STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

PETITION OF AQUA INDIANA, INC. PURSUANT TO IC 8-1-2-42.7 AND 170 IAC 1-5 FOR AUTHORITY TO INCREASE THE MONTHLY RECURRING RATES AND CHARGES CURRENTLY CHARGED AND COLLECTED BY ITS ABOITE WASTEWATER DIVISION FOR WASTEWATER UTILITY SERVICES PROVIDED IN PORTIONS OF ALLEN, HUNTINGTON AND WHITLEY COUNTIES; ESTABLISH A NON-RECURRING SYSTEM DEVELOPMENT CHARGE TO BE CHARGED AND COLLECTED BY THE ABOITE WASTEWATER DIVISION AND IMPLEMENT NEW RATE SCHEDULES REFLECTING THE RATES AND CHARGES APPROVED IN THIS CAUSE	)	**CAUSE NO. 44752**

TESTIMONY OF

CRYSTAL L. THACKER – PUBLIC'S EXHIBIT NO. 4

ON BEHALF OF THE

INDIANA OFFICE OF UTILITY CONSUMER COUNSELOR

JUNE 24, 2016

Respectfully submitted,

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Deputy Consumer Counselor

TESTIMONY OF OUCC WITNESS CRYSTAL L. THACKER
CAUSE NO. 44752
AQUA INDIANA, INC. – ABOITE WASTEWATER DIVISION

I. INTRODUCTION

Q: Please state your name and business address.

A: My name is Crystal L. Thacker, and my business address is 115 W. Washington St., Suite 1500 South, Indianapolis, Indiana 46204.

Q: By whom are you employed and in what capacity?

A: I am employed by the Indiana Office of Utility Consumer Counselor ("OUCC") as a Utility Analyst II in the Electric Division. My qualifications are set forth in Appendix A to this testimony.

Q: What is the purpose of your testimony?

A: I present the OUCC's cost of equity analysis. I recommend and support the OUCC's 9.0% cost of equity.

Q: Please describe the review and analysis you conducted in order to prepare your testimony.

A: I reviewed the Petition, testimony and exhibits filed by Aqua Indiana, Inc. ("Petitioner" or "Aqua") in this Cause. I reviewed various publications related to cost of equity. Additionally, I reviewed Petitioner's responses to discovery.

Q: Please summarize your cost of equity testimony.

A: To estimate Petitioner's cost of equity, I used both a Discounted Cash Flow ("DCF") model and a Capital Asset Pricing Model ("CAPM"). My recommended 9.0% cost of equity is 36 basis points above the high point of my models' range and

135 basis points below Petitioner's proposed cost of equity.[1] Using the cost of debt identified by OUCC witness Edward R. Kaufman, my 9.0% cost of equity results in a weighted cost of capital of 6.7854%.[2]

Table CLT-1
Cost of Equity Ranges

Methodology	Range
DCF	8.12% - 8.64%
CAPM	7.71% - 8.42%

II. PROXY GROUP

Q: Please describe your proxy group.

A: I used a proxy group of eight water utilities included in Value Line Investment Survey. This is the same utility proxy group Petitioner's witness Dylan D'Ascendis employed in his cost of equity analysis.

III. DISCOUNTED CASH FLOW MODEL

Q: Please describe the DCF model.

A: The DCF model is based on the "dividend discount model" of financial theory, which maintains that the value of any security or commodity is the discounted present value of all future cash flows. The most common variation of the DCF model (as used in regulation) is the "constant growth" or "Gordon DCF model."

[1] Petitioner's Direct Testimony of Bobby D. Estep, Schedule D-1, line 10.
[2] See OUCC Schedule 9 attached to the OUCC Testimony of Margaret A. Stull.

The Gordon DCF model assumes that dividends are expected to grow at a constant rate.

$$K=(D/P)+g$$

Where: K=discount rate (cost of equity)
D=current dividend rate
P=current price
g=constant rate of expected growth

This formula recognizes that the return expected or required by investors includes the dividend yield (current income) and expected growth in dividends (future income).

Q: What current dividend yields did you use in your DCF analyses?

A: I used both a three-month average dividend yield of 2.33% and a six-month average dividend yield of 2.49% (before adjusting to forward yields). Schedule CLT-2, page 1 displays the average dividend yields of my proxy group.

Q: Did you convert the current dividend yields to forward dividend yields?

A: Yes. In order to determine the forward yields (D_1/P_0), I converted the current dividend yields (D_0/P_0) to forward yields (D_1/P_0) using the one-half-years growth methodology. Mr. D'Ascendis also used the one-half-years growth methodology in his DCF analysis.

Q: Please explain the one-half-years growth methodology to convert the dividend yields in your DCF model?

A: To calculate a forward yield, I adjusted the current yield using the following equation:

$$(D_1/P_0) = (D_0/P_0) * (1 + .5g)$$

Where: (D_1/P_0) = forward yield

(D_0/P_0) = current yield

g = growth rate

This dividend yield component recognizes the timing of dividend payments and dividend increases.

Q: Has the Commission supported the use of the one-half-year's growth methodology to convert current yields to forward yields?

A: Yes. Although there is no universally accepted methodology, the one-half-times growth methodology to convert current yields to forward yields has been regularly accepted by this Commission and was affirmed in its order in Cause No. 40103, Indiana-American Water Company, Inc. order dated May 30, 1996. On page 40 of its order, the Commission expressed its belief that the forward dividend yield, and not the full year method, fairly represents the dividend payments expected and received by investors:

> We are well aware of the advantages and limitations of the various approaches used by each of the witnesses. For example, the half-year method used by the OUCC for calculating the forward dividend yield is the most frequently used approach in this jurisdiction, and it is rarely a point of contention in DCF analysis. We believe that it fairly represents the dividend payments expected and received by investors, while the full year method employed by Petitioner overstates the dividend yield.

Q: What growth rates (g) do you use in your two DCF analyses?

A: I use a 5.72% growth rate in my first analysis[3] and a 6.07% growth rate in my second analysis.[4]

Q: Please describe the growth rate (g) you used in your first DCF analysis.

A: I used both historical and forecasted growth rates of dividends per share ("DPS"), earnings per share ("EPS"), and book value per share ("BVPS"). I used Value Line as my source of growth rates.[5] DPS, EPS, and BVPS are three of the most commonly-used financial indicators to evaluate growth.

Value Line provides forecasted and historical growth rates of EPS, DPS, and BVPS. Value Line publishes both 5 and 10 year historical growth rates, but only a single 5 year forecasted growth rate. To attain an equal weighting between historical and forecasted growth rates, I averaged the two historical growth rates, then averaged that result with the forecasted growth rate, giving historical growth and forecasted growth the same weight. I averaged the weighted EPS, DPS and BVPS growth rates to estimate a 5.72% growth rate variable

Q: How did you estimate the growth rate (g) for the second DCF model?

A: I averaged forecasted growth in EPS reported by Value Line, Yahoo.com (Thomson Financial Network), and Zacks to estimate a 6.07% growth rate.[6]

Q: Why didn't you eliminate low growth rates from your DCF analysis?

A: While investors may not expect low growth to occur, if a company experiences low historical growth rates or is forecasted to experience low growth rates, investors

[3] See Schedule CLT-2, page 1.
[4] See Schedule CLT-2, page 2.
[5] See Schedule CLT-2, page 1.
[6] See Schedule CLT-2, page 2.

will consider those low growth rates when estimating a company's future growth rate. Low growth rates are not ignored by investors. Also, one should consistently use or reject *both* high positive growth rates and low positive growth rates. My analysis uses several double digit growth rates, and it is consistent to also consider low positive growth rates. While growth rates as high as 15.0% or as low as 1.5% by themselves may not reflect investor expectations, they should not be ignored. If you remove or include low growth rates, you also need to remove or include high growth rates to be consistent.

Q: Do you consider your growth rates to be reasonable?

A: Yes. Research shows that a company cannot sustain a growth rate over the long run that is greater than the growth rate of the economy.[7] Table CLT-2 lists sources I reviewed of long-term growth forecasts of the U.S. economy that produced a forecasted nominal Gross Domestic Product ("GDP") growth rate between 4.0% and 4.4%.

[7] How improper risk assessment leads to overstated required returns for utility stocks by Steven G. Kihm, NRRI Journal of Applied Regulation, Volume 1, June 2003. See also, What risk premium is "normal"? by Robert D. Arnott and Peter L. Bernstein, Financial Analysts Journal, March/April 2002, Volume 58, No. 2.

Table CLT-2
Long-Term Growth Forecasts of the U.S. Economy

Document	Attachment	Forecast
The Budget and Economic Outlook: 2016 to 2026 U.S. Congressional Budget Office January 2016	OUCC Testimony of Crystal L. Thacker, Attachment CLT-1	Nominal GDP Projected Annual Average 2015-2025: 4.0%
Survey of Professional Forecasters Federal Reserve Bank of Philadelphia February 12, 2016	OUCC Testimony of Edward R. Kaufman, Attachment ERK 4	2.28% long-term real GDP growth + 2.12% long-term inflation = 4.4% annual nominal GDP growth rate
Blue Chip Financial Forecasts Vol. 35, No. 6, June 1, 2016	OUCC Testimony of Edward R. Kaufman, Attachment ERK 2	2.2% average real GDP growth rate + 2.1% GDP Chained Price Index = 4.3% annual nominal GDP growth rate

Q: What are the results of your DCF analyses?

A: The results of my DCF analyses are presented on Schedule CLT-2 and range from 8.12% to 8.64%.

IV. CAPITAL ASSET PRICING MODEL

Q: Please describe your CAPM analysis.

A: The Capital Asset Pricing Model, or CAPM, is a method used to estimate the cost of capital for a company. The CAPM assumes investors make choices based on risk and return. Investors require a higher return for assuming additional risk. The CAPM separates risk into two categories: systematic and unsystematic. Systematic risk, or market risk, includes inflation, monetary policy, fiscal policy, and politics. Unsystematic risk, or firm-specific risk, includes merger activity, management decisions, labor issues, and other risks unique to a company.

Investors can reduce or eliminate unsystematic risk through diversification; the total risk of a portfolio is less than the risk of individual securities in a portfolio. Systematic risk cannot be reduced or eliminated as it affects all securities to some degree. However, an investor can create a portfolio to assume the amount of (systematic) market risk the investor finds acceptable. Therefore, an investor's required return depends on the market risk the investor assumes.

Q: How is systematic risk measured?

A: The measure of an asset's risk in relation to the market as a whole is described as its "beta." By definition, the overall market has a beta of one (1.0). Because it is difficult to measure the return on all assets, analysts typically rely on a market index as a proxy for the market. Assets more volatile than the market will have a beta greater than 1.0 and are considered riskier than the market. Assets less volatile than the market will have a beta less than 1.0 and are considered less risky than the market.

The general form of the CAPM is:

$K = Rf_c + B*(Rm-Rf)$ where,

where:

K	=	Cost of Equity
Rf_c	=	Current Risk-Free Rate of Return
B	=	Beta
Rm-Rf	=	Expected Market Equity Risk Premium
Rm	=	Market Equity Return
Rf	=	Risk-Free Rate of Return

The return on an asset (K) equals the risk-free rate of return (Rf_c) plus its beta (B) multiplied by the market equity risk premium (Rm - Rf). The market equity risk premium equals the market equity return minus the risk-free rate of return.

Q: What source did you use to estimate beta?

A: I used Value Line as my source of beta. Based on Value Line data, my water company proxy group produces an average beta of 0.713.[8]

Q: Did you use a geometric mean risk premium or an arithmetic mean risk premium in your CAPM analysis?

A: I used both geometric and arithmetic mean risk premiums. I prefer the geometric mean, but both calculations provide meaningful insight when estimating a market risk premium for the CAPM. Both have extensive documentation and articles supporting their use.[9] I also perform a second CAPM analysis that uses a forecasted market risk premium.

Q: Has the Commission ruled on the use of arithmetic mean risk premiums versus geometric mean risk premiums?

A: Yes. This Commission has given weight to both methodologies. In the Commission Order in Cause No. 39315, the Commission said both means should be used:

> As in the Indiana Cities case, we find there is merit in using both the arithmetic and geometric means and that neither result should be relied upon to the exclusion of the other.[10]

The Commission reaffirmed that position in Cause No. 43860:

> Neither the arithmetic risk premium nor the geometric mean risk premium should be excluded in favor of the other, and nothing has caused us to change our opinion regarding the appropriate application of both arithmetic and geometric mean risk premiums. Therefore, the Commission will continue to give both the geometric and arithmetic mean risk premiums substantial weight.[11]

[8] See Schedule CLT-3, page 2.
[9] See OUCC witness Edward R. Kaufman's Testimony, Appendix E.
[10] Cause No. 39315, Commission Order, dated October 21, 1992, page 12.
[11] Cause No. 43860, Commission Order, dated April 30, 2010, page 48.

Q: When calculating a market risk premium, do you use total returns or income returns?

A: I use total returns because investors consider growth potential as well as income when buying long-term bonds. Therefore, total returns for equity and debt investments should be considered when estimating a risk premium.

Q: How has the Commission ruled on the use of total returns versus income returns?

A: In Indiana-American Water Company Inc.'s, Cause No. 42520 the Commission agreed total returns and not income returns should be used to estimate a historical risk premium. Page 59 of the final order states as follows:

> Another area of disagreement in the CAPM analysis is whether the model should use total returns or income returns. We find Mr. Gorman's analysis in this area to be the most persuasive. The income return on Treasury bonds, is simply the average of Treasury bond yield quotes over the historical period, and this yield quote does not measure the actual return investors earn by making investments in Treasury bonds. Investors simply cannot invest only in Treasury bond income returns. Rather, investors must take the risk of variations in bond prices before they invest in treasury bonds. Therefore the actual return experienced by investors in Treasury securities is measured by total return, not simply the income return.

Q: Did you use forecasted information as well as historical data to estimate a risk premium?

A: Yes. In addition to the historical data discussed above I used forecasted risk premiums in my CAPM.

Q: What forecasted market risk premium did you use in your CAPM?

A: I relied on several sources, including the Survey of Professional Forecasters, Dr. Aswath Damodaran's home page, and KPMG. These sources are listed in Table CLT-3. After eliminating the lowest result, these sources produce a range of forecasted risk premiums from 4.51% to 6.22%. Based on these sources and

historically low interest rates, a forecasted risk premium of 6.20% is reasonable at this time.

Table CLT-3
Forecasted Market Risk Premiums

Document	Attachment	Forecast
The Equity Risk Premium in 2015 John R. Graham and Campbell R. Harvey Duke CFO Global Business Outlook October 2, 2015	OUCC Testimony of Crystal L. Thacker, Attachment CLT-2	4.51%
Equity Market Risk Premium – Research Summary KPMG April 12, 2016	OUCC Testimony of Edward R. Kaufman, Attachment ERK 7	5.75%
Client Alert Duff & Phelps March 16, 2016	OUCC Testimony of Crystal L. Thacker, Attachment CLT-3	5.50%
Survey of Professional Forecasters Federal Reserve Bank of Philadelphia February 12, 2016	OUCC Testimony of Edward R. Kaufman, Attachment ERK 4	5.37% stock returns – 3.39% rate on 10-Year Treasury Bonds = 1.98% implied risk premium
Damodaran Online Aswath Damodaran Stern School of Business at New York University May, 2016	http://people.stern.nyu.edu/adamodar/New_Home_Page/home.htm	6.22%

Q: How did you estimate the risk-free rate used in your CAPM?

