Prepared By: Anjuli Winker
Sponsored By: Anjuli Winker

3-4. Please refer to the Direct Testimony of Anjuli Winker at page 29, lines 3-4.

    a.   Please describe all bases for Ms. Winker's contention that "[p]ast performance is often an indication of future performance, especially in a regulated industry like the electric utility industry."

    b.   Please produce all documents on which Ms. Winker relies for her contention that "[p]ast performance is often an indication of future performance, especially in a regulated industry like the electric utility industry."

RESPONSE:

a. Ms. Winker's statement was made in response to a question about whether it is appropriate to consider the historical growth rates of the proxy group that she used for her DCF and Capital Asset Pricing Model analyses. The proxy group is comprised of a group of regulated utilities. In general, regulation creates a more predictable and stable financial environment than the market, which results in fewer fluctuations and more stable revenues. Therefore, the past performance of a regulated utility is often an indicator of future performance.

Ms. Winker's statement is also based on the importance of using a range of indicators to estimate growth because individual investors have different expectations of growth. Accordingly, Ms. Winker's DCF analysis included a range of measures of both historical and projected growth for her proxy group.

b. Please see Attachments CEHE-OPUC 3-4b and 3-6b.

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Attachment 3-4b

Roger A. Morin, PhD

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Public Utilities Reports, Inc.

yield must be adjusted for the flotation cost allowance by dividing it by $(1 - f)$, where f is the flotation cost factor.[6]

$$K = D_1/P_0 \, (1 - f) + g \qquad (9\text{-}4)$$

9.3 Growth Estimates: Historical Growth

The principal difficulty in calculating the required return by the DCF approach is in ascertaining the growth rate that investors are currently expecting. While there is no infallible method for assessing what the growth rate is precisely, an explicit assumption about its magnitude cannot be avoided. Estimating the growth component is the most difficult and controversial step in implementing DCF since it is a quantity that lies buried in the minds of investors. Three general approaches to estimating expected growth can be used, each with its own strengths and blemishes:

1. historical growth rates

2. analysts' forecasts

3. sustainable growth rates

This section describes the historical growth approach while the next two sections address the other two approaches.

Historical growth rates in dividends, earnings, and book value are often used as proxies for investor expectations in DCF analysis. Investors are certainly influenced to some extent by historical growth rates in formulating their future growth expectations. In addition, these historical indicators are widely used by analysts, investors, and expert witnesses in regulatory proceedings, at least as a starting point in their company analyses. Professional certified financial analysts are also well-versed in the use of historical growth indicators. To wit, the calculation of historical growth rates is normally one of the first steps in security analysis. Historical indicators are also used extensively in scholarly research. There exists a vast literature in empirical finance designed to evaluate the use of historical financial information as surrogates for expected values. This literature is discussed in the next section.

When using historical growth rates in a regulatory environment, a convenient starting point is to focus on the utility in question, and to assume that its growth profile is relatively stable and predictable. Under circumstances of stability, it is reasonable to examine past growth trends in earnings, dividends,

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[6] The conceptual and empirical support for the flotation cost adjustment is fully discussed in Chapter 10.

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and book values as proxies for investor expectations. The fundamental assumption is made that investors arrive at their expected growth forecast by simply extrapolating past history. In other words, historical growth rates influence investor anticipations of long-run growth rates.

In using historical growth rates, three decisions must be made: (1) which historical data series is most relevant; (2) over what past period; and (3) which computational method is most appropriate.

Historical Series

DCF proponents have variously based their historical computations on earnings per share, dividends per share, and book value per share. Of the three possible growth rate measures, growth in dividends per share is likely to be preferable, at least conceptually. DCF theory states clearly that it is expected future cash flows in the form of dividends that constitute investment value.

However, since the ability to pay dividends stems from a company's ability to generate earnings, growth in earnings per share can be expected to strongly influence the market's dividend growth expectations. After all, dividend growth can only be sustained if there is growth in earnings. It is the expectation of earnings growth that is the principal driver of stock prices. On the down side, using earnings growth as a surrogate for expected dividend growth can be problematic since historical earnings per share are frequently more volatile than dividends per share. Past growth rates of earnings per share tend to be very volatile and can sometimes lead to unreasonable results, such as negative growth rates. For example, in the 1990s and early 2000s, electric and gas company earnings growth rates were unstable and volatile, and such growth rates could not reasonably be expected to continue. Historically based DCF estimates of the cost of equity were downward-biased by the anemic historical growth rates of earnings and dividends in those years of major restructuring efforts, writeoffs, mergers and acquisitions, and shrinking profitability in the passage from a regulated monopoly to a competitive industry.

The relative stability of earnings and dividends is displayed in Figure 9-1 for The Southern Company. Under normal circumstances, dividend growth rates are not nearly as affected by year-to-year inconsistencies in accounting procedures as are earnings growth rates, and they are not as likely to be distorted by an unusually poor or bad year. Dividend growth is more stable than earnings growth because dividends reflect normalized long-term earnings rather than transitory earnings, because investors value stable dividends, and because companies are reluctant to cut dividends because of the information effect of dividend payments.

3-5. Please refer to the Direct Testimony of Anjuli Winker at page 29, lines 5-7.

    a.   Please describe all bases for Ms. Winker's contention that "[i]nvestors place more significance on the past financial results of electric utilities than other sectors of the economy, because the regulatory process has fewer fluctuations with more stable revenues."

    b.   Please produce all documents on which Ms. Winker relies for her contention that "[i]nvestors place more significance on the past financial results of electric utilities than other sectors of the economy, because the regulatory process has fewer fluctuations with more stable revenues."

RESPONSE:

a. Please see the response to CEHE-OPUC 3-4a.

b. Please see the response to CEHE-OPUC 3-4b.

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Sponsored By: Anjuli Winker

3-6. Please refer to the Direct Testimony of Anjuli Winker at page 29, lines 16-18.

    a.   Please describe all bases for Ms. Winker's contention that "investors also consider sustainable retained earnings growth rates, forecasted and historical book value growth rates, and dividend growth rates to determine expected future performance."

    b.   Please produce all documents on which Ms. Winker relies for her contention that "investors also consider sustainable retained earnings growth rates, forecasted and historical book value growth rates, and dividend growth rates to determine expected future performance."

RESPONSE:

a. Ms. Winker's statement was made in response to a question about whether she agrees with Mr. Hevert's decision to perform a DCF analysis using projected growth as the only indicator of growth. Because individual investors have different expectations of growth, it is important to use a range of indicators to estimate growth.

b. Please see Attachment CEHE-OPUC 3-6b.

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Attachment 3-6b

THE COST OF CAPITAL –

A PRACTITIONER'S GUIDE

BY

DAVID C. PARCELL

PREPARED FOR THE SOCIETY OF UTILITY
AND REGULATORY FINANCIAL ANALYSTS
(SURFA)

2010 EDITION

Author's Note: This manual has been prepared as an educational reference on cost of capital concepts. Its purpose is to describe a broad array of cost of capital models and techniques. No cost of equity model or other concept is recommended or emphasized, nor is any procedure for employing any model recommended. Furthermore, no opinions or preferences are expressed by either the author or the Society of Utility and Regulatory Financial Analysts.

On the other hand, advocates of average prices note that stocks are subject to random fluctuations as buy or sell orders flow in, so the price at any moment can represent a temporary disequilibrium. For this reason, they recommend the use of an average of recent prices.

Growth Rate

The growth rate component of the DCF equation – g – is usually the most crucial, and controversial, element in the use of this methodology. In estimating the appropriate growth rate, it is important to recognize two factors. First, the proper growth rate reflects the growth expectations of investors embodied in the price (i.e., yield component) of the company's stock. Analysts should recognize that individual investors have different expectations regarding growth and therefore no single indicator captures the growth expectations of all investors. Second, since the DCF model combines price (i.e., yield) and growth, the focus on growth expectations should target estimates of growth within a consistent time frame of the stock price contained in the yield component. Each of these factors relates to a "matching" of the yield and growth components of the DCF model.

An almost limitless array of techniques have been used in rate proceedings to estimate the constant growth rate component. Since the dividend discount model is technically concerned with growth in dividends, many methods are concerned directly with dividend growth. On the other hand, other methods examine factors other than dividend growth to estimate g. The objective of each of these methods is to estimate the growth of dividends (cash flow) within the DCF context. The DCF model is forward-looking in that it is designed to reflect the perceptions of investors as they set the current price of the company's stock. The following analysis discusses, in alphabetical order, the most commonly used estimates of g.

Historic Growth Rates

Historic data is often used in DCF analyses. The logic here is that investors rely on past rates of growth, to some extent, in making estimates of future growth (Gordon, Gordon and Gould, 1989, 50). Three issues to be considered in the use of historic growth are: first, what

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financial indicator of growth is to be considered?; second, how is growth to be measured?; and third, over what time period is growth to be measured?

1. Financial Indicators of Growth

There is a wide variety of acceptable methods for using historical growth to estimate future growth in the DCF model (Gordon, Gordon and Gould, 1989, 50). The three most commonly-used financial indicators of growth are dividends per share (DPS), earnings per share (EPS), and book value per share (BVPS) (Howe & Rasmussen, 1982, 133). Actually, growth in DPS, EPS, and BVPS can be defined in terms of each other, as DPS = EPS = ΔBVPS (Patterson, 1971). Viewed this way, any of the three terms is dependent upon the others and each can be viewed as the investors' perceived growth rate.

(a) **Dividends Per Share.** Past growth of DPS is the most direct link between historic dividend growth and projected dividend growth. However, in the long-run, dividends can grow at a rate no greater than that of earnings. If the dividends out-paced earnings for an extended period of time, the company would deplete its equity capital. In the short-run, the two growth rates can diverge without causing financial harm to the company. The average of these growth rates may provide a better forecast of the long-run dividend growth rate than any of the individual forecasts, because in the long-run the dividend growth rate should equal the growth rate of the earnings since it is primarily earnings that are used to support the dividends.

(b) **Earnings Per Share.** An investor's expectations concerning a company's cash flows include both dividends plus the eventual proceeds from the sale of the stock. Earnings provide the source of both the dividends paid to stockholders and the retained earnings which increase the book value and ultimately the market price of the stock. As a result, EPS is often used as a substitute for DPS.

(c) **Book Value Per Share.** The growth of BVPS is used as a proxy for DPS growth since BVPS growth principally reflects (in the absence of large stock sales at prices well above or below book value) the retention (i.e., not paying out all of earnings as dividends) of earnings.

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The purpose of earnings retention is to enhance the level of future EPS and DPS. In addition, a company's EPS is equal to the BVPS times return on equity (ROE). As a result, any factor that causes the BVPS to increase (decrease) will tend to cause the EPS to increase (decrease).

(d)   **Relationships Among Growth Rates.** Even though the DCF model assumes that EPS, DPS, BVPS and market price all grow at the same rate, it is generally recognized that in practice this does not normally occur. However, what is important to recognize in using the simplified version of the DCF model is that the analyst has no basis to forecast different future rates of growth for each of these items.

2.   Measurement of Growth

There are three commonly-used ways to measure historic growth rates. These are the arithmetic growth, compound (geometric) growth rate and the trended (least squares) growth rate.

(a)   **Arithmetic Growth Rate.** The arithmetic growth rate measure the average rate of growth (usually on an annual basis) over the period studied. The arithmetic growth rate thus considers and measures each annual change over the period studied and averages these growth rates. The following example shows the arithmetic growth rate calculation.

Year	EPS	% change
1	$1.00	
2	$1.10	10.0%
3	$1.20	9.1%
4	$1.40	16.7%
5	$1.50	7.1%
Average		10.7%

(b)   **Compound Growth Rate.** The compound growth rate measures the period (usually annual) rate of growth between two sets of data – the beginning value and the ending value. The compound growth rate is a geometric mean and is derived from the following formula:

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(8.16) $G_c = n\sqrt{E/B} - 1$

where: G_c = compound growth rate

E = ending value

B = beginning value

n = number of periods between data points

The compound growth rate does not consider any values between the beginning and ending point. Compound growth rates can be performed on many pocket calculators. In addition, services such as Value Line show compound growth rates over the past 5 and 10 years. In addition, mutual funds provide compound growth rates (as required by the Securities and Exchange Commission) for both the individual fund and for "target" fund indices.

(c)   **Trended Growth Rate.** The trended, or least squares, growth rate employs regression analysis to estimate the average rate of growth over a period of time. Frequently, a semilog transformation is used in a time series simple regression analysis. This takes the form:

(8.17) $D_t^* = a^* + b^*t + u_t$

where: D_t^* - $\ln D_t$ = logarithm of DPS in time period t

$a^* = \ln a$ = intercept term

$b^* = \ln b$ = regression coefficient = growth rate (by computing antilog)

t = time period

u_t = disturbance term.

Computers are normally required to calculate trended growth rates.

(d)   **Arithmetic Versus Compound Growth Rate.** A dispute frequently occurs as to whether the arithmetic or compound growth rate better portrays the expected growth rate in a DCF (or risk premium) analysis. This dispute, as well as the relative merits of each position, has

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been documented by Ibbotson and Sinquefield. In their 1982 book (Ibbotson and Sinquefield, 1982, 14), they stated:

> "Naturally, it is the geometric mean that more directly measures the change in wealth over more than one period. On the other hand, the arithmetic mean serves as a better representation of typical performance over single periods."

In contrast, in the 2009 Yearbook (Ibbotson, 2009, 139), it was stated:

> The arithmetic mean is the rate of return which, when compounded over multiple periods, gives the mean of the profitability distribution of ending wealth values. This makes the arithmetic mean return appropriate for computing a discount rate and a cost of capital. The discount rate that equates expected (mean) future values with the present value of an investment is that investment's cost of capital. The logic of using the discount rate as the cost of capital is reinforced by noting that investors will discount their expected (mean) ending wealth values from an investment back to the present using the arithmetic mean, for the reason given above. They will therefore require such an expected (mean) return prospectively (that is, in the present looking forward the future) in order to commit their capital to the investment.

This conflict has also been addressed in the financial literature. As is usually the case, no viewpoint reins supreme. Perhaps a study by Carleton and Lakonishok (1985, 39) best expresses the advantages of each procedure:

> "Which of the two means should be used? The truth is, each is appropriate under particular circumstances. The geometric mean measures changes in wealth over more than one period on a buy and hold (with dividends reinvested) strategy. If the average investor rebalanced his portfolio every period, the geometric mean would not be a correct representation of his portfolio's performance over time. The arithmetic mean would provide a better measure of typical performance over a single historical period (in the example, one year)."

This representative comparison appears to lead to a conclusion that investors likely consider both arithmetic and compound growth rates.

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3.   **Time Period**

The selection of a time period over which to measure the historic growth rate is a third issue to be considered. Many investment services, such as Value Line, calculate five year and ten year growth rates. A period encompassing one or two full business cycles can also be utilized. Virtually any time period can be utilized to calculate historic growth rates.

Certain criteria should be employed in selecting a time period. First, the time period should be recent and normally end with the most recent period available (except in circumstances where the most recent time period is unrepresentative of current expectations, such as a recession). Second, the economic and financial conditions existing during the time period should be representative of those conditions anticipated during the time period that dividends are being projected.

Projected Growth Rates

Most utilities are followed by security analysts who provide projections for various per share growth rates. There are three general sources of security analysts' forecast data. First, are "sell-side" analysts working for security firms such as Merrill Lynch. Second, are "buy-side" analysts working for institutional investors such as banks, pension funds, insurance companies and investment advisors. Third, are analysts working for investment-advisory services such as Value Line.

Dividends per share growth rates are estimated by some of the analysts' publications, such as Value Line. Estimates of earnings per share growth are more common. Four primary sources – First Call (Thompson Financial, formerly known as I/B/E/S Institutional Brokers Estimate System) Zacks Investment Research, Inc., and Value Line – summarize the EPS estimates of other analysts and provide the mean, median and range of estimates. Finally, book value per share growth rates are estimated by a few publications (e.g., Value Line).

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The appropriateness of use of analysts' forecasts, whether on an exclusive basis or in conjunction with historic information, as the growth component in the DCF model has been a matter of dispute among both academics and cost of capital witnesses for many years. Appendix 8.3 summarizes several of the academic studies which have addressed this issue. Three general questions are evident from a review of these studies.

1.   **Dispute Over Value of Projected Growth Rates**

Advocates of projected growth rates (Vander Weide and Carleton, 1988; Chatfield, Hein and Moyer, 1990; Brown and Rozeff, 1978; Linke, 1982) maintain that analysts' growth forecasts are superior predictors of future EPS in comparison to naïve (i.e., simple historical growth extrapolations or no change) models of EPS. However, other studies claim that analysts' forecasts are no better than historical extrapolations (Cragg and Malkiel, 1968; Elton and Gruber, 1972; Malkiel, 1990). Still other studies (Gordon, Gordon and Gould, 1989) show analysts' growth forecasts as well as historic retention growth rates to be reasonable indications of investor expectations, with analysts' forecasts being somewhat better. Finally, Cragg and Malkiel (1982, 162) found that long-term expected growth rates, together with the risk measure provided by the variance of the growth-rate predictions, gives a closer valuation of common stocks than do "simple alternatives."

Studies have also challenged the accuracy of analysts' forecasts. A study by Dreman and Berry concluded that consensus estimates of EPS differ significantly from actual reported earnings. They also concluded that the average error appears to be increasing over time and that analysts are optimistic on average. They conclude "These findings question the use of finely calibrated earnings forecasts that are integral to the most common valuation/models and indirectly question the valuation methods themselves" (Dreman and Berry, 1995, 30). A similar study by Clayman and Schwartz compared Zacks Investment Research EPS projections with actual EPS for 399 companies for the period 1982-1992. They concluded that analysts' forecasts of EPS overstated actual EPS by as much as fifty percent. They conclude ". . . market participants should take analysts' innate overestimation biases into account when making stock valuation judgments" (Clayman and Schwartz, 1994, 68). Still another study by Chopra (1998)

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concluded 'Analysts' forecasts of EPS and growth in EPS tend to be overly optimistic. He concluded that analysts' forecasts of EPS over the past 13 years have been more than twice the actual growth rate.

Another criticism of analysts' forecasts of growth rates is that they are not constant and sustainable growth rates, as required by the DCF model. Analysts' growth rates include the impact of growth from a base year (or period) that may be characterized by abnormally depressed or high earnings. Such growth rates thus often assume non-constant growth and may not be sustainable (Brigham and Gapenski, 1990, 147).

2. Exclusive Use of Projected Growth Rates

Other studies have evaluated the appropriateness of exclusive use of analysts' forecasts. Timme and Eisemann (1989) note, for example, that exclusive use of a consensus forecast assumes that it "incorporates all information relating to equity valuation contained in alternative proxies;" however, their studies indicate that forecasts do not contain all relevant information and thus should not be relied upon exclusively. Conroy and Harris (1987) found that analysts' forecasts were better predictors than historic growth over the very short term, but the advantage declined steadily over time. They conclude that combinations of analysts' forecasts and historic growth provide the best forecasting results. Avera and Fairchild (1982) and Newbolt, Zumwalt, and Kannan (1987) reached similar conclusions.

3. Whose Projections Are Best?

Finally, a number of studies have commented on the relative accuracy of various analysts' forecasts. Brown and Rozeff (1978) found that Value Line was superior to other forecasts. Chatfield, Hein and Moyer (1990, 438) found, further "Value Line to be more accurate than alternative forecasting methods" and that "investors place the greatest weight on the forecasts provided by Value Line." Finally, Collins and Hopwood (1980) concluded that Value Line predictions are more accurate than competing models as they produce fewer and

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smaller extreme errors. In contrast, Avera and Fairchild (1982) contend that Value Line forecasts are not an acceptable surrogate for the growth component in the DCF model.

Quarterly Growth Rates

As noted in the "Dividend Yield" section of this Chapter, annual DCF rates can be converted to quarterly DCF rates via the growth rate component as well as the yield component. This can be done utilizing the following formula:

$$(8.18) \qquad g = [1 + g)^{0.25} - 1] \, x \, 100$$

This growth rate can be combined with any of the yield calculations except the quarterly yield, since the latter already reflects the quarterly compounding effect.

Retention Growth Rate

The retention growth rate (also known as fundamental growth rate or plow-back growth rate) is attributed to Myron Gordon (1974, 81-82). It is rationalized on the grounds that, fundamentally, dividend growth is based on retained earnings and new stock sales at a price different from book value. Since retained earnings provide for growth in statutory equity and growth in equity provides for growth in a business the rate of earnings plow-back serves as a basis for estimating future dividend growth.

The retention growth rate is derived from the formula:

$$(8.19) \qquad G_r = (b) \, x \, (r) + (v) \, x \, (s)$$

where: G_r = retention growth rate

b = earnings retention rate, or 1 minus payout ratio

r = return on equity

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v = fraction of sales of new stock that accrues to current stockholders (i.e., variance from book values

s = percentage increase in new stock raised from sale

The first term of the above equation, (b) x (r), represents the internal growth of the firm and reflects the growth from retained earnings. This term is also known as the plowback ratio and earnings retention ratio. The second term, (v) x (s), represents the external growth and reflects the increase (decrease) in book value resulting from sales of common stock.

The second term (which can be negative if stock is sold below book value) does not normally represent a major source of growth. As a result, the retention growth formula is often reduced to the form:

$$(8.20) \qquad G_T = (b)x\,(r)$$

This alternative form is sometimes used because the (v) x (s) term is difficult to estimate, since it is not normally known when, how much, and at what price stock will be issued (Howe & Rasmussen, 1982, 134; Brealey and Myers, 1984, 50). Retention growth rates can be calculated using both historic and projected figures for DPS, EPS, and return on equity.

In addition to its adoption by FERC, the retention growth rate has received endorsement in several finance texts (Reilly, 1985, 289; Cohen, Zinbard and Zeikel, 1982, 397; Sharpe, 1985, 427; Howe and Rasmussen, 1982, 134; Brealey and Myers, 1984, 50).

It is sometimes maintained that the retention growth method is circular, since expected return on equity (r) is a factor in determining the cost of equity (K). However, the expected rate of return helps quantify the growth rate that investors expect because the actual return on equity has a great influence on the attained level of future cash flows. This differs from the cost of equity, which reflects the return investors expect to receive on their market price investment. The return investors actually receive takes into consideration the future cash flows consistent

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with the achieved return on equity (r). If the market price is above book value, "K" will be less than "r," whereas if the market price is below book value, "K" will be higher than "r".

Stock Price Growth Rate

A less common estimate of growth is the historic growth of the utility's stock price. The logic for use of stock price growth is that, given a level of yield, a company's market price grows at the same rate as its dividend (Gordon, 1974, 58; Morin, 1984, 85).

Use of Multiple Growth Rates

Since the growth rate component is the most controversial part of the DCF equation, it is preferable to use more than one estimate of growth. It is reasonable to believe that investors, as a group, do not utilize a single growth estimate when they price a utility's stock. Thus, rate of return analysts should consider multiple growth estimates in order to better capture the growth embodied in a utility's stock price.

Firm-Specific vs Comparable Group DCF

Regardless of the specific DCF model utilized by an analysts, a decision must be made whether the model is to be applied to the market date of the subject utility, a group of comparable or proxy utilities, or both. The case for the firm-specific DCF is straight forward – direct market data are available for many utilities and this provides the market's most direct and meaningful measurement of the utility's cost of common equity.

On the other hand, it is often maintained that a particular firm's stock price, and hence DCF cost rate, is not appropriate for use in a regulatory proceeding. Morin (2006, 397-398) notes four reasons why the determination of cost of capital should not rest on the experience of a single firm:

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3-7.   Please refer to the Direct Testimony of Anjuli Winker at page 34, lines 18-20.

      a.   Please describe all bases for Ms. Winker's contention that the "shorter time period, therefore, better reflects current investor expectations and market conditions, than going back approximately four decades in the model."

      b.   Please produce all documents on which Ms. Winker relies for her contention that that the "shorter time period, therefore, better reflects current investor expectations and market conditions, than going back approximately four decades in the model."