A: Analysts generally recognize U.S. Treasury Securities as a source for the risk-free rate. On June 21, 2016, the spot yield of a 30 Year T-Bond was 2.49%.[12] However,

[12] As reported on CNBC.com.

long term U.S. Treasury yields are at historically low levels. Therefore, I used a "Normalized 20-year Treasury Yield" of 4.0% as published by Duff & Phelps ("D&P") in a Client Alert on March 16, 2016. In its March 16, 2016 publication, D&P suggested use of this rate when the risk-free rate is abnormally low. Page 14 of its article states as follows:

> To be clear, in most circumstances we would prefer using the "spot" yield (i.e., the yield available in the market) on a safe government security as a proxy for the risk-free rate. However, during times of flight to quality and/or high levels of central bank intervention (such as the period beginning with the Financial Crises) those lower observed yields imply a lower cost of capital (all other factors held the same), just the opposite of what one would expect in times of relative economy-wide distress and uncertainty. During these periods, using a non-normalized risk-free rate (with no corresponding adjustments to the ERP) would likely lead to an *underestimated* cost of equity capital, and so a "normalization" adjustment may be a reasonable approach to address the apparent inconsistency.

I agree it is generally preferable to use current spot yields, but not when they produce inappropriately low results. At this time, current yields would produce inappropriately low results.

Q: How did D&P derive its 4.0% Normalized Risk-Free Rate?

A: D&P combines the long term real risk-free rate with forecasted inflation. Based on studies of inflation swap rates and/or yields on long-term U.S. Treasury Inflation-Protected Securities (TIPS), D&P concluded that the long-term real risk-free rate is 1.2% to 2.0%. D&P then reviewed several sources, to develop an expected range of forecasted inflation rates of 1.8% to 2.6%.[13] D&P combined the two ranges to

[13] See Attachment CLT-3, page 30.

derive its estimated "Normalized Risk-Free Rate" of 3.0% to 4.6% and concludes that a 4.0% Normalized Risk-Free Rate is reasonable.

Q: Did you also review current yields to estimate a risk-free rate of return?

A: Yes. I reviewed short, intermediate and long-term risk-free rates, but my estimated cost of equity relies on long term yields. As shown in Schedule CLT-3, I reviewed one year Treasury notes as an estimate of short-term yields, an average of five year and ten year notes as an estimate of intermediate-term yields, and 30 year notes as an estimate of long-term yields. More specifically, I reviewed the three month and six month averages of these yields.

Q: Please provide a brief summary of your CAPM results.

A: To estimate cost of equity, using a water proxy group beta of 0.713 and historical risk premium, I calculated both a geometric mean risk premium and an arithmetic mean risk premium. I then averaged the risk premiums and combined the risk premiums with the risk-free interest rate of 4.0% as described above. This results in an estimated cost of equity of 7.71%.[14]

To estimate cost of equity, using a water proxy group beta of 0.713 and forecasted risk premium, I combined a 6.20% risk premium with the long term risk-free interest rate of 4.0%. This results in an estimated cost of equity of 8.42%.[15]

V. COST OF EQUITY

Q: What is your recommended cost of equity?

A: I recommend a 9.0% cost of equity for Petitioner. The results of my DCF and CAPM analyses for the water industry proxy group range from 7.71% to 8.64%.

[14] See Schedule CLT-3, page 3, lines 3 and 6.
[15] See Schedule CLT-3, page 3, lines 9 and 12.

Based on the totality of my analysis, company-specific risks, and current economic conditions, I believe it is reasonable to recommend a cost of equity that is slightly above the high end of the range of my models.

Q: Does this conclude your testimony?

A: Yes.

APPENDIX A
QUALIFICATIONS OF CRYSTAL L. THACKER

Q: Have you previously testified before the Indiana Utility Regulatory Commission?

A: Yes. I have filed testimony in financing cases, rate cases, and various tracker cases.

Q: Please describe your educational background and experience.

A: I graduated from the Kelley School of Business in 2012 with a Bachelor of Science in Business with majors in Accounting and Finance. I have been employed by the OUCC for the past 13 years and worked on multiple cases during that time. I have participated in a number of utility-related courses, seminars, and conferences, including the Annual Regulatory Studies Program sponsored by the National Association of Regulatory Utility Commissioners ("NARUC") and the Institute of Public Utilities at Michigan State University.

Q: Please describe your duties and responsibilities at the OUCC.

A: I review Indiana utilities' requests for regulatory relief filed with the Indiana Utility Regulatory Commission ("Commission"). I also prepare and present testimony based on my analyses, and make recommendations to the Commission on behalf of Indiana utility consumers.

Summary of Cost of Equity Studies

DCF Studies		
Value Line Proxy Group		
DCF Study using 3 month dividend yield	8.12%	Schedule CLT-2, Page 1, Line 20
DCF Study using 6 month dividend yield	8.28%	Schedule CLT-2, Page 1, Line 21
Growth in Forecasted Earnings Per Share		
DCF Study using 3 month dividend yield	8.48%	Schedule CLT-2, Page 2, Line 20
DCF Study using 6 month dividend yield	8.64%	Schedule CLT-2, Page 2, Line 21
Range of DCF Studies:	**8.12% - 8.64%**	
CAPM Studies		
Value Line Proxy Group		
Historical Risk Premiums		
CAPM Study using normalized long term interest rates	7.71%	Schedule CLT-3, Page 3, Lines 3 and 6
Forecasted Risk Premiums		
CAPM Study using normalized long term interest rates	8.42%	Schedule CLT-3, Page 3, Lines 9 and 12
Range of CAPM Studies	**7.71% - 8.42%**	
Range of All Studies	**7.71% - 8.64%**	
Average of All Studies	**8.27%**	
Midpoint of All Studies	**8.17%**	

DCF MODEL
VALUE LINE PROXY
SUMMARY OF GROWTH RATES (g)

Line		10 YEAR EARNINGS PER SHARE	5 YEAR EARNINGS PER SHARE	FORECASTED EARNINGS PER SHARE	10 YEAR DIVIDENDS PER SHARE	5 YEAR DIVIDENDS PER SHARE	FORECASTED DIVIDENDS PER SHARE	10 YEAR BOOK VALUE PER SHARE	5 YEAR BOOK VALUE PER SHARE	FORECASTED BOOK VALUE PER SHARE	AVERAGE
1	AMERICAN STATES WATER	12.00%	12.00%	6.00%	6.50%	10.00%	7.00%	5.50%	6.00%	4.00%	7.67%
2	AMERICAN WATER WORKS		13.00%	8.00%		10.00%	10.50%		2.50%	4.00%	8.00%
3	AQUA AMERICA	8.50%	13.00%	7.00%	8.00%	7.50%	9.00%	7.00%	7.00%	6.00%	8.11%
4	CALIFORNIA WATER	5.00%	4.00%	6.00%	1.50%	2.00%	6.50%	5.50%	5.00%	4.00%	4.39%
5	CONNECTICUT WATER	4.00%	9.00%	4.50%	2.00%	2.00%	4.50%	6.50%	9.50%	2.50%	4.94%
6	MIDDLESEX WATER	5.00%	5.50%	3.50%	1.50%	1.50%	3.00%	4.50%	3.00%	4.00%	3.50%
7	SJW CORP	6.50%	15.00%	1.50%	4.00%	2.50%	6.00%	6.00%	5.00%	6.00%	5.83%
8	YORK WATER	5.50%	6.00%	6.00%	4.00%	2.50%	6.50%	6.50%	4.50%	3.50%	5.00%
9	AVERAGE	6.64%	9.69%	5.31%	3.93%	4.75%	6.63%	5.93%	5.31%	4.25%	5.83%
10	50/50 WEIGHT HISTORICAL/FORECASTED		8.17%	5.31%		4.34%	6.63%		5.62%	4.25%	5.72%

*Value Line April 15, 2016

DIVIDEND YIELDS

		Nov-2015	Dec-2015	Jan-2016	Feb-2016	Mar-2016	Apr-2016	3 MONTH AVERAGE	6 MONTH AVERAGE
11	AMERICAN STATES WATER	2.20%	2.10%	2.20%	1.90%	2.30%	2.30%	2.17%	2.17%
12	AMERICAN WATER WORKS	2.40%	2.30%	2.20%	2.10%	2.00%	1.90%	2.00%	2.15%
13	AQUA AMERICA	2.50%	2.40%	2.50%	2.30%	2.30%	2.30%	2.30%	2.38%
14	CALIFORNIA WATER	3.10%	2.90%	3.00%	2.70%	2.60%	2.50%	2.60%	2.80%
15	CONNECTICUT WATER	3.10%	2.80%	2.70%	2.60%	2.50%	2.40%	2.50%	2.68%
16	MIDDLESEX WATER	3.20%	3.10%	3.10%	2.90%	2.60%	2.40%	2.63%	2.88%
17	SJW CORP	2.70%	2.50%	2.60%	2.40%	2.20%	2.20%	2.27%	2.43%
18	YORK WATER	2.60%	2.60%	2.60%	2.30%	2.20%	2.10%	2.20%	2.40%
19	AVERAGE	2.73%	2.59%	2.61%	2.40%	2.34%	2.26%	2.33%	2.49%

COST OF EQUITY = DIVIDEND YIELD * (1+.5 * GROWTH RATE) + GROWTH RATE

USING A THREE MONTH AVERAGE YIELD AND A
20 5.72% Growth Rate (Line 10) **8.12%**

USING A SIX MONTH AVERAGE YIELD AND A
21 5.72% Growth Rate (Line 10) **8.28%**

DCF MODEL
VALUE LINE PROXY GROUP
FORECASTED EARNINGS PER (ONLY)

Line		VALUE LINE FORECASTED EPS*	YAHOO.COM FORECASTED EPS**	ZACKS FORECASTED EPS***
1	AMERICAN STATES WATER	6.00%	3.85%	3.85%
2	AMERICAN WATER WORKS	8.00%	7.60%	7.19%
3	AQUA AMERICA	7.00%	5.85%	6.37%
4	CALIFORNIA WATER	6.00%	9.05%	9.05%
5	CONNECTICUT WATER SRVICES	4.50%	5.00%	5.00%
6	MIDDLESEX WATER	3.50%	2.70%	
7	SJW CORP	1.50%	14.00%	
8	YORK WATER CO.	6.00%	4.90%	
9	AVERAGE	5.31%	6.62%	6.29%
10	AVERAGE OF ALL 3 FORECASTS OF GROWTH			6.07%

*Value Line April 15, 2016
**Yahoo.com April 19, 2016 - Yahoo.com relies on Thomson Financial Network for analyst earnings estimates
***Zacks May 11, 2016

DIVIDEND YIELDS

		Nov-2015	Dec-2015	Jan-2016	Feb-2016	Mar-2016	Apr-2016	3 MONTH AVERAGE	6 MONTH AVERAGE
11	AMERICAN STATES WATER	2.20%	2.10%	2.20%	1.90%	2.30%	2.30%	2.17%	2.17%
12	AMERICAN WATER WORKS	2.40%	2.30%	2.20%	2.10%	2.00%	1.90%	2.00%	2.15%
13	AQUA AMERICA	2.50%	2.40%	2.50%	2.30%	2.30%	2.30%	2.30%	2.38%
14	CALIFORNIA WATER	3.10%	2.90%	3.00%	2.70%	2.60%	2.50%	2.60%	2.80%
15	CONNECTICUT WATER SRVICES	3.10%	2.80%	2.70%	2.60%	2.50%	2.40%	2.50%	2.68%
16	MIDDLESEX WATER	3.20%	3.10%	3.10%	2.90%	2.60%	2.40%	2.63%	2.88%
17	SJW CORP	2.70%	2.50%	2.60%	2.40%	2.20%	2.20%	2.27%	2.43%
18	YORK WATER CO.	2.60%	2.60%	2.60%	2.30%	2.20%	2.10%	2.20%	2.40%
19	AVERAGE	2.73%	2.59%	2.61%	2.40%	2.34%	2.26%	2.33%	2.49%

COST OF EQUITY = DIVIDEND YIELD * (1+.5 * GROWTH RATE) + GROWTH RATE

USING A THREE MONTH AVERAGE DIVIDEND YIELD AND A
20 6.07% 5 Year Growth Rate (Line 10) **8.48%**

USING A SIX MONTH AVERAGE DIVIDEND YIELD AND A
21 6.07% 5 Year Growth Rate (Line 10) **8.64%**

YIELDS ON U.S. TREASURY SECURITIES

	1 Year T-NOTE	5 Year T-NOTE	10 Year T-NOTE	30 Year T-BOND
2-Jan-15	0.25%	1.74%	2.26%	2.85%
6-Feb-15	0.15%	1.24%	1.72%	2.29%
6-Mar-15	0.19%	1.45%	1.97%	2.57%
3-Apr-15	0.24%	1.42%	1.93%	2.51%
1-May-15	0.21%	1.38%	1.97%	2.65%
5-Jun-15	0.23%	1.53%	2.13%	2.87%
3-Jul-15	0.29%	1.67%	2.37%	3.15%
7-Aug-15	0.32%	1.61%	2.29%	3.00%
4-Sep-15	0.34%	1.48%	2.18%	2.93%
2-Oct-15	0.30%	1.45%	2.15%	2.95%
6-Nov-15	0.31%	1.47%	2.10%	2.88%
4-Dec-15	0.48%	1.67%	2.24%	3.00%
1-Jan-16	0.63%	1.71%	2.24%	2.96%
5-Feb-16	0.43%	1.40%	1.97%	2.77%
4-Mar-16	0.54%	1.22%	1.75%	2.61%
1-Apr-16	0.61%	1.36%	1.88%	2.66%
6-May-16	0.58%	1.32%	1.85%	2.70%
3-Jun-16	0.68%	1.40%	1.87%	2.66%
3-Month Average	0.62%	1.36%	1.87%	2.67%
6-Month Average	0.58%	1.40%	1.93%	2.73%
Spot Yields -	0.54%	1.19%	1.69%	2.49%

Interest rates obtained from Value Line Selections and Opinions
Spot yields taken from CNBC.com

RISK PREMIUM

Historical Risk Premiums

Total Returns 1926 - 2015

	Stocks	Long Bonds	Int Bonds	Short Bonds
Geometric Mean	10.00%	5.60%	5.20%	3.40%
Arithmetic Mean	12.00%	6.00%	5.30%	3.50%

Market Risk Premiums

Geometric Mean	4.40%	4.80%	6.60%
Arithmetic Mean	6.00%	6.70%	8.50%
Average Premium	5.20%	5.75%	7.55%

Total return data obtained from Duff & Phelps:
2016 Valuation Handbook: Guide to Cost of Capital

	Value Line Beta*
AMERICAN STATES WATER	0.75
AMERICAN WATER WORKS COMPANY	0.70
AQUA AMERICA	0.75
CALIFORNIA WATER	0.75
CONNECTICUT WATER SRVICES	0.60
MIDDLESEX WATER	0.70
SJW CORP	0.75
YORK WATER CO.	0.70
Average	0.713

*April 15, 2016

CAPM Calculations

Historical Risk Premiums

Line			Long*	Int	Short
1	Premiums		5.20%	5.75%	7.55%
2	Rates	**3 month**	4.00%	1.61%	0.62%
3	Beta	0.713	**7.71%**	5.71%	6.00%
			Long*	Int	Short
4	Premiums		5.20%	5.75%	7.55%
5	Rates	**6 month**	4.00%	1.66%	0.58%
6	Beta	0.713	**7.71%**	5.76%	5.96%