RESPONSE:

a. Ms. Winker's statement relates to her use of an 18-year period to calculate the average risk premium for her bond yield plus risk premium model, rather than using Mr. Hevert's 39-year period. Monetary policy changes over time, and Ms. Winker's shorter time period is more reflective of current monetary policy. Please also see the Direct Testimony of Anjuli Winker at page 34, lines 17-18 and page 36, lines 9-13.

b. Not applicable.

Prepared By: Anjuli Winker
Sponsored By: Anjuli Winker

3-8. Please refer to the Direct Testimony of Anjuli Winker at page 36, lines 5-18.

    a.   Did Ms. Winker perform an independent regression analysis to determine whether equity risk premiums are inversely related to interest rate levels?

    b.   Did Ms. Winker review Mr. Hevert's regression analysis?

    c.   Did Ms. Winker find any errors in Mr. Hevert's regression analysis?

    d.   If the answer to subpart (c) is yes, please describe those errors in detail.

    e.   Does Ms. Winker dispute Mr. Hevert's conclusion on page 72 of his Direct Testimony that "over time there has been a statistically significant negative relationship between the 30-year Treasury yield and the equity risk premium?"

    f.   If the answer to subpart (e) is yes, please describe in detail all bases for Ms. Winker's disagreement and provide all documents that support her position.

RESPONSE:

a. No.

b. Yes.

c. Ms. Winker did not review Mr. Hevert's regression analysis to identify errors. She conducted her review to determine whether it was necessary for Mr. Hevert to perform a regression analysis.

d. Not applicable.

e. Ms. Winker does not have an opinion regarding Mr. Hevert's conclusion on page 72 of his direct testimony, because she did not review his regression analysis for accuracy.

f. Not applicable.

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Sponsored By: Anjuli Winker

3-9.   Please refer to the Direct Testimony of Anjuli Winker at page 40, lines 6-16. Please describe how Ms. Winker arrived at a 9.15% point estimate for her recommended return on equity.

RESPONSE:

Please see the Direct Testimony of Anjuli Winker at page 19, line 15 to page 29, line 7; page 29, line 19 to page 31, line 10; page 33, lines 8-19; page 34, line 13 to page 35, line 14; and page 37, line 4 to page 40, line 16.

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3-10. Please refer to the Direct Testimony of Anjuli Winker at page 43, lines 5-12.

      a.   Has Ms. Winker performed any quantitative analysis to determine what CenterPoint Houston's ratio of Cash Flow from Operations pre-Working Capital to Debt would be under Ms. Winker's capital structure recommendation? If so, please provide that analysis.

      b.   Has Ms. Winker performed any quantitative analysis to determine what CenterPoint Houston's ratio of Debt to Earnings Before Interest, Taxes, Depreciation, and Amortization would be would be under Ms. Winker's capital structure recommendation? If so, please provide that analysis.

      c.   Has Ms. Winker performed any quantitative analysis to determine what CenterPoint Houston's ratio of Funds from Operations to Debt would be under Ms. Winker's capital structure recommendation? If so, please provide that analysis.

RESPONSE:

a. No.

b. No.

c. No.

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3-11. Please refer to Schedule AW-1 to the Direct Testimony of Anjuli Winker. If not already provided as part of Ms. Winker's workpapers, please provide the source documents for all numbers listed in Schedule AW-1.

RESPONSE:

Please see the Workpapers to the Direct Testimony of Anjuli Winker.

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Sponsored By: Anjuli Winker

3-12. Please refer to Schedule AW-3 to the Direct Testimony of Anjuli Winker. If not already provided as part of Ms. Winker's workpapers, please provide the relevant portions of the Mergent Bond Record publications cited in footnote 2.

RESPONSE:

Please see Attachment CEHE-OPUC 3-12.

Prepared By: Anjuli Winker
Sponsored By: Anjuli Winker

Attachment 3-12

Corporate Bond Yield Averages

Month	AV. CORP.	CORPORATE BY RATINGS Aaa	Aa	A	Baa	CORPORATE BY GROUPS P.U.	IND.	R.R.	PUBLIC UTILITY BONDS Aaa	Aa	A	Baa	INDUSTRIAL BONDS Aaa	Aa	A	Baa	RAILROAD BONDS Aaa	Aa	A	Baa
2000																				
Jan.	8.06	7.78	7.96	8.15	8.33	8.22	7.89	—	7.95	8.17	8.35	8.40	7.60	7.74	7.94	8.26	—	—	—	—
Feb.	7.96	7.68	7.82	8.06	8.29	8.10	7.82	—	7.82	7.99	8.25	8.33	7.53	7.65	7.87	8.24	—	—	—	—
Mar.	7.99	7.68	7.83	8.07	8.37	8.14	7.83	—	7.87	7.99	8.28	8.40	7.48	7.66	7.84	8.34	—	—	—	—
Apr.	7.98	7.64	7.82	8.07	8.40	8.14	7.82	—	7.87	8.00	8.29	8.40	7.41	7.63	7.84	8.40	—	—	—	—
May	8.41	7.99	8.24	8.49	8.90	8.55	8.25	—	8.22	8.44	8.70	8.86	7.76	8.03	8.28	8.94	—	—	—	—
June	8.05	7.67	7.87	8.18	8.48	8.22	7.87	—	7.96	8.10	8.36	8.47	7.37	7.63	8.00	8.49	—	—	—	—
July	7.98	7.65	7.81	8.11	8.35	8.17	7.78	—	8.00	8.10	8.25	8.33	7.30	7.51	7.97	8.36	—	—	—	—
Aug.	7.88	7.55	7.70	8.02	8.26	8.05	7.70	—	7.89	7.95	8.13	8.25	7.20	7.44	7.91	8.26	—	—	—	—
Sept.	7.98	7.62	7.83	8.13	8.35	8.16	7.81	—	7.92	8.11	8.23	8.32	7.29	7.54	8.03	8.37	—	—	—	—
Oct.	7.95	7.55	7.81	8.11	8.34	8.08	7.82	—	7.80	8.08	8.14	8.29	7.29	7.55	8.08	8.38	—	—	—	—
Nov.	7.90	7.45	7.75	8.09	8.28	8.03	7.76	—	7.71	8.03	8.11	8.25	7.19	7.47	8.07	8.31	—	—	—	—
Dec.	7.65	7.21	7.48	7.88	8.02	7.79	7.50	—	7.51	7.79	7.84	8.01	6.90	7.16	7.90	8.03	—	—	—	—
2001																				
Jan.	7.55	7.15	7.38	7.75	7.93	7.76	7.34	—	7.53	7.73	7.80	7.99	6.76	7.02	7.70	7.86	—	—	—	—
Feb.	7.50	7.10	7.32	7.69	7.87	7.69	7.30	—	7.46	7.62	7.74	7.94	6.74	7.01	7.64	7.80	—	—	—	—
Mar.	7.41	6.98	7.22	7.61	7.84	7.59	7.23	—	7.31	7.51	7.68	7.85	6.64	6.92	7.55	7.83	—	—	—	—
Apr.	7.63	7.20	7.43	7.82	8.07	7.81	7.45	—	7.53	7.72	7.94	8.06	6.86	7.14	7.74	8.08	—	—	—	—
May	7.69	7.29	7.50	7.88	8.07	7.88	7.49	—	7.61	7.79	7.99	8.11	6.96	7.20	7.75	8.03	—	—	—	—
June	7.56	7.18	7.34	7.73	7.97	7.75	7.36	—	7.50	7.62	7.85	8.02	6.85	7.05	7.60	7.92	—	—	—	—
July	7.51	7.13	7.27	7.65	7.97	7.71	7.30	—	7.46	7.55	7.78	8.05	6.80	6.99	7.52	7.89	—	—	—	—
Aug.	7.37	7.02	7.11	7.48	7.85	7.57	7.16	—	7.36	7.39	7.59	7.95	6.67	6.83	7.37	7.74	—	—	—	—
Sep.	7.54	7.17	7.27	7.67	8.03	7.73	7.34	—	7.52	7.55	7.75	8.12	6.83	7.00	7.60	7.93	—	—	—	—
Oct.	7.41	7.03	7.13	7.59	7.91	7.64	7.18	—	7.45	7.47	7.63	8.02	6.60	6.79	7.54	7.79	—	—	—	—
Nov.	7.32	6.97	7.01	7.49	7.81	7.61	7.03	—	7.45	7.45	7.57	7.96	6.48	6.56	7.40	7.66	—	—	—	—
Dec.	7.55	6.76	7.19	7.70	8.05	7.86	7.23	—	7.53	7.53	7.83	8.27	6.67	6.85	7.56	7.82	—	—	—	—
2002																				
Jan.	7.38	6.55	7.03	7.50	7.87	7.69	7.07	—	—	7.28	7.66	8.13	6.55	6.78	7.35	7.60	—	—	—	—
Feb.	7.32	6.51	6.95	7.37	7.89	7.62	7.02	—	—	7.14	7.54	8.18	6.51	6.76	7.20	7.59	—	—	—	—
Mar.	7.57	6.81	7.22	7.62	8.11	7.83	7.30	—	—	7.42	7.76	8.32	6.81	7.02	7.47	7.89	—	—	—	—
Apr.	7.49	6.76	7.16	7.49	8.04	7.74	7.23	—	—	7.38	7.57	8.26	6.76	6.93	7.40	7.81	—	—	—	—
May	7.49	6.75	7.20	7.43	8.09	7.76	7.22	—	—	7.43	7.52	8.33	6.75	6.95	7.33	7.84	—	—	—	—
June	7.36	6.64	7.08	7.25	7.96	7.67	7.06	—	—	7.33	7.42	8.26	6.64	6.83	7.09	7.67	—	—	—	—
July	7.27	6.53	6.98	7.14	7.90	7.54	6.99	—	—	7.22	7.31	8.07	6.53	6.74	6.97	7.71	—	—	—	—
Aug.	7.06	6.37	6.84	6.95	7.58	7.34	6.77	—	—	7.10	7.17	7.74	6.37	6.57	6.73	7.42	—	—	—	—
Sep.	6.87	6.15	6.63	6.76	7.40	7.23	6.51	—	—	6.98	7.08	7.62	6.15	6.27	6.43	7.17	—	—	—	—
Oct.	7.08	6.33	6.74	6.95	7.74	7.43	6.72	—	—	7.07	7.23	8.00	6.33	6.40	6.67	7.48	—	—	—	—
Nov.	7.01	6.31	6.71	6.89	7.62	7.31	6.70	—	—	7.03	7.14	7.76	6.31	6.39	6.63	7.47	—	—	—	—
Dec.	6.90	6.21	6.63	6.80	7.45	7.20	6.59	—	—	6.94	7.07	7.61	6.21	6.32	6.53	·7.28	—	—	—	—
2003																				
Jan.	6.84	6.17	6.59	6.76	7.35	7.13	6.54	—	—	6.87	7.06	7.47	6.17	6.30	6.46	7.23	—	—	—	—
Feb.	6.62	5.95	6.34	6.63	7.06	6.92	6.31	—	—	6.66	6.93	7.17	5.95	6.02	6.33	6.94	—	—	—	—
Mar.	6.53	5.89	6.28	6.54	6.95	6.80	6.26	—	—	6.56	6.79	7.05	5.89	6.04	6.30	6.84	—	—	—	—
Apr.	6.44	5.74	6.22	6.45	6.85	6.68	6.18	—	—	6.47	6.64	6.94	5.74	5.97	6.26	6.76	—	—	—	—
May	6.02	5.22	5.85	6.08	6.38	6.35	5.70	—	—	6.20	6.36	6.47	5.22	5.48	5.79	6.29	—	—	—	—
June	5.85	4.97	5.72	5.92	6.19	6.21	5.49	—	—	6.12	6.21	6.30	4.97	5.31	5.62	6.07	—	—	—	—
July	6.26	5.49	6.07	6.34	6.62	6.54	5.98	—	—	6.37	6.57	6.67	5.49	5.77	6.11	6.56	—	—	—	—
Aug.	6.57	5.87	6.31	6.63	7.01	6.78	6.35	—	—	6.48	6.78	7.08	5.87	6.13	6.48	6.92	—	—	—	—
Sep.	6.37	5.72	6.13	6.42	6.79	6.58	6.16	—	—	6.30	6.56	6.87	5.72	5.95	6.27	6.71	—	—	—	—
Oct.	6.32	5.70	6.11	6.33	6.73	6.50	6.14	—	—	6.28	6.43	6.79	5.70	5.94	6.23	6.67	—	—	—	—
Nov.	6.27	5.65	6.08	6.28	6.66	6.44	6.09	—	—	6.26	6.37	6.69	5.65	5.91	6.18	6.63	—	—	—	—
Dec.	6.20	5.65	6.02	6.19	6.60	6.36	6.04	—	—	6.18	6.27	6.61	5.62	5.85	6.11	6.58	—	—	—	—
2004																				
Jan.	6.08	5.54	5.91	6.08	6.44	6.23	5.92	—	—	6.06	6.15	6.47	5.54	5.74	6.02	6.40	—	—	—	—
Feb.	6.00	5.50	5.87	6.04	6.27	6.17	5.83	—	—	6.10	6.15	6.28	5.50	5.65	5.93	6.24	—	—	—	—
Mar.	5.84	5.33	5.70	5.86	6.11	6.01	5.67	—	—	5.93	5.97	6.12	5.33	5.48	5.75	6.10	—	—	—	—
Apr.	6.22	5.73	6.10	6.25	6.46	6.38	6.05	—	—	6.33	6.35	6.46	5.73	5.85	6.15	6.45	—	—	—	—
May.	6.51	6.04	6.40	6.54	6.75	6.68	6.34	—	—	6.66	6.62	6.75	6.04	6.13	6.45	6.73	—	—	—	—
June	6.42	6.01	6.21	6.42	6.78	6.53	6.31	—	—	6.30	6.46	6.84	6.01	6.12	6.37	6.72	—	—	—	—
July	6.24	5.82	6.02	6.23	6.62	6.34	6.13	—	—	6.09	6.27	6.67	5.82	5.94	6.18	6.57	—	—	—	—
Aug.	6.08	5.65	5.87	6.08	6.48	6.18	5.98	—	—	5.95	6.14	6.45	5.65	5.79	6.02	6.47	—	—	—	—
Sep.	5.91	5.46	5.73	5.91	6.27	6.01	5.81	—	—	5.79	5.98	6.27	5.46	5.67	5.84	6.27	—	—	—	—
Oct.	5.87	5.47	5.69	5.86	6.21	5.95	5.78	—	—	5.74	5.94	6.17	5.47	5.63	5.78	6.24	—	—	—	—
Nov.	5.89	5.52	5.72	5.88	6.21	5.97	5.80	—	—	5.79	5.97	6.16	5.52	5.65	5.78	6.25	—	—	—	—
Dec.	5.84	5.47	5.69	5.82	6.15	5.93	5.75	—	—	5.78	5.92	6.10	5.47	5.60	5.72	6.20	—	—	—	—
2005																				
Jan.	5.72	5.36	5.58	5.68	6.02	5.80	5.63	—	—	5.68	5.78	5.95	5.36	5.48	5.58	6.08	—	—	—	—
Feb.	5.55	5.20	5.44	5.51	5.82	5.64	5.45	—	—	5.55	5.61	5.76	5.20	5.32	5.40	5.87	—	—	—	—
Mar.	5.77	5.40	5.64	5.73	6.06	5.86	5.67	—	—	5.76	5.83	6.01	5.40	5.53	5.63	6.11	—	—	—	—
Apr.	5.65	5.33	5.44	5.58	6.05	5.72	5.58	—	—	5.56	5.64	5.95	5.33	5.31	5.52	6.15	—	—	—	—
May	5.54	5.15	5.29	5.49	6.01	5.60	5.48	—	—	5.39	5.53	5.88	5.15	5.18	5.45	6.13	—	—	—	—
June	5.35	4.96	5.02	5.33	5.86	5.39	5.31	—	—	5.05	5.40	5.70	4.96	4.99	5.26	6.01	—	—	—	—
July	5.46	5.06	5.14	5.44	5.95	5.50	5.41	—	—	5.18	5.51	5.81	5.06	5.10	5.37	6.10	—	—	—	—
Aug.	5.49	5.09	5.20	5.48	5.96	5.51	5.46	—	—	5.23	5.50	5.80	5.09	5.16	5.45	6.12	—	—	—	—
Sept.	5.53	5.13	5.24	5.50	6.03	5.54	5.51	—	—	5.27	5.52	5.83	5.13	5.21	5.47	6.22	—	—	—	—
Oct.	5.77	5.34	5.46	5.75	6.29	5.79	5.74	—	—	5.50	5.79	6.08	5.34	5.42	5.70	6.49	—	—	—	—
Nov.	5.86	5.42	5.55	5.83	6.39	5.88	5.83	—	—	5.59	5.88	6.19	5.42	5.52	5.78	6.59	—	—	—	—
Dec.	5.82	5.38	5.51	5.84	6.33	5.83	5.80	—	—	5.55	5.80	6.14	5.38	5.45	5.88	6.51	—	—	—	—

Notes: Moody's® Long-Term Corporate Bond Yield Averages have been published daily since 1929. They are derived from pricing data on a regularly-replenished population of nearly 75 seasoned corporate bonds in the US market, each with current outstandings over $100 million. The bonds have maturities as close as possible to 30 years; they are dropped from the list if their remaining life falls below 20 years, if their ratings change. Bonds with deep discounts or steep premiums to par are generally excluded. All yields are yield-to-maturity calculated on a semi-annual basis. Each observation is an unweighted average, with Average Corporate Yields representing the unweighted average of the corresponding Average Industrial and Average Public Utility observations. Because of the dearth of Aaa -rated railroad term bond issues, Moody's® Aaa railroad bond yield average was discontinued as of December 18, 1967. Moody's® Aaa public utility average suspended from Jan. 1984 thru Sept. 1984. Oct. 1984 figure for last 14 business days only. The Railroad Bond Averages were discontinued as of July 17, 1989 because of insufficient frequently tradable bonds. The July figures were based on 8 business days.
Because of the dearth of Aaa rated public utility bond issues, Moody's Aaa public utility bond yield average was discontinued as of December 10, 2001.
Note: October 2002 figures have been adjusted.
Note: January 2003 figures have been adjusted.

Corporate Bond Yield Averages

	AV. CORP.	CORPORATE BY RATINGS				CORPORATE BY GROUPS				PUBLIC UTILITY BONDS					INDUSTRIAL BONDS					RAILROAD BONDS			
		Aaa	Aa	A	Baa	P.U.	IND.	R.R.		Aaa	Aa	A	Baa		Aaa	Aa	A	Baa		Aaa	Aa	A	Baa
2006																							
Jan.	5.75	5.29	5.45	5.79	6.24	5.77	5.73	----	Jan.	----	5.50	5.75	6.06	Jan.	5.29	5.39	5.83	6.41	Jan.	----	----	----	----
Feb.	5.80	5.35	5.51	5.85	6.27	5.83	5.78	----	Feb.	----	5.55	5.82	6.11	Feb.	5.35	5.46	5.87	6.43	Feb.	----	----	----	----
Mar.	5.95	5.52	5.67	5.98	6.41	5.98	5.92	----	Mar.	----	5.71	5.98	6.26	Mar.	5.52	5.64	5.96	6.55	Mar.	----	----	----	----
Apr.	6.26	5.84	6.00	6.27	6.68	6.28	6.23	----	Apr.	----	6.02	6.29	6.54	Apr.	5.84	5.98	6.26	6.82	Apr.	----	----	----	----
May	6.36	5.95	6.13	6.40	6.75	6.39	6.33	----	May	----	6.16	6.42	6.59	May	5.95	6.10	6.37	6.90	May	----	----	----	----
June	6.35	5.89	6.11	6.39	6.78	6.39	6.31	----	June	----	6.16	6.40	6.61	June	5.89	6.05	6.36	6.94	June	----	----	----	----
July	6.33	5.85	6.08	6.36	6.76	6.37	6.28	----	July	----	6.13	6.37	6.61	July	5.85	6.02	6.35	6.91	July	----	----	----	----
Aug.	6.16	5.68	5.91	6.19	6.59	6.20	6.11	----	Aug.	----	5.97	6.20	6.43	Aug.	5.68	5.85	6.18	6.74	Aug.	----	----	----	----
Sept.	5.98	5.51	5.75	5.98	6.43	6.03	5.94	----	Sept.	----	5.81	6.00	6.26	Sept.	5.51	5.68	5.95	6.59	Sept.	----	----	----	----
Oct.	5.97	5.51	5.74	5.94	6.42	6.01	5.93	----	Oct.	----	5.80	5.98	6.24	Oct.	5.51	5.68	5.90	6.60	Oct.	----	----	----	----
Nov.	5.78	5.33	5.57	5.76	6.20	5.82	5.73	----	Nov.	----	5.61	5.80	6.04	Nov.	5.33	5.52	5.72	6.36	Nov.	----	----	----	----
Dec.	5.79	5.29	5.58	5.78	6.22	5.83	5.74	----	Dec.	----	5.62	5.81	6.05	Dec.	5.29	5.53	5.75	6.38	Dec.	----	----	----	----
2007																							
Jan.	5.92	5.40	5.75	5.93	6.34	5.96	5.88	----	Jan.	----	5.78	5.96	6.16	Jan.	5.40	5.71	5.91	6.52	Jan.	----	----	----	----
Feb.	5.88	5.39	5.72	5.88	6.28	5.91	5.85	----	Feb.	----	5.73	5.90	6.10	Feb.	5.39	5.70	5.86	6.44	Feb.	----	----	----	----
Mar.	5.84	5.30	5.66	5.84	6.27	5.87	5.80	----	Mar.	----	5.66	5.85	6.10	Mar.	5.30	5.66	5.83	6.43	Mar.	----	----	----	----
Apr.	5.99	5.47	5.83	5.99	6.39	6.01	5.96	----	Apr.	----	5.83	5.97	6.24	Apr.	5.47	5.82	6.00	6.54	Apr.	----	----	----	----
May	6.00	5.47	5.85	6.01	6.39	6.03	5.97	----	May	----	5.86	5.99	6.23	May	5.47	5.84	6.04	6.54	May	----	----	----	----
June	6.32	5.79	6.17	6.33	6.70	6.34	6.29	----	June	----	6.18	6.30	6.54	June	5.79	6.15	6.36	6.84	June	----	----	----	----
July	6.26	5.73	6.09	6.30	6.65	6.28	6.24	----	July	----	6.11	6.25	6.49	July	5.73	6.07	6.34	6.81	July	----	----	----	----
Aug.	6.26	5.79	6.06	6.29	6.65	6.28	6.23	----	Aug.	----	6.11	6.24	6.51	Aug.	5.79	6.01	6.35	6.79	Aug.	----	----	----	----
Sept.	6.21	5.74	6.02	6.23	6.59	6.24	6.17	----	Sept.	----	6.10	6.18	6.45	Sept.	5.74	5.93	6.28	6.73	Sept.	----	----	----	----
Oct.	6.12	5.66	5.94	6.13	6.48	6.17	6.06	----	Oct.	----	6.04	6.11	6.36	Oct.	5.66	5.84	6.14	6.60	Oct.	----	----	----	----
Nov.	5.97	5.44	5.78	5.97	6.40	6.04	5.90	----	Nov.	----	5.87	5.97	6.27	Nov.	5.44	5.67	5.97	6.51	Nov.	----	----	----	----
Dec.	6.15	5.49	5.91	6.19	6.65	6.23	6.07	----	Dec.	----	6.03	6.16	6.51	Dec.	5.49	5.78	6.22	6.78	Dec.	----	----	----	----
2008																							
Jan.	6.02	5.33	5.78	6.06	6.54	6.08	5.96	----	Jan.	----	5.87	6.02	6.35	Jan.	5.33	5.68	6.10	6.73	Jan.	----	----	----	----
Feb.	6.24	5.53	5.97	6.26	6.82	6.28	6.19	----	Feb.	----	6.04	6.21	6.60	Feb.	5.53	5.90	6.30	7.04	Feb.	----	----	----	----
Mar.	6.24	5.51	5.90	6.24	6.89	6.29	6.17	----	Mar.	----	5.99	6.21	6.68	Mar.	5.51	5.80	6.27	7.10	Mar.	----	----	----	----
Apr.	6.29	5.55	5.93	6.30	6.97	6.36	6.21	----	Apr.	----	5.99	6.29	6.81	Apr.	5.55	5.86	6.31	7.12	Apr.	----	----	----	----
May	6.30	5.57	6.00	6.30	6.92	6.38	6.22	----	May	----	6.07	6.27	6.79	May	5.57	5.93	6.33	7.05	May	----	----	----	----
June	6.42	5.68	6.11	6.43	7.07	6.50	6.35	----	June	----	6.19	6.38	6.93	June	5.68	6.02	6.48	7.22	June	----	----	----	----
July	6.44	5.67	6.05	6.47	7.16	6.50	6.38	----	July	----	6.13	6.40	6.97	July	5.67	5.97	6.54	7.35	July	----	----	----	----
Aug.	6.42	5.64	6.01	6.46	7.15	6.48	6.35	----	Aug.	----	6.09	6.37	6.98	Aug.	5.64	5.92	6.55	7.31	Aug.	----	----	----	----
Sept.	6.50	5.65	6.03	6.55	7.31	6.59	6.41	----	Sept.	----	6.13	6.49	7.15	Sept.	5.65	5.93	6.60	7.47	Sept.	----	----	----	----
Oct.	7.56	6.28	6.79	7.58	8.88	7.70	7.42	----	Oct.	----	6.95	7.56	8.58	Oct.	6.28	6.63	7.60	9.17	Oct.	----	----	----	----
Nov.	7.65	6.12	6.73	7.68	9.21	7.80	7.49	----	Nov.	----	6.83	7.60	8.98	Nov.	6.12	6.63	7.76	9.44	Nov.	----	----	----	----