Forecasted Risk Premiums

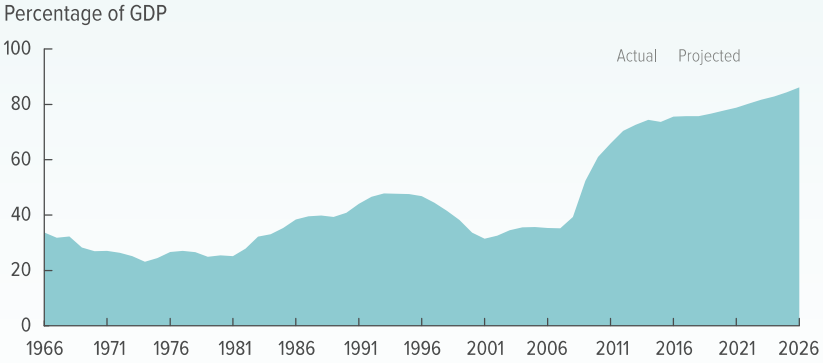
	Risk premiums		Long*
7	Premiums		6.20%
8	Rates	**3 month**	4.00%
9	Beta	0.713	**8.42%**
	Risk premiums		Long*
10	Premiums		6.20%
11	Rates	**6 month**	4.00%
12	Beta	0.713	**8.42%**

* Long uses a Normalized Risk Free Rate

CONGRESS OF THE UNITED STATES
CONGRESSIONAL BUDGET OFFICE

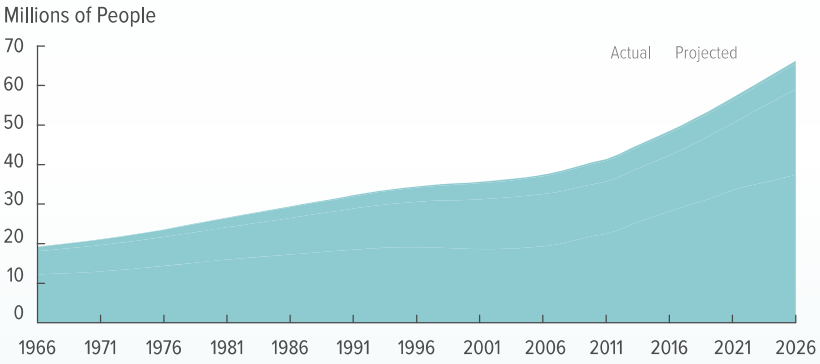
CBO

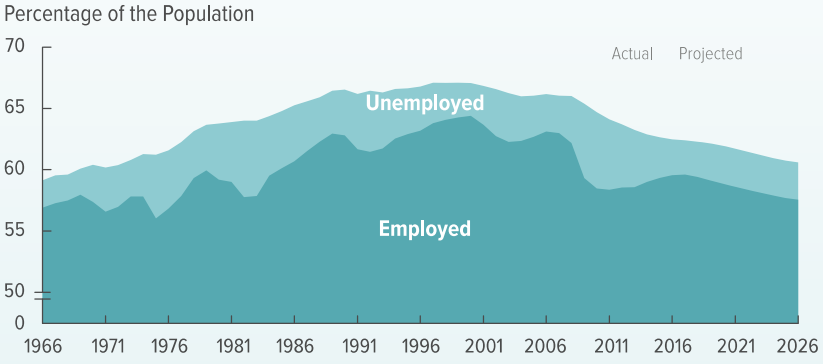
The Budget and Economic Outlook: 2016 to 2026



In CBO's projections, growing deficits drive up **debt** over the next decade, as spending rises and revenues remain relatively flat as a share of the economy.

Spending for Social Security and Medicare increases as the number of **people age 65 or older** grows.





Because retiring baby boomers reduce the percentage of the population in the **labor force**, the economy expands more moderately in later years after growing solidly this year and next.

JANUARY 2016

Table 2-4.

Comparison of CBO's Current and Previous Economic Projections for Calendar Years 2015 to 2025

	Estimated, 2015	Forecast 2016	Forecast 2017	Projected Annual Average 2015–2020	Projected Annual Average 2021–2025	Projected Annual Average 2015–2025
			Percentage Change From Fourth Quarter to Fourth Quarter			
Real (Inflation-adjusted) GDP						
January 2016	2.0	2.7	2.5	2.2	2.0	2.1
August 2015	2.0	3.1	2.7	2.4	2.1	2.3
Nominal GDP						
January 2016	3.4	4.3	4.4	4.0	4.1	4.0
August 2015	3.2	4.7	4.7	4.3	4.3	4.3
PCE Price Index						
January 2016	0.5	1.5	2.0	1.6	2.0	1.8
August 2015	0.6	1.8	2.0	1.7	2.0	1.9
Core PCE Price Index[a]						
January 2016	1.4	1.6	1.9	1.8	2.0	1.9
August 2015	1.4	1.7	1.9	1.8	2.0	1.9
Consumer Price Index[b]						
January 2016	0.4	1.7	2.4	2.0	2.4	2.2
August 2015	0.7	2.3	2.3	2.1	2.4	2.2
Core Consumer Price Index[a]						
January 2016	2.0	2.0	2.2	2.2	2.3	2.3
August 2015	2.0	2.1	2.3	2.2	2.3	2.3
GDP Price Index						
January 2016	1.3	1.6	1.9	1.8	2.0	1.9
August 2015	1.1	1.6	2.0	1.8	2.1	1.9
Employment Cost Index[c]						
January 2016	2.2	2.9	3.3	3.1	3.2	3.1
August 2015	2.8	3.3	3.5	3.3	3.3	3.3
Real Potential GDP						
January 2016	1.5	1.6	1.7	1.8	2.0	1.9
August 2015	1.7	1.9	2.1	2.1	2.1	2.1
			Calendar Year Average			
Unemployment Rate (Percent)						
January 2016	5.3 [d]	4.7	4.4	4.8	5.0	4.9
August 2015	5.4	5.1	5.0	5.2	5.2	5.2
Interest Rates (Percent)						
Three-month Treasury bills						
January 2016	0.1 [d]	0.7	1.6	1.9	3.2	2.5
August 2015	0.1	0.7	1.7	2.0	3.4	2.6
Ten-year Treasury notes						
January 2016	2.1 [d]	2.8	3.5	3.4	4.1	3.7
August 2015	2.3	3.0	3.7	3.6	4.3	3.9
Tax Bases (Percentage of GDP)						
Wages and salaries						
January 2016	43.6	43.9	43.9	43.9	43.9	43.9
August 2015	43.4	43.5	43.5	43.5	43.5	43.5
Domestic economic profits						
January 2016	9.2	8.7	8.6	8.4	7.5	8.0
August 2015	9.7	9.3	8.9	8.7	7.6	8.1

Source: Congressional Budget Office, using data from the Bureau of Labor Statistics and the Federal Reserve.

GDP = gross domestic product; PCE = personal consumption expenditures.

a. Excludes prices for food and energy.

b. The consumer price index for all urban consumers.

c. The employment cost index for wages and salaries of workers in private industries.

d. Actual value for 2015.

The Equity Risk Premium in 2015

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ABSTRACT

We analyze the history of the equity risk premium from surveys of U.S. Chief Financial Officers (CFOs) conducted every quarter from June 2000 to March 2015. The risk premium is the expected 10-year S&P 500 return relative to a 10-year U.S. Treasury bond yield. We show that the equity risk premium has increased more than 50 basis points from the levels observed in 2014. The current 10-year risk premium is 4.51%. Similarly, measures of risk such as investor disagreement and perceptions of volatility have increased. Interestingly, the increased premium and risk are not reflected in market-based measures of risk, such as the VIX and credit spreads. We also link our survey results to measures survey-based measures of the weighted average cost of capital and investment hurdle rates. The hurdle rates are significantly higher than the cost of capital implied by the market risk premium.

JEL Classification: *G11, G31, G12, G14*

Keywords: *Cost of capital, financial crisis, equity premium, WACC, hurdle rate, long-term market returns, stock return forecasts, long-term equity returns, expected excess returns, disagreement, individual uncertainty, skewness, asymmetry, survey methods, TIPs, VIX, credit spreads*

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DUFF & PHELPS

Client Alert

March 16, 2016

Duff & Phelps Increases U.S. Equity Risk Premium Recommendation to 5.5%, Effective January 31, 2016

Contents

Section 01

Executive Summary

Executive Summary

5.5%

The Duff & Phelps U.S. Equity Risk Premium Recommendation effective January 31, 2016

Duff & Phelps Increases U.S. Equity Risk Premium Recommendation to 5.5%, Effective January 31, 2016

- Equity Risk Premium: Increased from 5.0% to 5.5%
- Risk-Free Rate: 4.0% (normalized)
- Base U.S. Cost of Equity Capital: 9.5% (4.0% + 5.5%)

The Equity Risk Premium (ERP) is a key input used to calculate the cost of capital within the context of the Capital Asset Pricing Model (CAPM) and other models.[1,2] The ERP is used as a building block when estimating the cost of capital (i.e., "discount rate", "expected return", "required return"), and is an essential ingredient in any business valuation, project evaluation, and the overall pricing of risk. Duff & Phelps regularly reviews fluctuations in global economic and financial conditions that warrant periodic reassessments of the ERP.

Based on current market conditions, Duff & Phelps is increasing its U.S. ERP recommendation from 5.0% to 5.5% when developing discount rates as of January 31, 2016 and thereafter until such time that evidence indicates equity risk in financial markets has materially changed and new guidance is issued.

[1] The equity risk premium (ERP), sometimes referred to as the "market" risk premium, is defined as the return investors expect as compensation for assuming the additional risk associated with an investment in a diversified portfolio of common stocks *in excess* of the return they would expect from an investment in risk-free securities.

[2] The cost of capital is the expected rate of return required in order to attract funds to a particular investment.

4.0%

The Duff & Phelps concluded normalized risk-free rate, as of January 31, 2016

Duff & Phelps developed its current ERP recommendation in conjunction with a "normalized" 20-year yield on U.S. government bonds of 4.0% as a proxy for the risk-free rate (R_f) implying a 9.5% (4.0% + 5.5%) "base" U.S. cost of equity capital estimate at the end of January 2016.[3] The use of the spot yield-to-maturity of 2.4% as of January 29, 2016 would result in an overall discount rate that is likely inappropriately low vis-à-vis the risks currently facing investors.[4]

Duff & Phelps last changed its U.S. ERP recommendation on February 28, 2013.[5] On that date, our recommendation was lowered to 5.0% (from 5.5%) in response to evidence that suggested a *reduced* level of risk in financial markets relative to the heightened uncertainty observed in the aftermath of the 2008 global financial crisis, and during the ensuing Euro sovereign debt crisis (which was severely felt from 2010 until 2012).

During 2015, we started seeing some signs of increased risk in financial markets. While the evidence was somewhat mixed as of December, 31, 2015, we can now see clear indications that equity risk in financial markets has increased significantly as of January 31, 2016. Exhibit 1 summarizes the factors considered in our U.S. ERP recommendation.[6]

Exhibit 1: Factors Considered in U.S. ERP Recommendation

Factor	Change	Effect on ERP
U.S. Equity Markets	↓	↑
Implied Equity Volatility	↑	↑
Corporate Spreads	↑	↑
Historical Real GDP Growth and Forecasts	↔	↔
Unemployment Environment	↓	↓
Consumer and Business Sentiment	↔	↔
Sovereign Credit Ratings	↔	↔
Damodaran Implied ERP Model	↑	↑
Default Spread Model	↑	↑

[3] A risk-free rate is the return available on a security that the market generally regards as free of the risk of default. We discuss the background for using a normalized risk-free rate and our concluded normalized risk-free rate in Section 3 "Estimating the Risk-Free Rate", starting on page 9.
[4] The 20-year constant-maturity U.S. Treasury yield was 2.36%, as of January 29, 2016. Source: Board of Governors of the Federal Reserve System website at: http://www.federalreserve.gov/releases/h15/data.htm.
[5] To access the Client Alert report documenting Duff & Phelps' prior U.S. ERP recommendation, visit: www.duffandphelps.com/costofcapital.
[6] Some of the factors in Exhibit 1 are discussed in greater detail later in this report.

Taking these factors together, we find support for increasing our ERP recommendation relative to our previous recommendation.[7]

TO BE CLEAR:

- The Duff & Phelps U.S. ERP recommendation as of January 31, 2016 (and thereafter, until further notice) is 5.5%, matched with a normalized risk-free rate of 4.0%. This implies a 9.5% (4.0% + 5.5%) "base" U.S. cost of equity capital estimate as of January 31, 2016.

- Many valuations are done at year-end. The Duff & Phelps U.S. ERP recommendation for use with December 31, 2015 valuations is 5.0%, matched with a normalized risk-free rate of 4.0%. This implies a 9.0% (4.0% + 5.0%) "base" U.S. cost of equity capital estimate as of December 31, 2015.

[7] The Duff & Phelps ERP estimate is made in relation to a risk-free rate (either "spot" or "normalized"). A "normalized" risk-free rate can be developed using longer-term averages of Treasury bond yields and the build-up framework outlined in Section 3 "Estimating the Risk-Free Rate", starting on page 9.

Section 02

Overview of Duff & Phelps ERP Methodology

Overview of Duff & Phelps ERP Methodology

A Two-Dimensional Process

There is no single universally accepted methodology for estimating the ERP; consequently there is wide diversity in practice among academics and financial advisors with regards to ERP estimates. For this reason, Duff & Phelps employs a two-dimensional process that takes into account a broad range of economic information and multiple ERP estimation methodologies to arrive at its recommendation.

First, a reasonable range of normal or unconditional ERP is established. Second, based on current economic conditions, we estimate where in the range the true ERP likely lies (top, bottom, or middle).

Long-term research indicates that the ERP is cyclical.[8] We use the term *normal*, or *unconditional* ERP to mean the long-term average ERP without regard to current market conditions. This concept differs from the *conditional* ERP, which reflects current economic conditions.[9] The "unconditional" ERP range versus a "conditional" ERP is further distinguished as follows:

"What is the range?"

- **Unconditional ERP Range** – The objective is to establish a reasonable range for a normal or unconditional ERP that can be expected over an entire business cycle. Based on an analysis of academic and financial literature and various empirical studies, we have concluded that a reasonable long-term estimate of the normal or unconditional ERP for the U.S. is in the range of 3.5% to 6.0%.[10]

"Where are we in the range?"

- **Conditional ERP** – The objective is to determine where within the unconditional ERP range the conditional ERP should be, based on current economic conditions. Research has shown that ERP fluctuates during the business cycle. When the economy is near (or in) a recession, the conditional ERP is at the higher end of the normal, or unconditional ERP range. As the economy improves, the conditional ERP moves back toward the middle of the range and at the peak of an economic expansion, the conditional ERP approaches the lower end of the range.

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[8] See for example John Cochrane's "Discount Rates. American Finance Association Presidential Address" on January 8, 2011, where he presented research findings on the cyclicality of discount rates in general. His remarks were published as Cochrane, J. H. (2011), *Presidential Address: Discount Rates*. The Journal of Finance, 66: 1047–1108.

[9] The "conditional" ERP is the ERP estimate published by Duff & Phelps as the "Duff & Phelps Recommended ERP".

[10] See Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital: Applications and Examples*, Fifth Edition, Chapter 8 "Equity Risk Premium", and accompanying Appendices 8A and 8B, for a detailed discussion of the ERP.

Section 03

Estimating the Risk-Free Rate

Estimating the Risk-Free Rate

The Risk-free Rate and Equity Risk Premium: Interrelated Concepts[11]

A risk-free rate is the return available, as of the valuation date, on a security that the market generally regards as free of the risk of default.

For valuations denominated in U.S. dollars, valuation analysts have typically used the spot yield to maturity (as of the valuation date) on U.S. government securities as a proxy for the risk-free rate. The two most commonly used risk-free bond maturities have been the 10- and 20-year U.S. government bond yields.

The use of (i) long-term U.S. government bonds, and (ii) an ERP estimated relative to yields on long-term bonds most closely match the investment horizon and risks that confront business managers who are making capital allocation decisions and valuation analysts who are applying valuation methods to value a "going concern" business.