Dec.	6.73	5.06	5.81	6.70	8.45	6.87	6.59	----	Dec.	----	5.93	6.54	8.13	Dec.	5.06	5.68	6.85	8.76	Dec.	----	----	----	----
2009																							
Jan.	6.59	5.05	5.84	6.46	8.14	6.77	6.41	----	Jan.	----	6.01	6.39	7.90	Jan.	5.05	5.67	6.52	8.39	Jan.	----	----	----	----
Feb.	6.64	5.27	6.02	6.47	8.08	6.72	6.56	----	Feb.	----	6.11	6.30	7.74	Feb.	5.27	5.93	6.62	8.42	Feb.	----	----	----	----
Mar.	6.84	5.50	6.11	6.66	8.42	6.85	6.83	----	Mar.	----	6.14	6.42	8.00	Mar.	5.50	6.07	6.90	8.84	Mar.	----	----	----	----
Apr.	6.85	5.39	6.17	6.70	8.39	6.90	6.79	----	Apr.	----	6.20	6.48	8.03	Apr.	5.39	6.14	6.90	8.74	Apr.	----	----	----	----
May	6.79	5.54	6.24	6.67	8.06	6.83	6.75	----	May	----	6.23	6.49	7.76	May	5.54	6.24	6.84	8.36	May	----	----	----	----
June	6.52	5.61	6.12	6.39	7.50	6.54	6.49	----	June	----	6.13	6.20	7.30	June	5.61	6.11	6.58	7.69	June	----	----	----	----
July	6.17	5.41	5.71	6.09	7.09	6.15	6.18	----	July	----	5.63	5.97	6.87	July	5.41	5.78	6.20	7.30	July	----	----	----	----
Aug.	5.83	5.26	5.45	5.78	6.58	5.80	5.86	----	Aug.	----	5.33	5.71	6.36	Aug.	5.26	5.56	5.84	6.79	Aug.	----	----	----	----
Sept.	5.61	5.13	5.21	5.56	6.31	5.60	5.62	----	Sept.	----	5.15	5.53	6.12	Sept.	5.13	5.27	5.58	6.50	Sept.	----	----	----	----
Oct.	5.63	5.15	5.24	5.57	6.29	5.64	5.61	----	Oct.	----	5.23	5.55	6.14	Oct.	5.15	5.25	5.59	6.44	Oct.	----	----	----	----
Nov.	5.68	5.19	5.29	5.64	6.32	5.71	5.64	----	Nov.	----	5.33	5.64	6.18	Nov.	5.19	5.26	5.64	6.46	Nov.	----	----	----	----
Dec.	5.78	5.26	5.44	5.77	6.37	5.86	5.71	----	Dec.	----	5.52	5.79	6.26	Dec.	5.26	5.36	5.74	6.47	Dec.	----	----	----	----
2010																							
Jan.	5.76	5.26	5.50	5.76	6.25	5.83	5.69	----	Jan.	----	5.55	5.77	6.16	Jan.	5.26	5.44	5.73	6.33	Jan.	----	----	----	----
Feb.	5.86	5.35	5.62	5.84	6.34	5.94	5.79	----	Feb.	----	5.69	5.87	6.25	Feb.	5.35	5.55	5.80	6.43	Feb.	----	----	----	----
Mar.	5.81	5.27	5.57	5.80	6.27	5.90	5.71	----	Mar.	----	5.64	5.84	6.22	Mar.	5.27	5.49	5.75	6.32	Mar.	----	----	----	----
Apr.	5.80	5.29	5.57	5.78	6.25	5.87	5.71	----	Apr.	----	5.62	5.81	6.19	Apr.	5.29	5.50	5.74	6.32	Apr.	----	----	----	----
May	5.52	4.96	5.25	5.49	6.05	5.59	5.44	----	May	----	5.29	5.50	5.97	May	4.96	5.19	5.47	6.13	May	----	----	----	----
June	5.52	4.88	5.16	5.44	6.23	5.62	5.42	----	June	----	5.22	5.46	6.18	June	4.88	5.11	5.42	6.28	June	----	----	----	----
July	5.32	4.72	4.96	5.25	6.01	5.41	5.23	----	July	----	4.99	5.26	5.98	July	4.72	4.92	5.23	6.04	July	----	----	----	----
Aug.	5.05	4.49	4.72	5.00	5.66	5.10	4.98	----	Aug.	----	4.75	5.01	5.55	Aug.	4.49	4.68	4.98	5.77	Aug.	----	----	----	----
Sept.	5.05	4.53	4.72	5.01	5.66	5.10	5.00	----	Sept.	----	4.74	5.01	5.53	Sept.	4.53	4.70	5.00	5.78	Sept.	----	----	----	----
Oct.	5.15	4.68	4.83	5.09	5.72	5.20	5.08	----	Oct.	----	4.89	5.10	5.62	Oct.	4.68	4.77	5.07	5.81	Oct.	----	----	----	----
Nov.	5.37	4.87	5.07	5.33	5.92	5.45	5.29	----	Nov.	----	5.12	5.37	5.85	Nov.	4.87	5.02	5.29	5.99	Nov.	----	----	----	----
Dec.	5.55	5.02	5.26	5.52	6.10	5.64	5.46	----	Dec.	----	5.32	5.56	6.04	Dec.	5.02	5.19	5.47	6.15	Dec.	----	----	----	----
2011																							
Jan.	5.56	5.04	5.26	5.53	6.09	5.64	5.46	----	Jan.	----	5.29	5.57	6.06	Jan.	5.04	5.22	5.48	6.11	Jan.	----	----	----	----
Feb.	5.66	5.22	5.37	5.64	6.15	5.73	5.58	----	Feb.	----	5.42	5.68	6.10	Feb.	5.22	5.31	5.59	6.19	Feb.	----	----	----	----
Mar.	5.55	5.13	5.28	5.52	6.03	5.62	5.48	----	Mar.	----	5.33	5.56	5.97	Mar.	5.13	5.22	5.48	6.09	Mar.	----	----	----	----
Apr.	5.56	5.16	5.29	5.52	6.02	5.62	5.49	----	Apr.	----	5.32	5.55	5.98	Apr.	5.16	5.25	5.48	6.06	Apr.	----	----	----	----
May	5.33	4.96	5.06	5.29	5.78	5.38	5.27	----	May	----	5.08	5.32	5.74	May	4.96	5.04	5.26	5.81	May	----	----	----	----
June	5.30	4.99	5.04	5.26	5.75	5.33	5.27	----	June	----	5.04	5.26	5.67	June	4.99	5.02	5.25	5.82	June	----	----	----	----
July	5.30	4.93	5.03	5.26	5.76	5.34	5.25	----	July	----	5.05	5.27	5.70	July	4.93	4.99	5.25	5.81	July	----	----	----	----
Aug.	4.79	4.37	4.47	4.74	5.36	4.78	4.79	----	Aug.	----	4.44	4.69	5.22	Aug.	4.37	4.50	4.79	5.49	Aug.	----	----	----	----
Sept.	4.60	4.09	4.23	4.54	5.27	4.61	4.58	----	Sept.	----	4.24	4.48	5.11	Sept.	4.09	4.21	4.59	5.42	Sept.	----	----	----	----
Oct.	4.60	3.98	4.16	4.54	5.37	4.66	4.54	----	Oct.	----	4.21	4.52	5.24	Oct.	3.98	4.11	4.56	5.50	Oct.	----	----	----	----
Nov.	4.39	3.87	3.97	4.34	5.14	4.37	4.41	----	Nov.	----	3.92	4.25	4.93	Nov.	3.87	4.01	4.43	5.34	Nov.	----	----	----	----
Dec.	4.47	3.93	4.03	4.40	5.25	4.47	4.47	----	Dec.	----	4.00	4.33	5.07	Dec.	3.93	4.06	4.46	5.43	Dec.	----	----	----	----

Notes: Moody's® Long-Term Corporate Bond Yield Averages have been published daily since 1929. They are derived from pricing data on a regularly-replenished population of nearly 75 seasoned corporate bonds in the US market, each with current outstandings over $100 million. The bonds have maturities as close as possible to 30 years; they are dropped from the list if their remaining life falls below 20 years, if their ratings change. Bonds with deep discounts or steep premiums to par are generally excluded. All yields are yield-to-maturity calculated on a semi-annual basis. Each observation is an unweighted average, with Average Corporate Yields representing the unweighted average of the corresponding Average Industrial and Average Public Utility observations. Because of the dearth of Aaa -rated railroad term bond issues, Moody's® Aaa railroad bond yield average was discontinued as of December 15, 1967. Moody's® Aaa public utility average suspended from Jan. 1984 thru Sept. 1984, Oct. 1984 figure for last 14 business days only. The Railroad Bond Averages were discontinued as of July 17, 1989 because of insufficient frequently tradable bonds. The July figures were based on 8 business days.
Because of the dearth of Aaa rated public utility bond issues, Moody's Aaa public utility bond yield average was discontinued as of December 10, 2001.