The risk-free rate and the ERP are interrelated concepts. All ERP estimates are, by definition, developed *in relation* to the risk-free rate. Specifically, the ERP is the extra return investors expect as compensation for assuming the additional risk associated with an investment in a diversified portfolio of common stocks, compared to the return they would expect from an investment in risk-free securities.

This brings us to an important concept. When developing cost of capital estimates, the valuation analyst should match the term of the risk-free rate used in the CAPM or build-up formulas with the duration of the expected net cash flows of the business, asset, or project being evaluated. Further, the term of the risk-free rate should also match the term of the risk-free rate used to develop the ERP, as illustrated in Exhibit 2.

Exhibit 2: The Risk-Free Rate and ERP Should be Consistent with the Duration of the Net Cash Flows of the Business, Asset, or Project Being Evaluated

Term of risk-free rate used in CAPM or Build-up equation	=	Expected duration of the net cash flows of the business, asset, or project being evaluated	=	Term of risk-free rate used to develop the ERP

[11] This section was extracted from Chapter 3 of the Duff & Phelps *2016 Valuation Handbook – Guide to Cost of Capital* (Hoboken, NJ: John Wiley & Sons, 2016). The discussion in this section was based on information available at the time of writing (through February 23, 2016). Events and market conditions may have changed since then relative to when this report is issued.

In many of the cases in which one is valuing a business, a "going concern" assumption is made (the life of the business is assumed to be indefinite), and therefore selecting longer-term U.S. government bond yields (e.g., 20 years) as the proxy for the risk-free rate is appropriate.

The risk-free rate and the ERP, like all components of the cost of equity capital (and the cost of equity capital itself), are *forward-looking* concepts. The reason that the cost of capital is a forward-looking concept is straightforward: when we value a company (for instance), we are trying to value how much we would pay (now) for the *future* economic benefits associated with owning the company. Since we will ultimately use the cost of capital to discount these future economic benefits (usually measured as expected cash flows) back to their present value, the cost of capital itself must *also* be forward-looking.

Spot Risk-Free Rates versus Normalized Risk-Free Rates

Beginning with the financial crisis of 2008 (the "Financial Crisis"), analysts have had to reexamine whether the "spot" rate is still a reliable building block upon which to base their cost of equity capital estimates. The Financial Crisis challenged long-accepted practices and highlighted potential problems of simply continuing to use the spot yield-to-maturity on a safe government security as the risk-free rate, without any further adjustments.

During periods in which risk-free rates appear to be abnormally low due to flight to quality or massive central bank monetary interventions, valuation analysts may want to consider normalizing the risk-free rate. By "normalization" we mean estimating a risk-free rate that more likely reflects the *sustainable* average return of long-term U.S. Treasuries.

Why Normalize the Risk-Free Rate?

The yields of U.S. government bonds in certain periods during and after the Financial Crisis may have been *artificially* repressed, and therefore likely unsustainable. Many market participants will agree that nominal U.S. government bond yields in recent periods have been artificially low. The Federal Reserve Bank ("Fed"), the central bank of the United States, kept a zero interest rate policy (dubbed "ZIRP" in the financial press) for seven years, from December 2008 until December 2015.

Even members of the Federal Open Market Committee (FOMC) have openly discussed the need to "normalize" interest rates over the last couple of years.[12] For example, at an April 2015 conference, James Bullard, President of the Federal

[12] The FOMC is a committee within the Federal Reserve System, charged under U.S. law with overseeing the nation's open market operations (i.e., the Fed's buying and selling of U.S. Treasury securities).

Reserve Bank of St. Louis, discussed "Some Considerations for U.S. Monetary Normalization", where he stated:[13]

> *"Now may be a good time to begin normalizing U.S. monetary policy so that it is set appropriately for an improving economy over the next two years."*

John C. Williams, President of the Federal Reserve Bank of San Francisco (not currently an FOMC member), has also been very vocal about the need to start normalizing interest rates. During 2015, he gave several presentations and speeches, where he mentioned the need to normalize interest rates. For example, in a series of presentations delivered in September and October 2015, he said:[14]

> *"(…) an earlier start to raising rates would allow us to engineer a smoother, more gradual process of policy normalization."*

In a more recent speech, he acknowledged, however, that even after normalization takes place, interest rates may simply be lower than in pre-Financial Crisis years. Discussing the Fed's short-term benchmark interest rate (the target federal funds rate), he elaborated on that topic:[15,16]

> *"As we make our way back to normal, we should consider what "normal" will look like for interest rates.(…) The evidence is building that the new normal for interest rates is quite a bit lower than anyone in this room is accustomed to.(...) That doesn't mean they'll be zero, but compared with the pre-recession "normal" funds rate of, say, between 4 and 4.5 percent, we may now see the underlying r-star guiding us towards a fed funds rate of around 3–3½ percent instead."*[17]

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[13] "Some Considerations for U.S. Monetary Policy Normalization", presentation at the 24th Annual Hyman P. Minsky Conference in Washington, D.C., April 15, 2015. A copy of the presentation can be found here: https://www.stlouisfed.org/~/media/Files/PDFs/Bullard/remarks/Bullard-Minsky-15-April-2015.pdf. For a list of speeches and presentations by President James Bullard, visit: https://www.stlouisfed.org/from-the-president/speeches-and-presentations.

[14] This series of presentations was entitled "The Economic Outlook: Live Long and Prosper". See for example, the presentation at UCLA Anderson School of Management, Los Angeles, California on September 28, 2015. A copy of the remarks can be found here: http://www.frbsf.org/our-district/press/presidents-speeches/williams-speeches/2015/september/economic-outlook-live-long-and-prosper-ucla/. For a list of speeches and presentations by President John C. Williams, visit: http://www.frbsf.org/our-district/press/presidents-speeches/williams-speeches/.

[15] The federal funds rate is the interest rate at which depository institutions lend balances to each other overnight. The target federal funds rate is a short-term rate and is used as the benchmark interest rate to implement U.S. monetary policies, such as raising or reducing interest rates.

[16] "After the First Rate Hike", Presentation to California Bankers Association, Santa Barbara, California on January 8, 2016. A copy of the remarks can be found here: http://www.frbsf.org/our-district/press/presidents-speeches/williams-speeches/2016/january/after-the-first-rate-hike-economic-outlook/.

[17] The so-called r* (r-star) stands for the longer-run value of the neutral rate. President Williams defined r-star as essentially what inflation-adjusted interest rates (i.e. real rates) will be once the economy is back to full strength.

While the views of regional Fed Presidents or individual FOMC members do not reflect the official positions of the committee, the reality is that the minutes of 2014 and 2015 FOMC meetings repeated the term "policy normalization" several times, in the context of deciding if and when to raise interest rates.[18]

At its December 15–16, 2015 meeting, the Fed decided to raise the target range for the federal funds rate for the first time in nine years, from a range of 0.00%–0.25% to 0.25%–0.50% (a 25 basis point increase). In support of its decision, the Fed highlighted the considerable improvement in the labor market over the course of the year, and reiterated its expectation that inflation would rise over the medium-term to its target rate of 2.0%.[19]

Even then, officials were very cautious on how to characterize the timing of nominalization policies, seemingly signaling that further increase in interest rates will be gradual.

Nevertheless, in conjunction with the December 15–16, 2015 meeting, FOMC members also submitted their projections of the most likely outcomes for real GDP growth, unemployment rate, inflation, and the federal funds rate for each year from 2015 to 2018 and over the longer run. All of the 17 FOMC participants believed that the target level for the federal funds rate should increase further during 2016, with the median projection suggesting it could rise by another 100 basis points. The median estimate for the longer-term federal funds rate is 3.5% (note: the federal funds rate is a short-term interest rate). However, given the recent headwinds in global financial markets, investors are projecting a much slower pace of rate hikes.[20]

So what does it mean when someone says the current U.S. Treasury yields are not "normal"? And even if interest rates are not considered "normal", why is that any different from other periods in history? Remember, the risk-free rate is intended to adjust the cost of equity capital for expected future inflation. Typically, valuation analysts use a 20-year U.S. government bond yield when developing a U.S. dollar-denominated cost of equity capital. Therefore, the risk-free rate should reflect an average expected return over those years.

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[18] To access minutes of FOMC meetings visit: http://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

[19] Minutes of the Federal Open Market Committee December 15–16, 2015", Board of Governors of the Federal Reserve System. For details visit: http://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

[20] See, for example, the CME Group FedWatch Tool. The FedWatch Tool is based on CME Group 30-Day Fed Fund futures prices, which are used to express the market's views on the likelihood of changes in U.S. monetary policy. This tool allows market participants to view the probability of an upcoming federal funds rate hike up to one year out. For details visit: http://www.cmegroup.com/trading/interest-rates/countdown-to-fomc.html.

To be clear, in most circumstances we would prefer using the "spot" yield (i.e., the yield available in the market) on a safe government security as a proxy for the risk-free rate.[21] However, during times of flight to quality and/or high levels of central bank intervention (such as the period beginning with the Financial Crisis) those *lower* observed yields imply a *lower* cost of capital (all other factors held the same), just the opposite of what one would expect in times of relative economy-wide distress and uncertainty. During these periods, using a non-normalized risk-free rate (with no corresponding adjustments to the ERP) would likely lead to an *underestimated* cost of equity capital, and so a "normalization" adjustment may be a reasonable approach to address the apparent inconsistency.

Why isn't the Current Spot Risk-Free Rate Considered "Normal"?

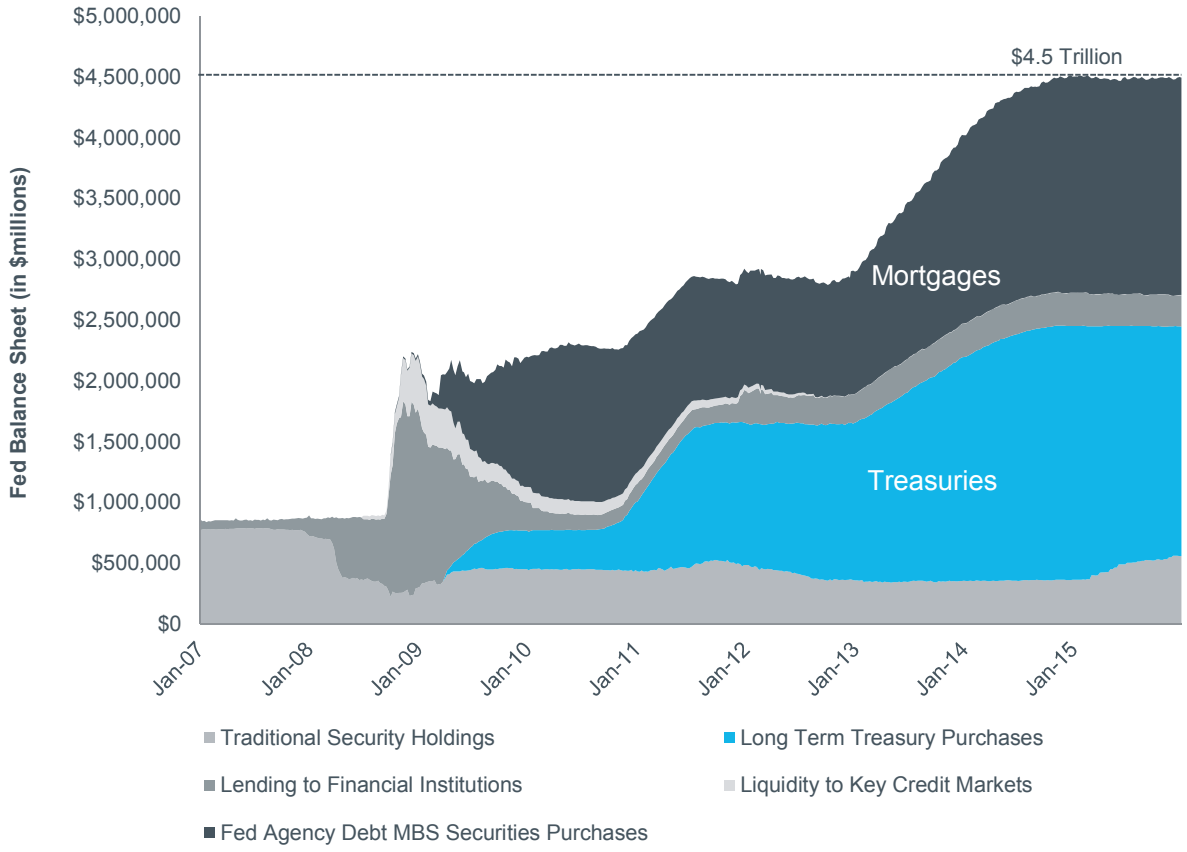
Part of the reason that U.S. Treasury yields are likely "artificially repressed" is that the "Fed" has been *telling* us that its actions are intended to push rates down, and thus boost asset prices (e.g., stocks, housing). For example, at the September 13, 2012 FOMC press conference, the Fed Chairman at the time, Ben Bernanke, stated:

> *"...the tools we have involve affecting financial asset prices...To the extent that home prices begin to rise, consumers will feel wealthier, they'll feel more disposed to spend ... So house prices is one vehicle. Stock prices – many people own stocks directly or indirectly...and if people feel that their financial situation is better because their 401(k) looks better or for whatever reason, their house is worth more, they are more willing to go out and spend, and that's going to provide the demand that firms need in order to be willing to hire and to invest."*

In Exhibit 3, the balance sheet of the U.S. Federal Reserve is shown over time. Since the Financial Crisis, the Fed has been purchasing massive quantities of U.S. Treasuries and mortgage backed securities (MBS) through a series of so-called quantitative easing (QE) measures. At the end of December 2015, the Fed's balance sheet summed to $4,491,440 million ($4.5 *trillion*), virtually unchanged from December 2014.[22]

[21] Government bond yields can be found at the Board of Governors of the Federal Reserve System website at: http://www.federalreserve.gov/releases/h15/data.htm.
[22] Source of underlying data: Federal Reserve Bank of Cleveland. To learn more, visit: https://www.clevelandfed.org.

Exhibit 3: Balance Sheet of the Federal Reserve (vis-à-vis Credit Easing Policy Tools)
January 2007–December 2015



In the post-crisis period, some analysts estimated that the Fed's purchases accounted for a growing majority of new Treasury issuance. In early 2013 in the online version of the *Financial Times*, one analyst wrote, "*The Fed, the biggest buyer in the market, has been the driver of artificially low Treasury yields*".[23] In Exhibit 4 we show the aggregate dollar amount of marketable securities issued by the U.S. Department of Treasury (e.g., bills, notes, bonds, inflation-indexed securities, etc.) from 2003 through December 2015. We also display how much of the U.S. public debt is being held by the Fed, foreign investors (including official foreign institutions), and other investors.[24]

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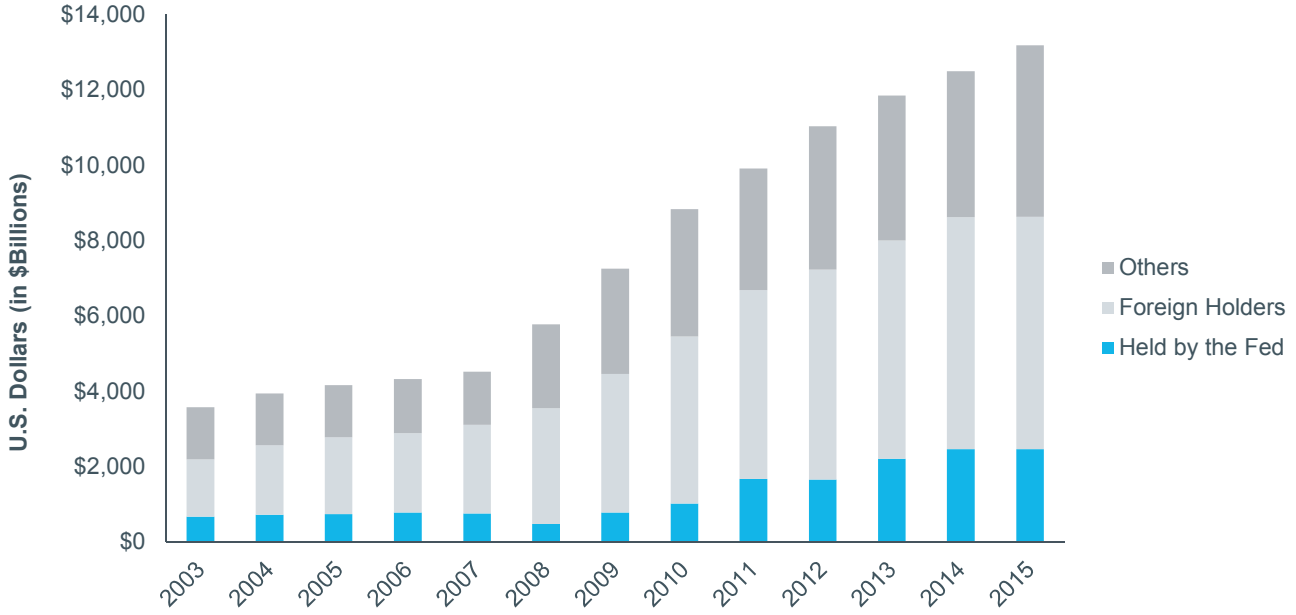
[23] Michael Mackenzie, "Fed injects new sell-off risk into Treasuries", FT.com, January 8, 2013.
[24] Source of underlying data: Federal Reserve Bank of St. Louis Economic Research; U.S. Department of the Treasury. Compiled by Duff & Phelps LLC. Sources included: (i) Board of Governors of the Federal Reserve System (U.S.), U.S. Treasury securities held by the Federal Reserve: All Maturities [TREAST], retrieved from FRED, Federal Reserve Bank of St. Louis at https://research.stlouisfed.org/fred2/series/TREAST/, January 29, 2016; (ii) Monthly Statements of the Public Debt (MSPD) retrieved from https://www.treasurydirect.gov/govt/reports/pd/mspd/mspd.htm, January 29, 2016; and (iii) U.S. Department of the Treasury International Capital (TIC) System's Portfolio Holdings of U.S. and Foreign Securities – A. Major Foreign Holders of U.S. Treasury Securities retrieved from http://www.treasury.gov/resource-center/data-chart-center/tic/Pages/ticsec2.aspx, February 17, 2016.

Exhibit 4: Marketable U.S. Treasury Securities Held by the Public
December 2003–December 2015

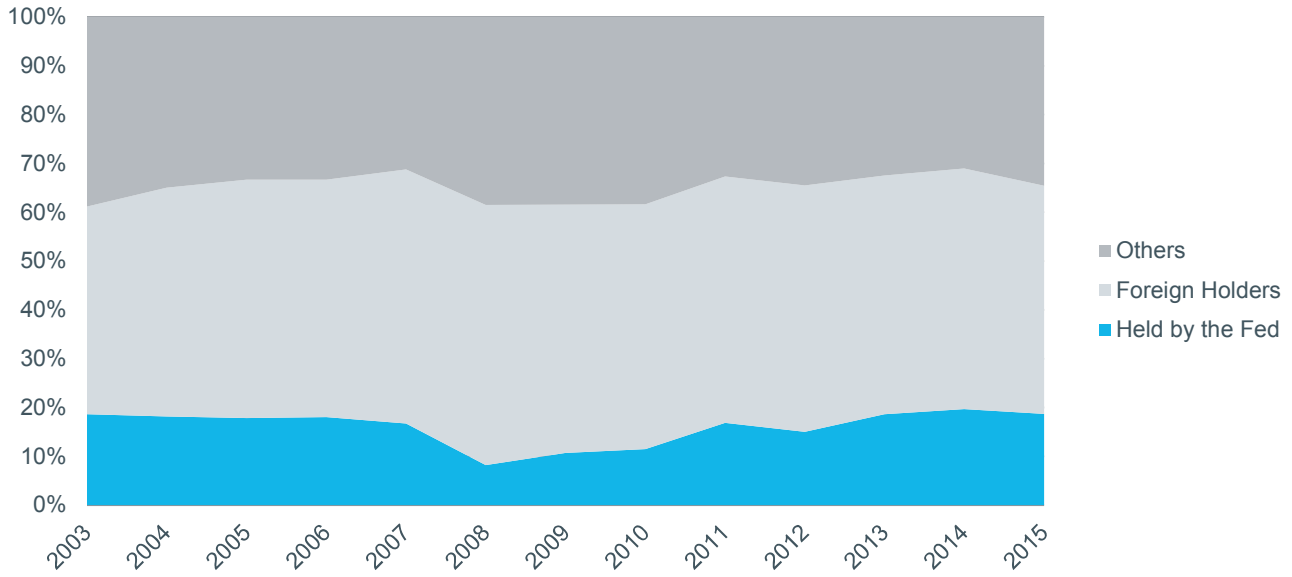


Notably, the issuance of marketable interest-bearing debt by the U.S. government to the public increased almost threefold between the end of 2007 and 2015. Keeping everything else constant (ceteris paribus), the law of supply and demand would tell us that the dramatic increase in supply would lead to a significant decline in government bond prices, which would translate into a surge in yields. But that is not what happened. During the same period, the Fed more than tripled its holdings of U.S. Treasury securities, representing a 16% compound annual growth rate through the end of 2015.[25] Between 2003 and 2008, the Fed's holdings of U.S. Treasuries had held fairly constant in the vicinity of $700 to $800 billion, with December 2008 being the significant exception, when holdings dropped to approximately $476 billion. The first QE program was announced by the FOMC in November 2008, and formally launched in mid-December 2008. After that period, the various QE programs implemented by the Fed have contributed to absorb a sizable portion of the increase in U.S. Treasuries issuance. It is noted that for the first time since 2008, the Fed's holding of marketable U.S. Treasury securities stayed constant at the end of 2015 (in dollar amount) relative to the prior year. Nevertheless, the share held by the Fed at the end of 2015 continues to be at similar levels as those of 2013 and 2014.

[25] If the comparison had been made between 2008 and 2015, the increase would be even more staggering: holdings by the Fed increased 417%, or a 26% compound annual growth rate.

Likewise, broad demand for safe government debt by foreign investors, amid the global turmoil that followed the Financial Crisis, has absorbed another considerable fraction of new U.S. Treasuries issuance. How significant are these purchases by the Fed and foreign investors? Exhibit 5 shows the same information as in Exhibit 4, but displays the relative share of each major holder of marketable U.S. Treasuries since 2003 until 2015.[26]

Exhibit 5: Relative Holdings of Marketable U.S. Treasury Securities Held by the Public (in percentage terms)
December 2003–December 2015



At the end of 2015, the relative share of U.S. Treasuries held by the Fed and foreign investors was almost 19% and 47% respectively, for a combined 65%. This combined level is actually close to the 69% observed at the end of 2007, prior to the onset of the Financial Crisis. However, as indicated above, the dollar amount of U.S. Treasuries has tripled after 2007, meaning that the Fed and foreign investors have absorbed over two-thirds of the available stock in the post-crisis period. Interestingly, a look at the composition of foreign investors reveals that since 2006 over two-thirds are actually foreign official institutions (i.e., central banks and central governments of foreign countries).[27,28] Thus, a great majority of U.S. Treasuries are currently being held by either foreign government arms or central banks around the world (including the Fed).

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[26] Source of underlying data: Federal Reserve Bank of St. Louis Economic Research; U.S. Department of the Treasury. Compiled by Duff & Phelps LLC.
[27] Source: Treasury International Capital (TIC) System's Portfolio Holdings of U.S. and Foreign Securities – A. Major Foreign Holders of U.S. Treasury Securities retrieved from http://www.treasury.gov/resource-center/data-chart-center/tic/Pages/ticsec2.aspx, February 17, 2016.
[28] For a description of foreign official institutions, visit "TIC Country Codes and Partial List of Foreign Official Institutions" at: http://www.treasury.gov/resource-center/data-chart-center/tic/Pages/foihome.aspx.

A team of researchers has recently studied the impact that this massive amount of U.S. Treasury purchases by foreign investors and the Fed have had on long-term real rates. Specifically, using data through November 2012, the authors estimated that by 2008 foreign purchases of U.S. Treasuries had cumulatively reduced 10-year real yields by around 80 basis points. The subsequent Fed purchases through the various QE programs implemented in the 2008–2012 period was estimated to incrementally depress 10-year real yields by around 140 basis points. Combining the impact of Fed and foreign investor purchases of U.S. Treasuries, real 10-year yields were depressed by 2.2% at the end of 2012, according to these authors' estimates.[29]

When the Fed concluded its third round of QE measures (in October 2014) and signaled that an increase in the target federal funds rate might be on the horizon, the salient question was what would happen to rates as one of the largest purchasers in the market (the Fed) discontinued its QE operations. All other things held the same, rates would be expected to rise. But again, that is not what happened. In fact, the yield on 10-year U.S. Treasury bonds dropped from 2.4% at the end of October to 2.2% at the end of December 2014. Likewise, the 20-year yield dropped from 2.8% to 2.5% over the same period. Even more concerning is the behavior of interest rates following the Fed's decision on December 16, 2015 to raise its target range for the federal funds rate for the first time in nine years. At first, the yield on 10- and 20-year U.S. Treasury bonds increased, reaching 2.3% and 2.7% respectively at December 31, 2015. In fact, yields had already been rising since October 2015, in anticipation of such a rate hike decision. However, by January 31, 2016, 10- and 20-year yields were back at 1.9% and 2.4%, respectively.

Why is that?

It may be useful to first distinguish short-term drivers versus long-term trends in interest rates.

It is almost undisputed that aggressive monetary policies implemented as a response to the Financial Crisis drove long-term interest rates in the U.S. and several advanced economies to historically low levels. But many economists claim that the current low rate environment is not just a cyclical story and that we can expect to see a lower level of interest rates in the long term (although not as low as today's). A number of explanatory factors and theories have emerged, some more pessimistic than others.

[29] Kaminska, Iryna and Zinna, Gabriele, "Official Demand for U.S. Debt: Implications for U.S. Real Interest Rates". IMF Working Paper No. 14/66 (April 2014).

It is not our place to select which, amongst the various theories, is more (or less) correct. Instead, we suggest that valuation specialists read different sources to get acquainted with such theories. A recent survey conducted by the Council of Economic Advisers lists various factors that could help explain why long-term interest rates are currently so low. According to the study, the following is a list of possible factors, bifurcated between those that are likely transitory in nature and those that are likely longer-lived:[30, 31]

Factors that Are Likely Transitory

- Fiscal, Monetary, and Foreign-Exchange Policies
- Inflation Risk and the Term Premium
- Private-sector Deleveraging

Factors that Are Likely Longer-Lived

- Lower Global Long-run Output and Productivity Growth
- Shifting Demographics
- The Global "Saving Glut"
- Safe Asset Shortage
- Tail Risks and Fundamental Uncertainty

The report concludes that it remains an open question whether the underlying factors linked to the currently low rates are transitory, or do they imply that the long-run equilibrium for long-term interest rates is lower than before the Financial Crisis.

The bottom line is that the future path of interest rates is currently uncertain.[32] So, for now, we will focus on some the factors that may be keeping interest rates ultra-low in the near term and discuss whether one can expect an increase from these levels in the medium term.

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[30] The Council of Economic Advisers, an agency within the Executive Office of the President of the United States, is charged with providing economic advice to the U.S. President on the formulation of both domestic and international economic policy.

[31] "Long-Term Interest Rates: A Survey", July 2015. The full report can be accessed here: https://www.whitehouse.gov/sites/default/files/docs/interest_rate_report_final_v2.pdf. See also "The Decline in Long-Term Interest Rates", July 14, 2015, a short blog article by Maurice Obstfeld and Linda Tesar discussing the various possible drivers of low long-term interest rates listed in the report. The article can be accessed here: https://www.whitehouse.gov/blog/2015/07/14/decline-long-term-interest-rates.

[32] For another analysis of current long-term interest rates, see Jonathan Wilmot, "When bonds aren't bonds anymore", *Credit Suisse Global Investment Returns Yearbook 2016*, February 2016.

First of all, the size of the Fed's balance sheet is still considered enormous by historical standards and the Fed has expressed the intent to keep its holdings for a long time. For example, at its December 2015 meeting, when announcing the increase by 25 basis points of the target range for the federal funds rate from 0.00%–0.25% to 0.25%–0.50%, the FOMC still stated that:[33]

> *"The Committee is maintaining its existing policy of reinvesting principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities and of rolling over maturing Treasury securities at auction, and it anticipates doing so until normalization of the level of the federal funds rate is well under way. This policy, by keeping the Committee's holdings of longer-term securities at sizable levels, should help maintain accommodative financial conditions."*

Translation: the Fed is keeping the size of its balance sheet constant for the foreseeable future, because it still wants to keep long-term interest rates low.

A report released in November 2014 (following the conclusion of QE3) by Standard & Poor's (S&P) appears to concur with our interpretation:[34]

> *"Since QE works via a stock effect, as long as a central bank is maintaining a certain stock of QE, it is still "doing" QE. If a central bank has reached the maximum point of expanding its balance sheet, it is a little perverse to describe it as having "ended QE." Rather, what it will have ended are the asset purchases required to get it to the point of having done the maximum amount of QE it has decided to put in place."*

So, while the process of rate normalization has formally begun, the Fed is planning for a very gradual increase in interest rates. For example, in the minutes of the same December 2015 meeting, the FOMC also stated that:

> *"The Committee expects that economic conditions will evolve in a manner that will warrant only gradual increases in the federal funds rate; the federal funds rate is likely to remain, for some time, below levels that are expected to prevail in the longer run."*

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[33] Press Release of FOMC's Monetary Policy Statement, December 16, 2015. For details visit: http://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.
[34] S&P *Ratings Direct* report entitled "Economic Research: The Fed Is Continuing, Not 'Ending,' Quantitative Easing", November 4, 2014.

Secondly, another phenomenon has helped push U.S. interest rates lower over time: purchases of U.S. Treasury securities by foreign investors have grown at a fast pace over the last several years.[35] While 2015 was the first time in many years when net purchases increased by only a negligible amount, the reality is that the total share of U.S. Treasuries owned by foreign investors is still very high (refer back to Exhibit 4). Should foreign demand for U.S. Treasury securities drop, it would still take some years for such significant holdings to be unwound (especially given the level of globalization of the world economy). Notably, there are academic studies that document a significant impact of foreign investors on U.S. interest rates even prior to the onset of 2008 Financial Crisis. One such study (not to be confused with the research cited above) estimated that absent the substantial foreign inflows into U.S. government bonds, the (nominal) 10-year Treasury yield would be 80 basis points higher using data through 2005.[36] The impact of foreign financial flows on long-term interest rates is not confined to the U.S. A recent research paper estimates that the increase in foreign holdings of Eurozone bonds between early 2000 and mid-2006 is associated with a reduction of Eurozone long-term interest rates by 1.55%.[37]

Thirdly, an environment of geopolitical and economic uncertainty led to flight to quality movements during certain periods of 2015, which helped drive interest rates even lower for major safe havens countries. Flight to quality has been particularly acute in early 2016.

Global investors had enough reasons to seek safe haven investments during 2015. In general, political conflicts continued in 2015 in various regions of the world. Major examples include (i) the face-off between the Eurozone and Greece's new radical left-leaning government, which culminated in Greece defaulting on its sovereign debt with the International Monetary Fund (IMF), being forced to accept a third bail-out package, and barely escaping an exit from the Eurozone; (ii) the escalation of the civil war in Syria, leading to a refugee crisis, with an increasing number of refugees seeking asylum in neighboring Middle Eastern countries and in the European Union; and (iii) the strengthening of the Islamic State of Iraq and Syria (ISIS), which continued to launch terrorist attacks across the globe, with the greatest shock felt in November when ISIS carried out a series of coordinated attacks in Paris, France.