Corporate Bond Yield Averages

Month	AV. CORP.	Corp. Aaa	Corp. Aa	Corp. A	Corp. Baa	P.U.	IND.	R.R.	PU Aaa	PU Aa	PU A	PU Baa	IND Aaa	IND Aa	IND A	IND Baa	RR Aaa	RR Aa	RR A
2012																			
Jan.	4.45	3.85	4.01	4.39	5.23	4.48	4.41	—	—	4.03	4.34	5.06	3.85	3.98	4.43	5.39	—	—	—
Feb.	4.42	3.85	3.99	4.39	5.14	4.47	4.37	—	—	4.02	4.36	5.02	3.85	3.96	4.41	5.26	—	—	—
Mar.	4.54	3.99	4.14	4.51	5.23	4.59	4.50	—	—	4.16	4.48	5.13	3.99	4.12	4.53	5.33	—	—	—
Apr.	4.49	3.96	4.08	4.44	5.19	4.53	4.44	—	—	4.10	4.40	5.11	3.96	4.06	4.48	5.27	—	—	—
May	4.33	3.80	3.91	4.26	5.07	4.36	4.30	—	—	3.92	4.20	4.97	3.80	3.90	4.32	5.17	—	—	—
June	4.22	3.64	3.78	4.14	5.02	4.26	4.18	—	—	3.79	4.08	4.91	3.64	3.77	4.18	5.13	—	—	—
July	4.03	3.40	3.54	3.93	4.87	4.12	3.93	—	—	3.58	3.93	4.85	3.40	3.49	3.93	4.89	—	—	—
Aug.	4.09	3.48	3.61	3.99	4.91	4.18	3.99	—	—	3.65	4.00	4.88	3.48	3.57	3.98	4.93	—	—	—
Sept.	4.09	3.49	3.68	4.01	4.84	4.17	4.00	—	—	3.69	4.02	4.81	3.49	3.66	4.00	4.87	—	—	—
Oct.	3.97	3.47	3.63	3.90	4.58	4.05	3.89	—	—	3.68	3.91	4.54	3.47	3.58	3.89	4.62	—	—	—
Nov.	3.92	3.50	3.57	3.87	4.51	3.95	3.88	—	—	3.60	3.84	4.42	3.50	3.54	3.89	4.60	—	—	—
Dec.	4.05	3.65	3.70	3.98	4.63	4.10	3.99	—	—	3.75	4.00	4.56	3.65	3.65	3.96	4.70	—	—	—
2013																			
Jan.	4.19	3.80	3.87	4.14	4.73	4.24	4.14	—	—	3.90	4.15	4.66	3.80	3.84	4.13	4.81	—	—	—
Feb.	4.27	3.90	3.95	4.19	4.85	4.29	4.25	—	—	3.95	4.18	4.74	3.90	3.95	4.20	4.95	—	—	—
Mar.	4.29	3.93	3.97	4.23	4.85	4.29	4.29	—	—	3.95	4.20	4.72	3.93	3.98	4.25	4.99	—	—	—
Apr.	4.07	3.73	3.77	4.03	4.59	4.08	4.07	—	—	3.74	4.00	4.49	3.73	3.79	4.05	4.69	—	—	—
May	4.23	3.89	3.94	4.19	4.73	4.24	4.22	—	—	3.91	4.17	4.65	3.89	3.97	4.20	4.80	—	—	—
June	4.63	4.27	4.32	4.56	5.19	4.63	4.63	—	—	4.27	4.53	5.08	4.27	4.36	4.58	5.29	—	—	—
July	4.76	4.34	4.46	4.69	5.32	4.78	4.74	—	—	4.44	4.68	5.21	4.34	4.47	4.69	5.43	—	—	—
Aug.	4.88	4.54	4.63	4.78	5.42	4.85	4.92	—	—	4.53	4.73	5.28	4.54	4.72	4.83	5.57	—	—	—
Sept.	4.95	4.64	4.69	4.85	5.47	4.90	4.99	—	—	4.58	4.80	5.31	4.64	4.80	4.90	5.62	—	—	—
Oct.	4.82	4.53	4.59	4.73	5.31	4.78	4.86	—	—	4.48	4.70	5.17	4.53	4.69	4.76	5.44	—	—	—
Nov.	4.91	4.63	4.67	4.82	5.38	4.86	4.95	—	—	4.56	4.77	5.24	4.63	4.79	4.85	5.52	—	—	—
Dec.	4.92	4.62	4.68	4.85	5.38	4.89	4.95	—	—	4.59	4.81	5.25	4.62	4.76	4.89	5.51	—	—	—
2014																			
Jan.	4.76	4.49	4.53	4.69	5.19	4.72	4.78	—	—	4.44	4.63	5.09	4.49	4.62	4.74	5.29	—	—	—
Feb.	4.68	4.45	4.46	4.60	5.10	4.64	4.71	—	—	4.38	4.53	5.01	4.45	4.54	4.66	5.19	—	—	—
Mar.	4.65	4.38	4.44	4.56	5.06	4.63	4.65	—	—	4.40	4.51	5.00	4.38	4.49	4.60	5.13	—	—	—
Apr.	4.52	4.24	4.33	4.45	4.90	4.52	4.51	—	—	4.30	4.41	4.85	4.24	4.36	4.48	4.96	—	—	—
May	4.38	4.16	4.20	4.31	4.76	4.37	4.40	—	—	4.16	4.26	4.69	4.16	4.24	4.35	4.83	—	—	—
June	4.44	4.25	4.26	4.35	4.80	4.42	4.45	—	—	4.23	4.29	4.73	4.25	4.29	4.41	4.86	—	—	—
July	4.37	4.16	4.20	4.28	4.73	4.35	4.39	—	—	4.16	4.23	4.66	4.16	4.23	4.34	4.80	—	—	—
Aug.	4.29	4.08	4.10	4.20	4.69	4.29	4.30	—	—	4.07	4.13	4.65	4.08	4.13	4.26	4.72	—	—	—
Sept.	4.39	4.11	4.19	4.30	4.80	4.40	4.37	—	—	4.18	4.24	4.79	4.11	4.19	4.35	4.82	—	—	—
Oct.	4.22	3.92	3.99	4.13	4.69	4.24	4.20	—	—	3.98	4.06	4.67	3.92	4.00	4.20	4.70	—	—	—
Nov.	4.28	3.92	4.04	4.18	4.79	4.29	4.26	—	—	4.03	4.09	4.75	3.92	4.04	4.27	4.82	—	—	—
Dec.	4.17	3.79	3.89	4.05	4.74	4.18	4.15	—	—	3.90	3.95	4.70	3.79	3.89	4.15	4.77	—	—	—
2015																			
Jan.	3.84	3.46	3.54	3.70	4.45	3.83	3.84	—	—	3.52	3.58	4.39	3.46	3.55	3.82	4.51	—	—	—
Feb.	3.93	3.61	3.64	3.81	4.51	3.91	3.94	—	—	3.62	3.67	4.44	3.61	3.65	3.94	4.57	—	—	—
Mar.	3.98	3.64	3.70	3.85	4.54	3.97	3.97	—	—	3.67	3.74	4.51	3.64	3.72	3.96	4.56	—	—	—
Apr.	3.93	3.52	3.64	3.82	4.48	3.96	3.88	—	—	3.63	3.75	4.51	3.52	3.65	3.89	4.45	—	—	—
May	4.35	3.98	4.07	4.24	4.89	4.38	4.31	—	—	4.05	4.17	4.91	3.98	4.09	4.30	4.86	—	—	—
June	4.56	4.19	4.27	4.45	5.13	4.60	4.52	—	—	4.29	4.39	5.13	4.19	4.25	4.51	5.12	—	—	—
July	4.57	4.15	4.25	4.44	5.20	4.63	4.51	—	—	4.27	4.40	5.22	4.15	4.22	4.49	5.18	—	—	—
Aug.	4.48	4.04	4.13	4.32	5.19	4.54	4.42	—	—	4.13	4.25	5.23	4.04	4.11	4.39	5.15	—	—	—
Sept.	4.59	4.07	4.21	4.43	5.34	4.68	4.49	—	—	4.25	4.39	5.42	4.07	4.16	4.46	5.25	—	—	—
Oct.	4.52	3.95	4.11	4.33	5.34	4.63	4.40	—	—	4.13	4.29	5.47	3.95	4.08	4.37	5.21	—	—	—
Nov.	4.62	4.06	4.21	4.43	5.46	4.73	4.51	—	—	4.22	4.40	5.57	4.06	4.20	4.45	5.34	—	—	—
Dec.	4.58	3.97	4.16	4.38	5.46	4.69	4.47	—	—	4.16	4.35	5.55	3.97	4.16	4.40	5.36	—	—	—
2016																			
Jan.	4.56	4.00	4.12	4.35	5.45	4.62	4.50	—	—	4.09	4.27	5.49	4.00	4.16	4.42	5.40	—	—	—
Feb.	4.44	3.96	3.98	4.22	5.34	4.44	4.43	—	—	3.94	4.11	5.28	3.96	4.02	4.33	5.39	—	—	—
Mar.	4.33	3.82	3.91	4.16	5.13	4.40	4.25	—	—	3.93	4.00	5.12	3.82	3.89	4.16	5.14	—	—	—
Apr.	4.09	3.62	3.71	3.98	4.79	4.16	4.01	—	—	3.74	4.00	4.75	3.62	3.67	3.93	4.82	—	—	—
May	4.04	3.65	3.70	3.94	4.68	4.06	4.02	—	—	3.65	3.93	4.60	3.65	3.73	3.95	4.75	—	—	—
June	3.91	3.50	3.60	3.80	4.53	3.93	3.88	—	—	3.56	3.78	4.47	3.50	3.63	3.82	4.58	—	—	—
July	3.67	3.28	3.39	3.58	4.22	3.70	3.64	—	—	3.36	3.57	4.16	3.28	3.42	3.58	4.27	—	—	—
Aug.	3.70	3.32	3.42	3.60	4.24	3.73	3.66	—	—	3.39	3.59	4.20	3.32	3.45	3.61	4.27	—	—	—
Sept.	3.78	3.41	3.50	3.68	4.31	3.80	3.75	—	—	3.47	3.66	4.27	3.41	3.53	3.69	4.35	—	—	—
Oct.	3.87	3.51	3.61	3.78	4.38	3.90	3.84	—	—	3.59	3.77	4.34	3.51	3.63	3.79	4.40	—	—	—
Nov.	4.20	3.86	3.94	4.11	4.71	4.21	4.19	—	—	3.91	4.08	4.64	3.86	3.97	4.14	4.77	—	—	—
Dec.	4.36	4.06	4.12	4.28	4.83	4.39	4.33	—	—	4.11	4.27	4.79	4.06	4.13	4.29	4.85	—	—	—
2017																			
Jan.	4.22	3.92	3.98	4.16	4.66	4.24	4.20	—	—	3.96	4.14	4.62	3.92	4.00	4.17	4.70	—	—	—
Feb.	4.23	3.95	4.01	4.18	4.64	4.25	4.21	—	—	3.99	4.18	4.58	3.95	4.02	4.19	4.70	—	—	—
Mar.	4.28	4.01	4.06	4.23	4.68	4.30	4.27	—	—	4.04	4.23	4.62	4.01	4.07	4.23	4.74	—	—	—
Apr.	4.16	3.87	3.93	4.12	4.57	4.19	4.13	—	—	3.93	4.12	4.51	3.87	3.92	4.11	4.62	—	—	—
May	4.15	3.85	3.93	4.11	4.55	4.19	4.12	—	—	3.94	4.12	4.50	3.85	3.92	4.09	4.60	—	—	—
June	3.98	3.68	3.78	3.93	4.37	4.01	3.95	—	—	3.77	3.94	4.32	3.68	3.78	3.92	4.41	—	—	—
July	4.01	3.70	3.80	3.98	4.39	4.06	3.96	—	—	3.82	3.99	4.36	3.70	3.78	3.95	4.41	—	—	—
Aug.	3.92	3.63	3.72	3.88	4.31	3.92	3.92	—	—	3.67	3.86	4.23	3.63	3.76	3.90	4.38	—	—	—
Sept.	3.92	3.63	3.73	3.88	4.30	3.93	3.91	—	—	3.70	3.87	4.24	3.63	3.75	3.89	4.37	—	—	—
Oct.	3.94	3.60	3.75	3.91	4.32	3.97	3.90	—	—	3.74	3.91	4.26	3.60	3.74	3.90	4.37	—	—	—
Nov.	3.88	3.57	3.67	3.84	4.27	3.88	3.87	—	—	3.65	3.83	4.16	3.57	3.68	3.85	4.37	—	—	—
Dec.	3.83	3.51	3.61	3.79	4.22	3.85	3.80	—	—	3.62	3.79	4.14	3.51	3.60	3.79	4.31	—	—	—
2018																			
Jan.	3.88	3.55	3.68	3.85	4.26	3.91	3.85	—	—	3.69	3.86	4.18	3.55	3.66	3.84	4.33	—	—	—
Feb.	4.13	3.82	3.95	4.09	4.51	4.15	4.12	—	—	3.94	4.09	4.42	3.82	3.95	4.09	4.60	—	—	—
Mar.	4.20	3.87	3.99	4.14	4.64	4.21	4.19	—	—	3.97	4.13	4.52	3.87	4.00	4.14	4.75	—	—	—
Apr.	4.22	3.85	4.01	4.17	4.67	4.24	4.20	—	—	3.99	4.17	4.58	3.85	4.03	4.17	4.76	—	—	—
May	4.36	4.00	4.12	4.30	4.83	4.36	4.34	—	—	4.10	4.28	4.71	4.00	4.13	4.31	4.94	—	—	—
June	4.35	3.96	4.11	4.29	4.83	4.37	4.33	—	—	4.11	4.27	4.71	3.96	4.11	4.29	4.95	—	—	—
July	4.31	3.87	4.07	4.26	4.79	4.35	4.26	—	—	4.10	4.27	4.67	3.87	4.03	4.23	4.91	—	—	—
Aug.	4.29	3.88	4.05	4.23	4.77	4.33	4.25	—	—	4.08	4.26	4.64	3.88	4.01	4.20	4.89	—	—	—
Sept.	4.38	3.98	4.14	4.31	4.88	4.41	4.35	—	—	4.18	4.32	4.74	3.98	4.09	4.30	5.02	—	—	—
Oct.	4.54	4.14	4.28	4.46	5.07	4.56	4.52	—	—	4.31	4.45	4.91	4.14	4.24	4.45	5.22	—	—	—
Nov.	4.64	4.22	4.34	4.53	5.22	4.65	4.62	—	—	4.40	4.52	5.03	4.22	4.34	4.53	5.34	—	—	—
Dec.	4.49	4.02	4.20	4.37	5.13	4.51	4.47	—	—	4.24	4.37	4.92	4.02	4.16	4.36	5.34	—	—	—