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[35] Source: Treasury International Capital (TIC) System's Portfolio Holdings of U.S. and Foreign Securities – A. Major Foreign Holders of U.S. Treasury Securities retrieved from http://www.treasury.gov/resource-center/data-chart-center/tic/Pages/ticsec2.aspx, February 17, 2016.

[36] Warnock, Francis E., and Veronica Cacdac Warnock, "International Capital Flows and U.S. Interest Rates," *Journal of International Money and Finance* 28 (2009): 903-919.

[37] Carvalho, Daniel and Michael Fidora, "Capital inflows and euro area long-term interest rates", ECB Working Paper 1798, June 2015. Note that the 'euro' was introduced to financial markets on January 1, 1999 as the new 'single currency' of what is now known as the Eurozone.

In addition, concerns about a slowing global economy and deflationary pressures have also led global investors to seek safe haven investments, such as government bonds issued by the U.S., Germany, and Switzerland, to name a few. Oil prices continued to tumble from its mid-2014 highs, reinforcing investor anxiety over stagnant growth in the Eurozone and Japan, as well as a deceleration in China and several other emerging-market countries.

Mid-August 2015 caught global markets by surprise, when China announced a devaluation of the yuan, following dramatic sell-offs of Chinese equities throughout the month of July. The surprise yuan devaluation was followed by a few days of disappointing news about China's economy. The apparent slowdown in China's economy (i) raised fears of a further global economic slowdown, (ii) significantly depressed commodity prices (China is the world's largest importer of several raw materials), and (iii) weighed heavily on world financial markets. The Fed's announcement in September that it would not raise rates (when the market participant consensus had been predicting a rate hike), took into consideration the increased economic uncertainty implied by the tumult observed in global markets.

On the other hand, the sharp decline in oil prices has put additional pressure in an already very low inflation environment, considered by many as bordering on deflation territory. For perspective, the price of Brent crude oil was at $115/barrel in mid-June 2014; since then prices declined to $38/barrel at the end of 2015, a cumulative 67% decline in the space of a year and a half. The collapse of oil prices has continued in early 2016.[38] The potential benefit of lower oil prices to oil-importing nations has not (yet, at least) been felt on economic growth. Worryingly, should major economic regions such as the Eurozone enter into a deflationary path, one could use Japan's "lost decades" as a parallel to what might happen in the future.

Deflation risks and economic stagnation are precisely what led central banks in Japan and Eurozone to recently boost their respective monetary easing policies. In October 2014, Japan's central bank surprised the world by announcing a second easing program self-dubbed as "quantitative and qualitative easing" (QQE).[39] In November, after the announcement of a second consecutive quarter of economic contraction, Japan's prime minister Shinzo Abe also proclaimed snap parliamentary elections, explicitly seeking endorsement to continue with the government's expansionary economic policies (also known as "Abenomics"). While Abe's party managed to keep its two-third majority in the December 2014 elections, the QQE measures failed to spur real economic growth in 2015, with headline inflation far below the Bank of Japan's (BOJ) 2.0% target.

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[38] Source: S&P *Capital IQ* database.
[39] For a list of BOJ's monetary policy decisions, visit: http://www.boj.or.jp/en/mopo/mpmdeci/index.htm/.

In another surprise move, the BOJ announced on January 29, 2016 a landmark decision to implement a negative interest rate policy (dubbed "NIRP" in the financial press), in conjunction with its QQE. The BOJ now joins the European Central Bank (ECB), as well as the Danish, the Swedish, and the Swiss central banks in adopting this new form of unconventional monetary policies. NIRP entails financial institutions paying interest on the liabilities that the central bank issues to them. The main idea of NIRP is to discourage savings, while creating incentives for consumers to increase their spending and companies to expand their investment. However, the consequence of such measures is to also pressure interest rates further downwards. According to an S&P research report:[40]

> *"Negative interest rate policy appears to be able to exert downward pressure on the whole yield curve via the portfolio rebalance effect, as security prices, perturbed by the central bank's fixing of one price, adjust to restore equilibrium."*

According to recent Bloomberg calculations, more than $7 trillion of government bonds globally offered negative yields in early February 2016, making up about 29% of the Bloomberg Global Developed Sovereign Bond Index.[41]

In the Eurozone, lackluster growth trends, coupled with deflation fears, induced the ECB to cut its benchmark rate to a new record low in early June 2014, while also announcing an unprecedented measure to charge negative interest rates on deposits held at the central bank.[42] Responding to a weak third quarter, the ECB again cut its benchmark rate to 0.05% in September 2014, and revealed details for two different securities purchase programs. The continued threat of deflation led the ECB to announce a larger scale sovereign debt buying program in January 2015, consisting of €60 billion in monthly asset purchases. This program was launched in March with an original target end-date of September 2016. Real GDP growth did accelerate in the first quarter of 2015, with consumer price inflation and job growth also showing signs of improvement. However, growth decelerated once again in the second and third quarters. The November terrorist attacks in Paris, the Syrian refugee crisis, and the mounting political uncertainty in Spain and Portugal were all risk factors affecting the Eurozone at the end of 2015. Inflation was also virtually stagnant in October and November. As a result, the ECB announced on December 3, 2015 a further cut of the already-negative deposit facility rate and an extension of monthly asset purchases to March 2017; markets were nevertheless disappointed, as a further expansion of the QE program had been anticipated.

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[40] Standard & Poor's *Ratings Direct* report entitled "Negative Interest Rates: Why Central Banks Can Defy 'Time Preference'", February 3, 2016.
[41] World's Negative-Yielding Bond Pile Tops $7 Trillion: Chart", February 9, 2015. This article can be accessed here: http://www.bloomberg.com/news/articles/2016-02-09/world-s-negative-yielding-bond-pile-tops-7-trillion-chart.
[42] For a list of ECB's monetary policy decisions, visit: https://www.ecb.europa.eu/press/govcdec/html/index.en.html.

Markets are now expecting the ECB to expand its QE policies at its March 2016 meeting.[43]

The current economic conditions in the Eurozone and Japan are in stark contrast with the recent performance of the U.S. economy. Over the last two years, the U.S. economy has been expanding at a healthy pace (albeit below its long-term potential). That, coupled with solid jobs gains, made the Fed more confident that a rise in short-term interest rates was in order, back in December 2015. The divergence in economic growth and monetary policies in the U.S. versus other major economic regions is actually contributing to some of the decline in U.S. Treasury yields. Ultimately, U.S. government bonds continue to offer more-attractive yields than bonds issued by other safe-haven countries, and a stronger dollar enables foreign investors to pick up extra returns on U.S. investments.

Looking forward to 2016, many of the forces behind disappointing U.S. stock market performance during 2015, such as low commodity prices, sluggish global growth, and shrinking corporate profits (partly due to a strong U.S. dollar), may still be present in the coming year. This could contribute to a downward pressure in global interest rates, including those in the U.S.

So, are artificially repressed U.S. Treasury yields sustainable? Sustainability implies that something can go on forever, but Stein's Law tells us that "If something cannot go on forever, it will stop".[44] A possible corollary of Stein's Law is that if the accommodative monetary policy (including the massive QE programs) by the Fed since the Financial Crisis "cannot go on forever", then the Fed may really not have much of a choice in whether to "stop" or not. Put simply, things that are destined to stop will stop by their own accord, one way or another. Whether it will be a "graceful dismount" is yet to be seen.

In the short-term, there are probably still enough significant factors that will keep interest rates at artificially low levels. However, in the medium-term, borrowing any major setback in the global economy, investors seem to be expecting U.S. interest rates to start rising, albeit slowly, after 2016.

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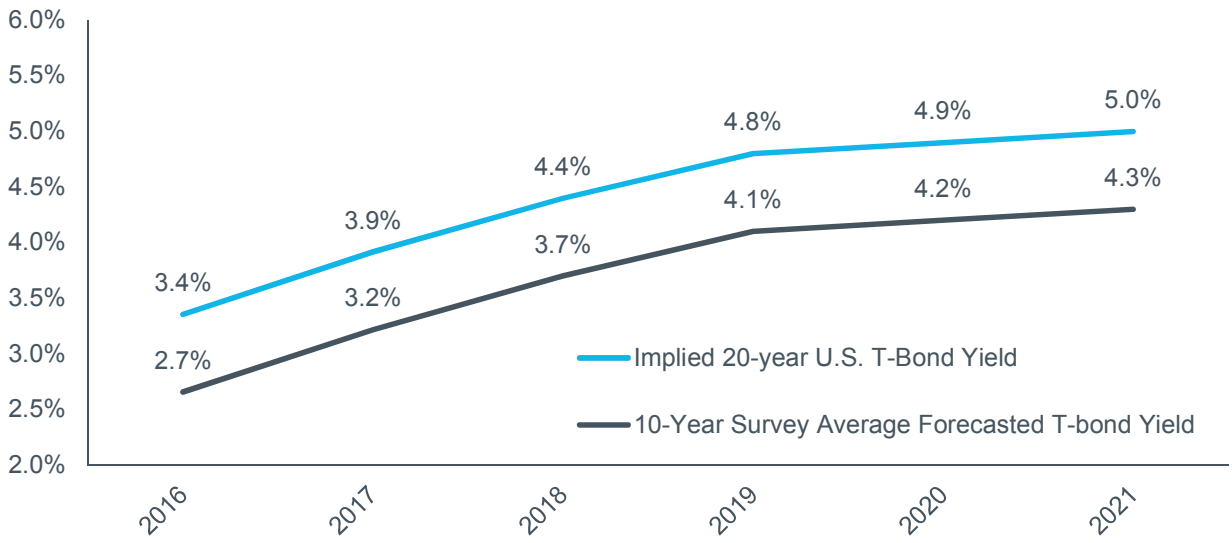
[43] The discussion in this section was based on information available at the time of writing (through February 23, 2016). Events and market conditions may have changed since then relative to when this report is issued.

[44] Professor Herbert Stein was a member and later chairman of the Council of Economic Advisers under Presidents Nixon and Ford. Source: Michael M. Weinstein, "Herbert Stein, Nixon Adviser And Economist, Is Dead at 83", *New York Times*, September 09, 1999.

We compiled consensus forecasts from reputable sources published close to year-end 2015. Exhibit 6 displays the average of consensus forecasts for 10-year U.S. Treasury bond yields through 2021 from a variety of surveys.[45,46,47] We then added a maturity premium to the 10-year yield, to arrive at an implied forecast for the 20-year government bond yield.[48]

Exhibit 6: Average forecasted 10-year U.S. Treasury Bond Yield and Implied 20-year U.S. Risk-free Rate (in percentage terms) at year-end 2015



[45] Sources: "Survey of Professional Forecasters: Fourth Quarter 2015", Federal Reserve Bank of Philadelphia (November 13, 2015); "The Livingston Survey: December 2015", Federal Reserve Bank of Philadelphia (December 10, 2015); "US Consensus Forecast ", Consensus Economics Inc. (January 11, 2016); *Blue Chip Economic Indicators* (January 10, 2016); *Blue Chip Financial Forecasts* (December 1, 2015); S&P *Capital IQ*™ database. Note that while some of the sources were released in 2016, the underlying surveys had been conducted in early January 2016, still reflecting expectations close to year-end 2015.

[46] Not all surveys provided consensus forecasts through 2021. At a minimum, all five sources included forecasts for 2016.

[47] Sources of underlying data: Survey of Professional Forecasters; Livingston Survey; U.S. Consensus Forecast; *Blue Chip Economic Indicators*; and *Blue Chip Financial Forecasts*; S&P *Capital IQ* database. Compiled by Duff & Phelps LLC.

[48] A maturity premium of approximately 70 basis points was added to the 10-year yield. This was based on the average yield spread between the 20 and the 10-year U.S. Treasury constant maturity bonds from December 2008 through December 2015. Had more recent data been used, when the yield spread declined to a range of 40 to 50 basis points, this would not have materially changed our main conclusion. While the magnitude of the maturity premium can be debated, using even the most recent 40 to 50 basis points average yield spread would imply that at year-end 2015 market participants expected the 20-year yield to reach close to 4.1% by 2018 (3.7% + approximately 0.4%).

The Congressional Budget Office (CBO), a non-partisan agency supporting the U.S. Congressional budgeting process, is more optimistic on how fast rates will rise. In its report "The Budget and Economic Outlook: 2016 to 2026", the CBO estimates the 10-year yield to average 3.5% in 2017, which would imply a 20-year yield around 4.2% using a maturity premium of 70 basis points. Its long-term forecast for the 10-year yield is 4.1% starting in 2019, again implying a long-term 20-year yield around 4.8%.[49]

Methods of Risk-free Rate Normalization

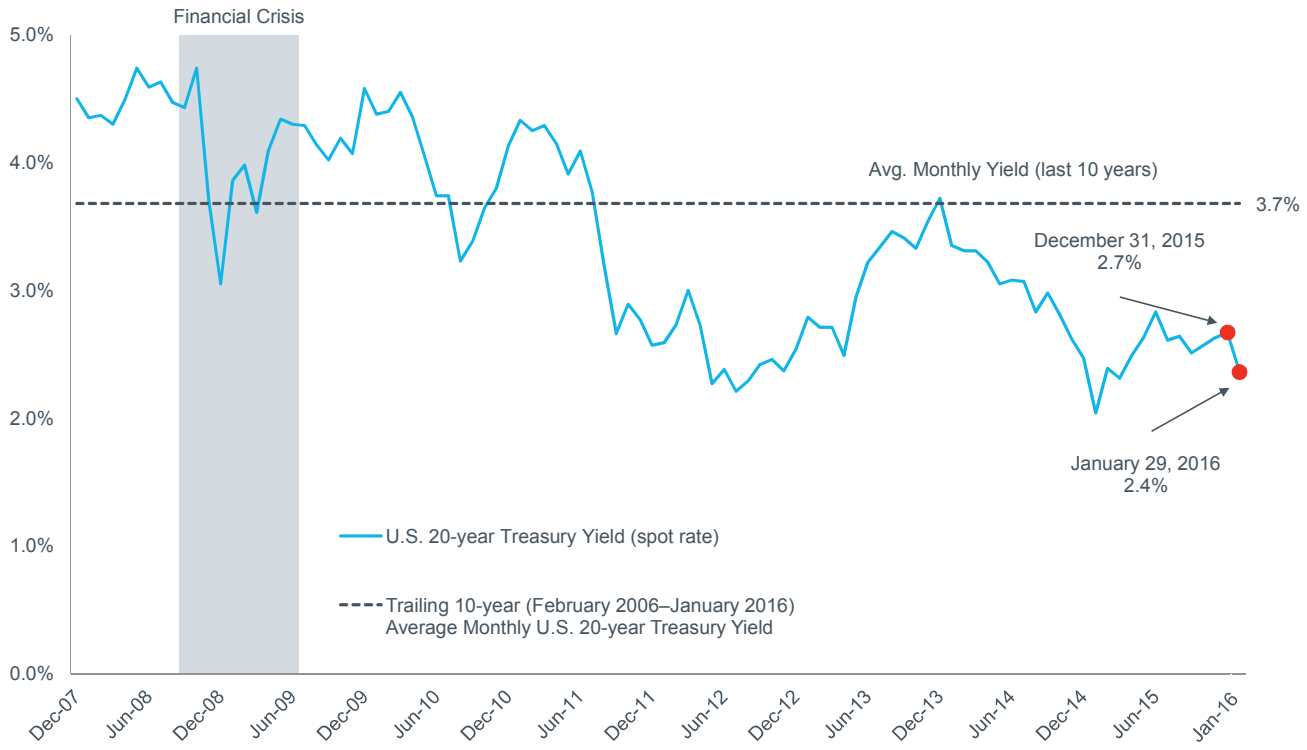
Normalization of risk-free rates can be accomplished in a number of ways, including (i) simple averaging, or (ii) various "build-up" methods.