Notes: Moody's® Long-Term Corporate Bond Yield Averages have been published daily since 1929. They are derived from pricing data on a regularly-replenished population of over 100 seasoned corporate bonds in the US market, each with current outstandings over $100 million. The bonds have maturities as close as possible to 30 years, with an average maturity of 28 years. They are dropped from the list if their remaining life falls below 20 years or if their ratings change. Bonds with deep discounts or steep premiums to par are generally excluded. All yields are yield-to-maturity calculated on a semi-annual compounding basis. Each observation is an unweighted average, with Average Corporate Yields representing the unweighted average of the corresponding Average Industrial, Average Public Utility observations. Because of the dearth of Aaa -rated railroad term bond issues, Moody's® Aaa railroad bond yield average was discontinued as of December 18, 1967. Moody's Aaa public utility average was suspended from Jan. 1984 thru Sept. 1984. Oct. 1984 figure for last 14 business days only. The Railroad Bond Averages were discontinued as of July 17, 1989 because of insufficient frequently tradable bonds. The July figures were based on 8 business days.
Because of the dearth of Aaa rated public utility bond issues, Moody's® Aaa public utility bond yield average was discontinued as of December 10, 2001.

3-13. Please refer to Schedule AW-4 to the Direct Testimony of Anjuli Winker. If not already provided as part of Ms. Winker's workpapers, please provide the source documents for all numbers listed in Schedule AW-4.

RESPONSE:

For the source documents for the numbers listed on page 1 of Schedule AW-4, please see the Workpapers to the Direct Testimony of Anjuli Winker. For the source documents for the numbers listed on page 2 of Schedule AW-4, please see Attachment CEHE-OPUC 3-13.

Prepared By: Anjuli Winker
Sponsored By: Anjuli Winker

Attachment 3-13

U.S. DEPARTMENT OF THE TREASURY

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Date	1 Mo	2 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
01/02/19	2.40	2.40	2.42	2.51	2.60	2.50	2.47	2.49	2.56	2.66	2.83	2.97
01/03/19	2.42	2.42	2.41	2.47	2.50	2.39	2.35	2.37	2.44	2.56	2.75	2.92
01/04/19	2.40	2.42	2.42	2.51	2.57	2.50	2.47	2.49	2.56	2.67	2.83	2.98
01/07/19	2.42	2.42	2.45	2.54	2.58	2.53	2.51	2.53	2.60	2.70	2.86	2.99
01/08/19	2.40	2.42	2.46	2.54	2.60	2.58	2.57	2.58	2.63	2.73	2.88	3.00
01/09/19	2.40	2.42	2.45	2.52	2.59	2.56	2.54	2.57	2.64	2.74	2.90	3.03
01/10/19	2.42	2.42	2.43	2.51	2.59	2.56	2.54	2.56	2.63	2.74	2.92	3.06
01/11/19	2.41	2.43	2.43	2.50	2.58	2.55	2.51	2.52	2.60	2.71	2.90	3.04
01/14/19	2.42	2.43	2.45	2.52	2.57	2.53	2.51	2.53	2.60	2.71	2.91	3.06
01/15/19	2.41	2.43	2.45	2.52	2.57	2.53	2.51	2.53	2.61	2.72	2.92	3.08
01/16/19	2.41	2.40	2.43	2.49	2.57	2.55	2.53	2.54	2.62	2.73	2.92	3.07
01/17/19	2.41	2.41	2.42	2.50	2.57	2.56	2.55	2.58	2.66	2.75	2.93	3.07
01/18/19	2.40	2.40	2.41	2.50	2.60	2.62	2.60	2.62	2.70	2.79	2.95	3.09
01/22/19	2.38	2.40	2.43	2.51	2.59	2.58	2.55	2.57	2.65	2.74	2.91	3.06
01/23/19	2.37	2.38	2.41	2.51	2.59	2.58	2.57	2.59	2.66	2.76	2.93	3.07
01/24/19	2.38	2.41	2.37	2.50	2.58	2.56	2.54	2.55	2.62	2.72	2.89	3.04
01/25/19	2.36	2.41	2.39	2.51	2.60	2.60	2.58	2.59	2.66	2.76	2.92	3.06
01/28/19	2.39	2.41	2.42	2.51	2.60	2.60	2.58	2.58	2.65	2.75	2.92	3.06
01/29/19	2.39	2.41	2.42	2.51	2.60	2.56	2.54	2.55	2.61	2.72	2.90	3.04
01/30/19	2.40	2.39	2.42	2.50	2.57	2.52	2.49	2.49	2.58	2.70	2.90	3.06
01/31/19	2.42	2.43	2.41	2.46	2.55	2.45	2.43	2.43	2.51	2.63	2.83	2.99
02/01/19	2.41	2.42	2.40	2.46	2.56	2.52	2.50	2.51	2.59	2.70	2.88	3.03
02/04/19	2.41	2.41	2.42	2.49	2.57	2.53	2.52	2.53	2.62	2.73	2.92	3.06
02/05/19	2.39	2.40	2.42	2.50	2.56	2.53	2.50	2.51	2.60	2.71	2.89	3.03
02/06/19	2.40	2.41	2.42	2.50	2.56	2.52	2.50	2.50	2.59	2.70	2.88	3.03
02/07/19	2.43	2.43	2.42	2.49	2.55	2.48	2.46	2.46	2.54	2.65	2.85	3.00
02/08/19	2.43	2.43	2.43	2.49	2.54	2.45	2.43	2.44	2.53	2.63	2.82	2.97
02/11/19	2.44	2.44	2.45	2.51	2.55	2.48	2.47	2.47	2.56	2.65	2.85	3.00
02/12/19	2.42	2.43	2.43	2.50	2.55	2.50	2.48	2.49	2.58	2.68	2.87	3.02
02/13/19	2.42	2.42	2.44	2.51	2.55	2.53	2.52	2.53	2.61	2.71	2.89	3.04
02/14/19	2.45	2.43	2.43	2.51	2.53	2.50	2.48	2.48	2.56	2.66	2.85	3.01
02/15/19	2.43	2.43	2.43	2.50	2.55	2.52	2.50	2.49	2.57	2.66	2.84	3.00

02/19/19	2.44	2.42	2.45	2.52	2.54	2.50	2.47	2.47	2.55	2.65	2.84	2.99
02/20/19	2.41	2.42	2.45	2.51	2.54	2.50	2.47	2.47	2.55	2.65	2.84	3.00
02/21/19	2.43	2.44	2.45	2.51	2.55	2.53	2.49	2.51	2.59	2.69	2.89	3.05
02/22/19	2.43	2.45	2.46	2.51	2.55	2.48	2.46	2.47	2.55	2.65	2.86	3.02
02/25/19	2.44	2.46	2.47	2.51	2.56	2.51	2.48	2.48	2.57	2.67	2.87	3.03
02/26/19	2.43	2.44	2.45	2.51	2.55	2.48	2.44	2.45	2.54	2.64	2.84	3.01
02/27/19	2.43	2.44	2.45	2.52	2.54	2.50	2.48	2.49	2.59	2.69	2.91	3.07
02/28/19	2.44	2.47	2.45	2.50	2.54	2.52	2.50	2.52	2.63	2.73	2.94	3.09
03/01/19	2.44	2.46	2.44	2.52	2.55	2.55	2.54	2.56	2.67	2.76	2.97	3.13
03/04/19	2.45	2.46	2.46	2.54	2.54	2.55	2.52	2.53	2.63	2.72	2.93	3.09
03/05/19	2.44	2.45	2.46	2.53	2.54	2.55	2.52	2.53	2.63	2.72	2.93	3.08
03/06/19	2.43	2.44	2.47	2.53	2.54	2.52	2.49	2.49	2.59	2.69	2.90	3.06
03/07/19	2.45	2.46	2.45	2.52	2.52	2.47	2.44	2.44	2.54	2.64	2.86	3.03
03/08/19	2.45	2.46	2.46	2.52	2.53	2.45	2.43	2.42	2.51	2.62	2.83	3.00
03/11/19	2.44	2.45	2.46	2.54	2.53	2.47	2.45	2.44	2.53	2.64	2.86	3.03
03/12/19	2.44	2.46	2.46	2.53	2.52	2.45	2.41	2.41	2.50	2.61	2.82	3.00
03/13/19	2.43	2.44	2.45	2.53	2.53	2.45	2.41	2.42	2.51	2.61	2.82	3.02
03/14/19	2.48	2.46	2.45	2.52	2.52	2.46	2.42	2.43	2.53	2.63	2.86	3.04
03/15/19	2.46	2.46	2.45	2.52	2.52	2.43	2.39	2.40	2.49	2.59	2.83	3.02
03/18/19	2.47	2.46	2.44	2.51	2.52	2.45	2.41	2.42	2.51	2.60	2.83	3.01
03/19/19	2.46	2.47	2.46	2.52	2.50	2.46	2.42	2.42	2.51	2.61	2.84	3.02
03/20/19	2.45	2.45	2.48	2.49	2.47	2.40	2.34	2.34	2.44	2.54	2.79	2.98
03/21/19	2.51	2.47	2.49	2.50	2.48	2.41	2.34	2.34	2.44	2.54	2.78	2.96
03/22/19	2.49	2.48	2.46	2.48	2.45	2.31	2.24	2.24	2.34	2.44	2.69	2.88
03/25/19	2.47	2.47	2.46	2.49	2.41	2.26	2.19	2.21	2.32	2.43	2.68	2.87
03/26/19	2.46	2.44	2.46	2.49	2.44	2.24	2.18	2.18	2.29	2.41	2.67	2.86
03/27/19	2.45	2.43	2.44	2.46	2.40	2.22	2.16	2.18	2.28	2.39	2.63	2.83
03/28/19	2.44	2.45	2.43	2.44	2.40	2.23	2.18	2.20	2.29	2.39	2.62	2.81
03/29/19	2.43	2.44	2.40	2.44	2.40	2.27	2.21	2.23	2.31	2.41	2.63	2.81
04/01/19	2.42	2.43	2.43	2.46	2.41	2.33	2.29	2.31	2.40	2.49	2.71	2.89
04/02/19	2.43	2.42	2.42	2.45	2.41	2.30	2.26	2.28	2.38	2.48	2.70	2.88
04/03/19	2.42	2.43	2.44	2.45	2.41	2.33	2.29	2.32	2.42	2.52	2.75	2.93
04/04/19	2.43	2.43	2.44	2.46	2.41	2.33	2.29	2.32	2.41	2.51	2.74	2.92
04/05/19	2.42	2.43	2.44	2.46	2.43	2.35	2.30	2.31	2.40	2.50	2.72	2.91
04/08/19	2.43	2.44	2.43	2.48	2.43	2.36	2.31	2.33	2.42	2.52	2.74	2.93
04/09/19	2.42	2.43	2.42	2.46	2.42	2.35	2.31	2.31	2.40	2.51	2.73	2.92
04/10/19	2.40	2.41	2.43	2.46	2.41	2.31	2.27	2.26	2.37	2.48	2.71	2.90
04/11/19	2.42	2.43	2.43	2.46	2.44	2.35	2.30	2.31	2.40	2.51	2.74	2.94
04/12/19	2.41	2.43	2.44	2.47	2.44	2.40	2.36	2.38	2.47	2.56	2.78	2.97
04/15/19	2.42	2.43	2.43	2.46	2.43	2.40	2.36	2.37	2.46	2.55	2.77	2.96
04/16/19	2.43	2.44	2.43	2.47	2.45	2.41	2.38	2.41	2.50	2.60	2.81	2.99
04/17/19	2.43	2.44	2.44	2.47	2.44	2.40	2.37	2.40	2.49	2.59	2.81	2.99
04/18/19	2.44	2.44	2.42	2.47	2.44	2.38	2.36	2.38	2.46	2.57	2.78	2.96
04/22/19	2.44	2.44	2.44	2.47	2.46	2.38	2.36	2.39	2.49	2.59	2.82	2.99
04/23/19	2.43	2.44	2.45	2.46	2.43	2.36	2.34	2.36	2.46	2.57	2.81	2.98
04/24/19	2.42	2.43	2.44	2.46	2.42	2.32	2.28	2.32	2.41	2.53	2.76	2.94
04/25/19	2.43	2.44	2.43	2.46	2.42	2.33	2.29	2.33	2.42	2.54	2.76	2.94
04/26/19	2.42	2.43	2.42	2.46	2.41	2.28	2.25	2.29	2.39	2.51	2.74	2.92
04/29/19	2.45	2.45	2.44	2.47	2.42	2.30	2.27	2.32	2.42	2.54	2.78	2.96

Date												
04/30/19	2.43	2.44	2.43	2.46	2.39	2.27	2.24	2.28	2.39	2.51	2.75	2.93
05/01/19	2.42	2.41	2.43	2.44	2.39	2.31	2.28	2.31	2.41	2.52	2.74	2.92
05/02/19	2.44	2.46	2.47	2.46	2.41	2.35	2.32	2.34	2.44	2.55	2.77	2.94
05/03/19	2.42	2.44	2.43	2.46	2.41	2.33	2.30	2.33	2.43	2.54	2.75	2.93
05/06/19	2.43	2.44	2.44	2.46	2.39	2.31	2.27	2.30	2.40	2.51	2.73	2.91
05/07/19	2.44	2.44	2.43	2.46	2.37	2.28	2.24	2.25	2.35	2.45	2.68	2.86
05/08/19	2.42	2.43	2.43	2.45	2.37	2.30	2.26	2.28	2.38	2.49	2.71	2.89
05/09/19	2.43	2.43	2.43	2.46	2.36	2.26	2.22	2.25	2.34	2.45	2.69	2.87
05/10/19	2.42	2.43	2.43	2.45	2.36	2.26	2.23	2.26	2.37	2.47	2.70	2.89
05/13/19	2.41	2.42	2.41	2.42	2.32	2.18	2.15	2.18	2.28	2.40	2.65	2.83
05/14/19	2.41	2.42	2.41	2.43	2.32	2.20	2.17	2.20	2.30	2.42	2.67	2.86
05/15/19	2.40	2.41	2.42	2.43	2.30	2.16	2.12	2.15	2.25	2.37	2.63	2.82
05/16/19	2.40	2.41	2.40	2.43	2.33	2.20	2.15	2.18	2.28	2.40	2.65	2.84
05/17/19	2.39	2.40	2.39	2.42	2.33	2.20	2.15	2.17	2.27	2.39	2.63	2.82
05/20/19	2.39	2.39	2.39	2.42	2.34	2.21	2.17	2.21	2.30	2.41	2.65	2.83
05/21/19	2.37	2.38	2.39	2.42	2.36	2.26	2.20	2.23	2.33	2.43	2.67	2.84
05/22/19	2.36	2.37	2.38	2.41	2.37	2.23	2.17	2.19	2.28	2.39	2.64	2.82
05/23/19	2.38	2.38	2.37	2.40	2.32	2.12	2.08	2.11	2.20	2.31	2.56	2.75
05/24/19	2.37	2.38	2.36	2.39	2.33	2.16	2.10	2.12	2.22	2.32	2.57	2.75
05/28/19	2.35	2.36	2.37	2.38	2.31	2.12	2.06	2.06	2.16	2.26	2.52	2.70
05/29/19	2.35	2.36	2.37	2.38	2.30	2.09	2.04	2.05	2.16	2.25	2.50	2.69
05/30/19	2.37	2.38	2.38	2.40	2.29	2.06	2.00	2.03	2.12	2.22	2.46	2.65
05/31/19	2.35	2.36	2.36	2.35	2.21	1.95	1.90	1.93	2.03	2.14	2.39	2.58
06/03/19	2.36	2.36	2.35	2.31	2.11	1.82	1.79	1.83	1.95	2.07	2.34	2.53
06/04/19	2.34	2.36	2.35	2.29	2.11	1.88	1.84	1.89	2.01	2.12	2.41	2.60
06/05/19	2.31	2.35	2.35	2.25	2.04	1.83	1.81	1.86	2.00	2.12	2.42	2.63
06/06/19	2.32	2.35	2.33	2.22	2.02	1.88	1.85	1.88	2.01	2.12	2.42	2.62
06/07/19	2.30	2.32	2.28	2.15	1.97	1.85	1.82	1.85	1.97	2.09	2.36	2.57
06/10/19	2.30	2.31	2.29	2.21	2.03	1.90	1.87	1.91	2.03	2.15	2.42	2.62

* The 2-month constant maturity series begins on October 16, 2018, with the first auction of the 8-week Treasury bill.

30-year Treasury constant maturity series was discontinued on February 18, 2002 and reintroduced on February 9, 2006. From February 18, 2002 to February 8, 2006, Treasury published alternatives to a 30-year rate. See Long-Term Average Rate for more information.

Treasury discontinued the 20-year constant maturity series at the end of calendar year 1986 and reinstated that series on October 1, 1993. As a result, there are no 20-year rates available for the time period January 1, 1987 through September 30, 1993.

Treasury Yield Curve Rates: These rates are commonly referred to as "Constant Maturity Treasury" rates, or CMTs. Yields are interpolated by the Treasury from the daily yield curve. This curve, which relates the yield on a security to its time to maturity is based on the closing market bid yields on actively traded Treasury securities in the over-the-counter market. These market yields are calculated from composites of indicative, bid-side market quotations (not actual transactions) obtained by the Federal Reserve Bank of New York at or near 3:30 PM each trading day. The CMT yield values are read from the yield curve at fixed maturities, currently 1, 2, 3 and 6 months and 1, 2, 3, 5, 7, 10, 20, and 30 years. This method provides a yield for a 10 year maturity, for example, even if no outstanding security has exactly 10 years remaining to maturity.

Treasury Yield Curve Methodology: The Treasury yield curve is estimated daily using a cubic spline model. Inputs to the model are primarily indicative bid-side yields for on-the-run Treasury securities. Treasury reserves the option to make changes to the yield curve as appropriate and in its sole discretion. See our Treasury Yield Curve Methodology page for details.

Negative Yields and Nominal Constant Maturity Treasury Series Rates (CMTs): At times, financial market conditions, in conjunction with extraordinary low levels of interest rates, may result in negative yields for some Treasury securities trading in the secondary market. Negative yields for Treasury securities most often reflect highly technical factors in Treasury markets related to the cash and repurchase agreement markets, and are at times unrelated to the time value of money.

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At such times, Treasury will restrict the use of negative input yields for securities used in deriving interest rates for the Treasury nominal Constant Maturity Treasury series (CMTs). Any CMT input points with negative yields will be reset to zero percent prior to use as inputs in the CMT derivation. This decision is consistent with Treasury not accepting negative yields in Treasury nominal security auctions.

In addition, given that CMTs are used in many statutorily and regulatory determined loan and credit programs as well as for setting interest rates on non-marketable government securities, establishing a floor of zero more accurately reflects borrowing costs related to various programs.

For more information regarding these statistics contact the Office of Debt Management by email at debt.management@do.treas.gov.

For other Public Debt Information contact (202) 504-3550

3-14. Please refer to the Direct Testimony of Karl Nalepa at pages 46-49. Please confirm that Mr. Nalepa is proposing to adjust both the Company's revenue requirement by $1.205 million and the Company's revenues by $1.205 million to remove the impacts of the Company's proposed energy efficiency billing determinant adjustment. If so, please explain why it is necessary to make both of these adjustments to remove the impacts of the energy efficiency adjustment and provide all calculations and other support for Mr. Nalepa's recommendation.

RESPONSE:

Not confirmed. Mr. Nalepa recommends removal of the Company's proposed energy efficiency program adjustment, which increases test year revenues by $1.205 million. His recommendation does not affect the total revenue requirement, but does reduce the Company's proposed *increase* in revenues by $1.205 million.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

3-15. Please explain Mr. Nalepa's opinion as to how the Company's proposed energy efficiency billing determinant adjustment for changes to test year costs is different from a test year weather normalization adjustment.

RESPONSE:

The Company's proposed energy efficiency program adjustment is a novel attempt to recover lost revenues by annualizing the calculated impact of certain energy efficiency programs that cannot otherwise be directly measured. In contrast, a weather normalization adjustment uses actual temperature data to remove the effect of non-normal weather conditions from test year energy consumption so that energy consumption under recent normal conditions can be determined. These adjustments also differ because the Commission has twice rejected similar attempts by the Company to impute an energy efficiency lost revenue adjustment, which no other utility employs. Conversely, the Company typically applies a weather normalization adjustment in developing rates, and the Commission generally requires utilities to weather normalize test year revenues in rate-making proceedings.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

3-16. Please explain Mr. Nalepa's opinion as to how the Company's proposed energy efficiency billing determinant adjustment for changes to test year costs is different from a test year customer count adjustment.

RESPONSE:

The Company's proposed energy efficiency program adjustment is a novel attempt to recover lost revenues by annualizing the assumed impact of certain energy efficiency programs that cannot otherwise be directly measured. In contrast, a customer count adjustment uses actual customer data to account for customer growth during the test year so that energy consumption using the most recent (test year-end) customer counts can be determined. These adjustments also differ because the Commission has twice rejected similar attempts by the Company to impute an energy efficiency lost revenue adjustment, which no other utility employs. Conversely, the Company typically applies a customer count adjustment in developing rates, and the Commission generally requires utilities to adjust for customer growth in rate-making proceedings.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document was served on all parties of record in this proceeding on this 14th day of June 2019, by facsimile, electronic mail, and/or first class, U.S. Mail.

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Cassandra Quinn