The first normalization method entails calculating averages of yields to maturity on long-term government securities over various periods. This method's implied assumption is that government bond yields revert to the mean. In Exhibit 7, the solid blue line is the spot yield on a 20-year U.S. government bond (December 2007–January 2016), whereas the dashed black line shows a 3.7% average monthly yield of the 20-year U.S. government bond over the previous 10 years ending on January 2016 (at the end of December 2015, the long-term average would still be 3.7%).[50] Government bond spot yields at the end of December 2015, and even more so at the end of January 2016, were lower than the monthly average over the last 10 years. Taking the average over the last 10 years is a simple way of "normalizing" the risk-free rate. An issue with using historical averages, though, is selecting an appropriate comparison period that can be used as a reasonable proxy for the future.

[49] "The Budget and Economic Outlook: 2016 to 2026", released January 25, 2016. Again, using a maturity premium of 40 basis points would imply a 20-year yield of 3.9% in 2017 and a long-term 20-year yield of 4.5% starting in 2019. For more details on this report, visit: https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51129-2016Outlook_OneCol-2.pdf.

[50] Source of underlying data: 20-year U.S. government bond series. Board of Governors of the Federal serve System website at: http:// www.federalreserve.gov/releases/h15/data.htm.

Exhibit 7: Spot and Average Yields on 20-year U.S. Government
December 2007–January 2016



The second normalization method entails using a simple build-up method, where the components of the risk-free rate are estimated and then added together. Conceptually, the risk-free rate can be (loosely) illustrated as the return on the following two components:[51]

Risk-Free Rate = Real Rate + Expected Inflation

Some academic studies have suggested the long-term "real" risk-free rate to be somewhere in the range of 1.2% to 2.0% based on the study of inflation swap rates and/or yields on long-term U.S. Treasury Inflation Protected Securities (TIPS).[52,53,54,55]

The second component, *expected inflation*, can also be estimated in a number of ways. Monetary policymakers and academics have been monitoring several measures of market expectations of future inflation. One method of estimating long-term inflation is to take the difference between the yield on a 20-year U.S. government bond yield and the yield of a 20-year U.S. TIPS. This is also known as the "breakeven inflation".[56] This calculation is shown in Exhibit 8 over the time period July 2004–January 2016.[57] Over this period, the average monthly breakeven long-term inflation estimate using this method was 2.3% (3.8% government bond yield – 1.5% TIPS). As of December 31, 2015, the average monthly breakeven long-term inflation estimate was also 2.3%.

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[51] This is a simplified version of the "Fisher equation", named after Irving Fisher. Fisher's "*The Theory of Interest*" was first published by Macmillan (New York), in 1930.

[52] TIPS are marketable securities whose principal is adjusted relative to changes in the Consumer Price Index (CPI).

[53] Haubrich, Joseph, George Pennacchi, and Peter Ritchken, "Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps," *Review of Financial Studies* Vol. 25 (5) (2012): 1588-1629. The results of the authors' work is updated on a monthly basis and published in the Federal Reserve Bank of Cleveland's website. The 'Inflation Expectations' monthly series published in the 'Inflation Central' section of the website, contains an expected 10-year Real Risk Premia (as predicted by the model), which would be a proxy for the maturity premium of the 10-year real yield over the short-term real risk-free rate. For example, in December 2015, this expected 10-year Real Risk Premia was 1.2%. The 'Inflation Central' is located here: https://www.clevelandfed.org/en/our-research/inflation-central.aspx.

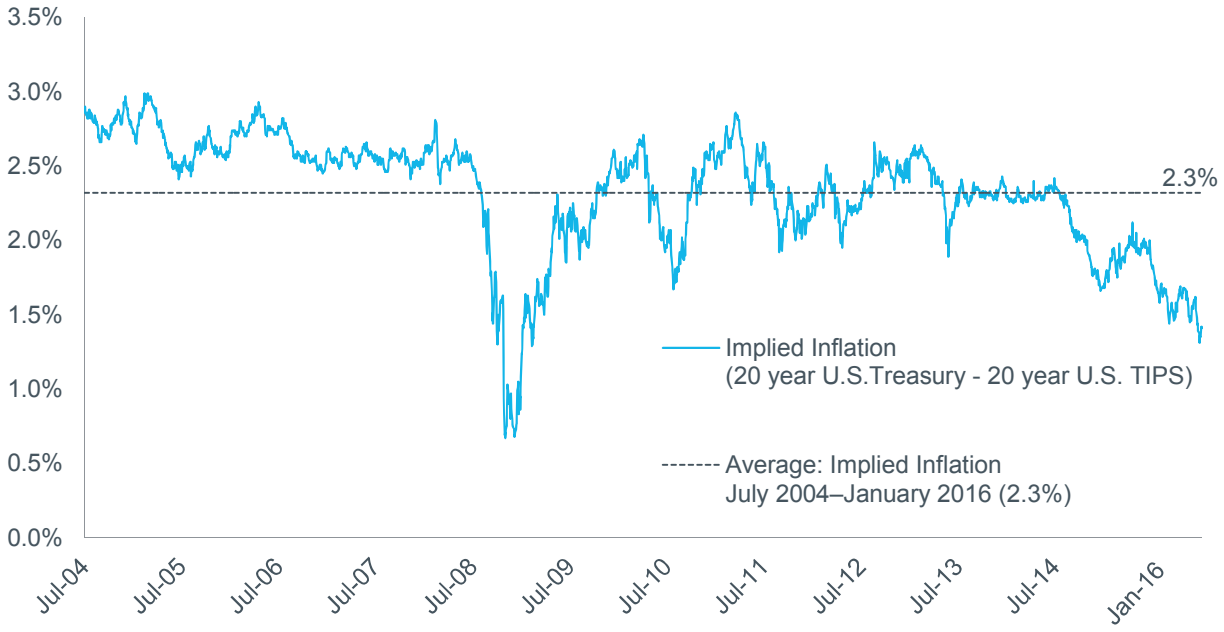
[54] Andrew Ang and Geert Bekaert "The Term Structure of Real Rates and Expected Inflation," *The Journal of Finance*, Vol. LXIII (2) (April 2008).

[55] Olesya V Grishchenko and Jing-zhi Huang "Inflation Risk Premium: Evidence From the TIPS Market," *The Journal of Fixed Income*, Vol. 22 (4) (2013): 5-30.

[56] Breakeven inflation is based on the differential between nominal and TIPS yields with equivalent maturity. However, several studies have documented that the breakeven inflation has not been a good predictor for inflation expectations. The differential between nominal and real rates is not only complicated by a liquidity premium, but also by the potential presence of the inflation risk premium, with both of these premiums varying through time. For a more detailed list of academic studies documenting the magnitude of the liquidity premium and the inflation risk premium, refer back to Chapter 7 of Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital: Applications and Examples*, 5th ed. (Hoboken, NJ: John Wiley & Sons, 2014).

[57] Source of underlying data: 20-year U.S. government bond series and 20-year TIPS series, Board of Governors of the Federal Reserve System website at: http://www.federalreserve.gov/releases/h15/data.htm. Calculated by Duff & Phelps LLC.

Exhibit 8: Breakeven Long-Term Inflation Estimate (20 year Government Bond Yield – 20 year TIPS Yield)
July 2004–January 2016



Additionally, in the U.S., there are a number of well-established surveys providing consensus estimates for expected inflation. One academic study has examined various methods for forecasting inflation over the period 1952–2004 and found that surveys significantly outperform other forecasting methods.[58] Exhibit 9 outlines some of the most prominent surveys in this area.[59] Altogether, the year-end 2015 estimates of longer-term inflation range from 1.8% to 2.6%.

[58] Ang, A., G. Bekaert, and M. Wei. "Do macro variables, asset markets, or surveys forecast inflation better?" *Journal of Monetary Economics*. 54, 1163-1212.
[59] Sources of underlying data: "The Livingston Survey: December 2015," Federal Reserve Bank of Philadelphia (December 10, 2015); "Survey of Professional Forecasters: Fourth Quarter 2015," Federal Reserve Bank of Philadelphia (November 13, 2015); *Blue Chip Financial Forecasts* Vol. 34 (12) (December 1, 2015); Federal Reserve Bank of Cleveland (estimates as of December 2015); Bloomberg.

Exhibit 9: Long-term Expected Inflation Estimates Year-end 2015 (approx.)

Source	Estimate (%)
Livingston Survey (Federal Reserve Bank of Philadelphia)	2.3
Survey of Professional Forecasters (Federal Reserve Bank of Philadelphia)	2.2
Cleveland Federal Reserve	1.8
Blue Chip Financial Forecasts	2.3
University of Michigan Survey 5-10 Year Ahead Inflation Expectations	2.6
Range of Expected Inflation Forecasts	1.8% – 2.6%

Adding the estimated ranges for the "real" risk-free rate and longer-term inflation together produces an estimated normalized risk-free rate range of 3.0% to 4.6%, with a midpoint of 3.8% (or 4.0%, if rounding to the nearest 50 basis points).

Range of Estimated Long-term Real Rate	1.2% to 2.0%
Range of Estimated Expected Inflation Forecasts	1.8% to 2.6%
Range of Estimated Long-term Normalized Risk-free Rate	3.0% to 4.6%
Midpoint	3.8%

Spot Yield or Normalized Yield?

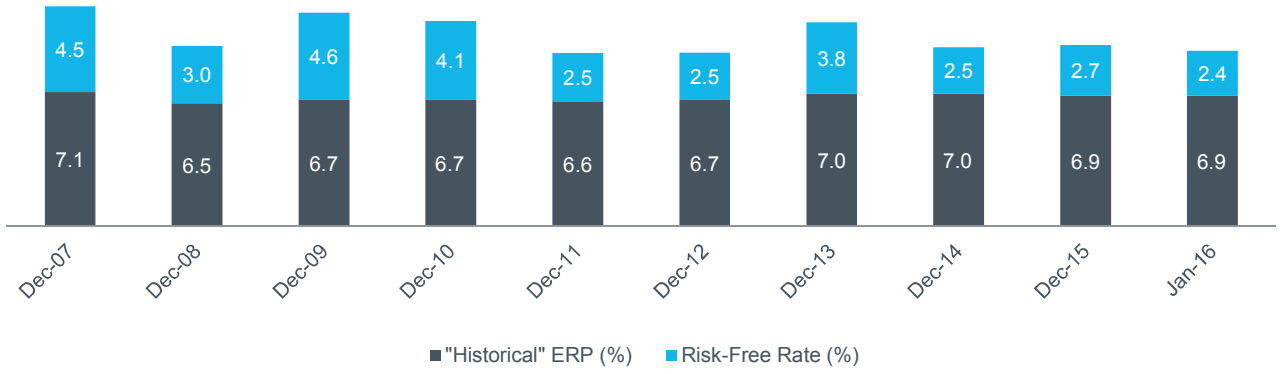
Should the valuation analyst use the current market yield on risk-free U.S. government bonds (e.g., "spot" yield equal to 2.7% at December 31, 2015 or 2.4% at January 31, 2016) or use a "normalized" risk-free yield when estimating the cost of equity capital?

As stated earlier, in most circumstances we would prefer to use the "spot" yield on U.S. government bonds available in the market as a proxy for the U.S. risk-free rate. However, during times of flight to quality and/or high levels of central bank intervention, those lower observed yields imply a lower cost of capital (all other factors held the same) – just the opposite of what one would expect in times of relative economic distress – so a "normalization" adjustment may be considered appropriate. By "normalization" we mean estimating a rate that more likely reflects the sustainable average return of long-term risk-free rates. *If spot yield-to-maturity were used at these times, without any other adjustments, one would arrive at an overall discount rate that is likely inappropriately low vis-à-vis the risks currently facing investors*. Exhibit 10 shows the potential problems of simply using the spot yield-to-maturity on 20-year U.S. government bonds in conjunction with unadjusted U.S. historical equity risk premia.[60] Data is displayed for year-end 2007 through year-end 2015, as well as end of January 2016. For example, in December 2008, at the height of the Financial Crisis (when risks were arguably at all-time highs), using the 1926–2008 historical ERP of 6.5% together with the spot 20-year yield of 3.0% would result in a base cost of equity capital of 9.5%. In contrast, the base cost of equity would be 11.6% (4.5% plus 7.1%) at year-end 2007, implying that risks were actually higher at the end of 2007 than at the end of 2008. From both a theoretical and practical standpoint, the reality is that investors likely perceived risks to be much higher in December 2008, relative to the December 2007. This demonstrates that a mechanical application of the data may result in nonsensical results.[61]

[60] Source of underlying data: Morningstar *Direct* database. Used with permission. Risk-free rate data series used: Long-term Gov't Bonds (IA SBBI US LT Govt YLD USD). All rights reserved. Calculations performed by Duff & Phelps LLC

[61] More detailed information on historical and forward-looking ERPs can be found later in this report.

Exhibit 10: Spot 20-year U.S. Treasury Yield in Conjunction with Unadjusted "Historical" Equity Risk Premium



Adjustments to the ERP or to the risk-free rate are, in principle, a response to the same underlying concerns and should result in broadly similar costs of capital. Adjusting the risk-free rate in conjunction with the ERP is only one of the alternatives available when estimating the cost of equity capital.

For example, one could use a spot yield for the risk-free rate, but *increase* the ERP or other adjustment to account for higher (systematic) risk. If the valuation analyst chooses to use the spot yield to estimate the cost of capital during periods when those yields are less than "normal," the valuation analyst must use an estimated ERP that is *matched* to (or implied by) those *below-normal* yields. However we note that the most commonly used data sources for ERP estimates are long-term series measured when interest rates were largely not subject to such market intervention. Using those data series with an abnormally low spot yield creates a mismatch.

Alternatively, if the valuation analyst chooses to use a normalized risk-free rate in estimating the cost of capital, the valuation analyst must again use an estimated ERP that is *matched* to those *normalized* yields. Normalizing the risk-free rate is likely a more direct (and more easily implemented) analysis than adjusting the ERP due to a *temporary* reduction in the yields on risk-free securities, while *longer-term* trends may be more appropriately reflected in the ERP.

4.0%

The Duff & Phelps concluded normalized risk-free rate, as of January 31, 2016

We examined interest rates for the months since the Financial Crisis began. We also estimated a "normalized" yield each month using trailing averages and a build-up model. Considering longer-term averages of Treasury bond yields, and the build-up framework outlined above, Duff & Phelps has currently concluded on a 4.0% "normalized" risk free rate in developing its U.S. ERP (as compared to the 2.4% "spot rate" as of January 31, 2016). The 4.0% normalized risk-free rate should be used in conjunction with the 5.5% ERP recommendation outlined herein, implying a 9.5% (4.0% + 5.5%) base cost of equity capital for the U.S. as of January 31, 2016 and thereafter (until further guidance is issued) .

Exhibit 11 (in Section 4 of this report) displays the month by month spot yields on 20-year U.S. government bonds and the matching "normalized" yields (as suggested by Duff & Phelps) for months in which the normalized yields are greater than the corresponding spot yields. The months in which we believe a valuation analyst should consider using a normalized risk-free rate (or at least consider whether adjustments are warranted) are highlighted in bold and the "normalized" yields are shown in these months.

Section 04

Basis for U.S. ERP Recommendation as of January 31, 2016

Basis for U.S. Recommended ERP as of January 31, 2016

Unconditional ERP

ERP is a forward-looking concept. It is an expectation as of the valuation date for which no market quotes are directly observable. While an analyst can observe premiums realized over time by referring to historical data (i.e., realized return approach or ex post approach), such realized premium data do not represent the ERP expected in prior periods, nor do they represent the current ERP estimate. Rather, realized premiums represent, at best, only a sample from prior periods of what may have then been the expected ERP.

To the extent that realized premiums on the average equate to expected premiums in prior periods, such samples may be representative of current expectations. But to the extent that prior events that are not expected to recur caused realized returns to differ from prior expectations, such samples should be adjusted to remove the effects of these nonrecurring events. Such adjustments are needed to improve the predictive power of the sample.

Alternatively, the analyst can derive forward-looking estimates for the ERP from sources such as: (i) data on the underlying expectations of growth in corporate earnings and dividends; (ii) projections of specific analysts as to dividends and future stock prices; or (iii) surveys (an ex-ante approach). The goal of these approaches is to estimate the true expected ERP as of the valuation date.

Duff & Phelps recognizes that making any ERP estimate requires a great degree of judgment. In arriving at our recommended ERP, we weigh both economic and financial markets evidence. We choose to change our recommendations when the preponderance of evidence indicates a change is justified. We try to avoid making a change in one month to only find the evidence reversing itself the following month.

As indicated in Section 2 “Overview of Duff & Phelps ERP Methodology”, based on the analysis of academic and financial literature and various empirical studies, we have concluded that a reasonable long-term estimate of the normal or unconditional U.S. ERP is in the range of 3.5% to 6.0%.

From 5.0% to 5.5%

The change in the Duff & Phelps recommended U.S. Equity Risk Premium effective January 31, 2016

Conditional ERP

As previously stated, based on recent economic and financial market conditions (further described below), we are updating our estimated *conditional* ERP as of January 31, 2016. Specifically, Duff & Phelps is increasing its recommended U.S. ERP from 5.0% to 5.5% (while maintaining a *normalized* risk-free rate of 4.0%) when developing discount rates as of January 31, 2016 and thereafter, until further guidance is issued.

Exhibit 11 displays the Duff & Phelps U.S. ERP recommendations issued since 2008 until the present, along with an indication of whether spot yields on 20-year U.S. government bonds or "normalized" yields (as suggested by Duff & Phelps) were used. In months in which we believe a valuation analyst should consider using a normalized risk-free rate (or at least consider whether adjustments are warranted), we show the "normalized" yields that match the Duff & Phelps recommended U.S. ERP.

Exhibit 11: Duff & Phelps Recommended U.S. ERP and Corresponding Risk Free Rates
January 2008−Present

	Duff & Phelps Recommended ERP	*Risk Free Rate*
Change in ERP Guidance (current guidance) ✓ January 31, 2015 − UNTIL FURTHER NOTICE	5.5%	4.0% Normalized 20-year Treasury yield *
Year-end 2015 Guidance December 31, 2015	5.0%	4.0% Normalized 20-year Treasury yield *
Change in ERP Guidance February 28, 2013 − January 30, 2016	5.0%	4.0% Normalized 20-year Treasury yield *
Change in ERP Guidance January 15, 2012 − February 27, 2013	5.5%	4.0% Normalized 20-year Treasury yield *
Change in ERP Guidance September 30, 2011 − January 14, 2012	6.0%	4.0% Normalized 20-year Treasury yield *
July 1, 2011 − September 29, 2011	5.5%	4.0% Normalized 20-year Treasury yield *
June 1, 2011 − June 30, 2011	5.5%	Spot 20-year Treasury Yield
May 1, 2011 − May 31, 2011	5.5%	4.0% Normalized 20-year Treasury yield *
December 1, 2010 − April 30, 2011	5.5%	Spot 20-year Treasury Yield
June 1, 2010 − November 30, 2010	5.5%	4.0% Normalized 20-year Treasury yield *
Change in ERP Guidance December 1, 2009 − May 31, 2010	5.5%	Spot 20-year Treasury Yield
June 1, 2009 − November 30, 2009	6.0%	Spot 20-year Treasury Yield
November 1, 2008 − May 31, 2009	6.0%	4.5% Normalized 20-year Treasury yield *
Change in ERP Guidance October 27, 2008 − October 31, 2008	6.0%	Spot 20-year Treasury Yield
January 1, 2008 − October 26, 2008	5.0%	Spot 20-year Treasury Yield

* Normalized in this context means that in months where the risk-free rate is deemed to be abnormally low, a proxy for a longer-term sustainable risk-free rate is used. To ensure the most recent ERP recommendation (and associated risk-free rate) is used, visit: www.duffandphelps.com/costofcapital.

To Be Clear:

December 31, 2015 (i.e., "year-end") Valuations: Duff & Phelps recommends a 5.0% U.S. ERP, matched with a normalized yield on 20-year U.S. government bonds equal to 4.0%, implying a 9.0% base cost of equity capital in the United States as of December 31, 2015.

January 31, 2016 Valuations: Duff & Phelps recommend a 5.5% U.S. ERP, matched with a normalized yield on 20-year U.S. government bonds equal to 4.0%, implying a 9.5% base cost of equity capital in the United States as of January 31, 2016 (and thereafter, until further notice).

Basis for Duff & Phelps Recommended U.S. ERP[62]

In estimating the conditional ERP, valuation analysts cannot simply use the long-term historical ERP, without further analysis. A better alternative would be to examine approaches that are sensitive to the current economic conditions.

As previously discussed, Duff & Phelps employs a multi-faceted analysis to estimate the conditional ERP that takes into account a broad range of economic information and multiple ERP estimation methodologies to arrive at its recommendation.[63]

First, a reasonable range of normal or unconditional ERP is established.

Second, based on current economic conditions, Duff & Phelps estimates where in the range the true ERP likely lies (top, bottom, or middle) by examining the current state of the economy (both by examining the level of stock indices as a forward indicator and examining economic forecasts), as well as the implied equity volatility and corporate spreads as indicators of perceived risk.

For example, since December 31, 2014, while the evidence was somewhat mixed, on balance we saw indications that equity risk in financial markets had stayed relatively constant through the end of 2015, when estimated against a normalized risk-free rate of 4.0%. Exhibit 12-A summarizes the primary economic and financial market indicators we analyzed at December 31, 2015 and how they have moved since December 31, 2014, with the corresponding relative impact on ERP indications:

[62] This discussion was extracted from Chapter 3 of the Duff & Phelps *2016 Valuation Handbook – Guide to Cost of Capital* (Hoboken, NJ: John Wiley & Sons, 2016). The discussion in this section was based on information available at the time of writing (through February 23, 2016). Events and market conditions may have changed since then relative to when this report is issued.

[63] To ensure you are always using the most recent ERP recommendation, visit: www.duffandphelps.com/costofcapital.

Exhibit 12-A: Economic and Financial Market Indicators Considered in Duff & Phelps' U.S. ERP Recommendation *as of December 31, 2015*

Factor	Change	Effect on ERP
U.S. Equity Markets	↔	↔
Implied Equity Volatility	↔	↔
Corporate Spreads	↑	↑
Historical Real GDP Growth and Forecasts	↔	↔
Unemployment Environment	↓	↓
Consumer and Business Sentiment	↔	↔
Sovereign Credit Ratings	↔	↔
Damodaran Implied ERP Model	↑	↑
Default Spread Model	↑	↑

Recent economic indicators point to a positive, yet below-pace, real growth for the U.S. economy. The economy has been expanding at a modest rate, but generally better than other major developed economies, and with the risks of a recession seemingly tempered. The employment situation is reaching a level of stability, with the U.S. economy reaching close to full employment. Consumer confidence and business sentiment are generally stable, with the former still above its long-term average.

On the other hand, inflation has been persistently below the Fed's target of 2.0%. The sharp decline in oil prices since 2014 has put additional pressure in an already very low inflation environment.

Concerns about a slowing global economy and deflationary pressures have troubled investors in 2015. Tumbling oil and other commodity prices have reinforced investor anxiety over stagnant growth in the Eurozone and Japan, as well as a deceleration in several emerging-market countries, with a particular focus on China (considered by many analysts as the engine of growth for the global economy). Global financial markets reacted negatively to these trends in August and September of 2015, but settled down towards year-end. As a result, the Fed saw sufficient support to raise its benchmark interest rate in December 2015, the first time since the beginning of the 2008 global financial crisis.

Since early 2016, however, broad equity indices (e.g., the S&P 500) across the globe have suffered significant losses, market volatility has spiked, and credit spreads of U.S. high-yield over U.S. investment grade corporate bonds continued to widen substantially (now affecting companies outside the oil and mining sectors). This has led global investors to seek safe haven investments, such as securities issued by the U.S., Germany, and United Kingdom governments, to name a few, causing sharp declines in government bond yields for these countries. Financial markets are now attaching a lower probability of further interest rate increases by the Fed in the near term.

We show in Exhibit 12-B the primary economic and financial market indicators as of January 31, 2016 and how they have moved since year-end 2014, with the corresponding relative impact on ERP indications.

Exhibit 12-B: Economic and Financial Market Indicators Considered in Duff & Phelps' ERP Recommendation *as of January 31, 2016*

Factor	Change	Effect on ERP
U.S. Equity Markets	↓	↑
Implied Equity Volatility	↑	↑
Corporate Spreads	↑	↑
Historical Real GDP Growth and Forecasts	↔	↔
Unemployment Environment	↓	↓
Consumer and Business Sentiment	↔	↔
Sovereign Credit Ratings	↔	↔
Damodaran Implied ERP Model	↑	↑
Default Spread Model	↑	↑

Finally, we examine other indicators that may provide a more quantitative view of where we are within the range of reasonable long-term estimates for the U.S. ERP.

Duff & Phelps currently uses several models as corroborating evidence. We reviewed these indicators both at year-end 2015 and at the end of January 2016.

- **Damodaran Implied ERP Model** − Professor Aswath Damodaran calculates implied ERP estimates for the S&P 500 and publishes his estimates on his website. Prof. Damodaran estimates an implied ERP by first solving for the discount rate that equates the current S&P 500 index level with his estimates of cash distributions (dividends and stock buybacks) in future years. He then subtracts the current yield on 10-year U.S. government bonds. Duff & Phelps then converts his estimate to an arithmetic average equivalent measured against the 20-year U.S. government bond rate.

  Prof. Damodaran has recently added new capabilities to his implied equity risk premium calculator. The new features introduced last year allow the user to select a variety of base projected cash flow yields, as a well as several expected growth rate choices for the following five years in the forecast. Each option for cash flow yields is independent of the growth rate assumptions, which means that the user can select up to 35 different combinations to estimate an implied ERP. More recently, Prof. Damodaran added a new feature that allows the terminal year's projected cash flows to be adjusted to what he considers a more sustainable payout ratio. This sustainable payout is computed using the long-term growth rate (g) and the trailing 12-month return on equity (ROE), as follows: Sustainable Payout = 1 – g/ROE. If the user selects this option, the payout ratio over the next (projected) five years is based on a linear interpolation between today's payout ratio and the Sustainable Payout. Otherwise, the terminal year payout ratio will be the same as today's value throughout the entire forecast.

  Exhibit 13 shows the current options that a user can select to arrive at an implied ERP indication. Each of these combinations can then be adjusted for a sustainable payout, if the user so decides.[64]

[64] Source of underlying data: Downloadable dataset entitled "Spreadsheet to compute ERP for current month". To obtain a copy, visit: http://people.stern.nyu.edu/adamodar/.

Exhibit 13: Professor Damodaran's Implied Equity Risk Premium Calculator Cash Flow Yield (Dividends + Buybacks) and Growth Rate Options

S&P 500 Cash Flow Yield (Dividends + Buybacks)	S&P Earnings Growth Rates for Years 1 through 5 in the Projections	Adjustment for Sustainable Payout
Trailing 12 months Dividend + Buyback Yield	Historical Growth Rate for the last 10 years	Adjust Cash Flow Yield for Sustainable Payout
Average Dividend + Buyback Yield for the last 10 years	Bottom-up Forecasted Growth Rate for next 5 years	Do Not Adjust Cash Flow Yield for Sustainable Payout
Average Dividend + Buyback Yield for the last 5 years	Top-Down Forecasted Growth Rate for next 5 years	
Average Payout for the last 10 years	Fundamental Growth Rate (based on Current ROE)	
Average Payout for the last 5 years	Fundamental Growth Rate (based on 10-Year Average ROE)	
Average Payout using S&P 500 Normalized Earnings		
Trailing 12 months Dividend + Buyback Yield, Net of Stock Issuance		

Note: ROE = Return on Equity

Based on Prof. Damodaran's estimates of the trailing 12-month cash flow yield (dividends plus buybacks) of S&P 500 constituents – as published on the home page of his website – his implied ERP (converted into an arithmetic average equivalent) was approximately 7.16% measured against an abnormally low 20-year U.S. government bond yield (2.67%), as of December 31, 2015.[65] The equivalent normalized implied ERP estimate was 5.83% measured against a normalized 20-year U.S. government bond yield (4.0%), which represents an increase of 44 basis points relative to the prior year's indication.[66] Testing the various available options outlined in Exhibit 13 – but not adjusting for a Sustainable Payout in the terminal year – we obtained a range of indications for a normalized arithmetic average implied ERP estimate between 3.77% and 6.42% (once again, measured against a normalized 20-year U.S. government bond yield of 4.0%), representing an increase in the range observed last year. Alternatively, if projected cash flows were adjusted for a Sustainable Payout, the implied ERP indications would narrow to a range between 4.45% and 5.33%.

Performing these same steps as of January 31, 2016 would result in increased ERP indications, if computed against spot yields, but similar ones when using a normalized risk-free rate. For example, the implied arithmetic average ERP measured against the spot 20-year U.S. government bond yield (2.36%) was 7.49%, using a trailing 12-month cash flow yield.[67] Against a normalized 20-year U.S. government bond yield (4.0%), this implied ERP would be 5.85% as of January 31, 2016.[68] Similarly, we obtained a range of normalized arithmetic average implied ERP estimates between 3.71% and 6.48% (unadjusted for Sustainable Payout and measured against a normalized 20-year U.S. government bond yield of 4.0%).

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[65] Damodaran's implied rate of return (based on the actual 10-year yield) on the S&P 500 = 8.39% as of January 1, 2016, minus 2.67% actual rate on 20-year U.S. government bonds plus an adjustment to equate the geometric average ERP to its arithmetic equivalent. The result reflects conversion of the implied ERP to an arithmetic average equivalent.

[66] Damodaran's implied rate of return (based on the actual 10-year yield) on the S&P 500 = 8.39% as of January 1, 2016 minus 4.00% normalized rate on 20-year U.S. government bonds plus an adjustment to equate the geometric average ERP to its arithmetic equivalent. The result reflects conversion of the implied ERP to an arithmetic average equivalent.

[67] Damodaran's implied rate of return (based on the actual 10-year yield) on the S&P 500 = 8.41% as of February 1, 2016, minus 2.36% actual rate on 20-year U.S. government bonds plus an adjustment to equate the geometric average ERP to its arithmetic equivalent. The result reflects conversion of the implied ERP to an arithmetic average equivalent.

[68] Damodaran's implied rate of return (based on the actual 10-year yield) on the S&P 500 = 8.41% as of February 1, 2016 minus 4.00% normalized rate on 20-year U.S. government bonds plus an adjustment to equate the geometric average ERP to its arithmetic equivalent. The result reflects conversion of the implied ERP to an arithmetic average equivalent.

[**Note**: Appendix A summarizes the U.S. ERP implied by the Damodaran model since December 31, 2008, as converted by Duff & Phelps into an arithmetic average equivalent against normalized 20-year U.S. government bonds.]

- **Default Spread Model (DSM)** – The Default Spread Model is based on the premise that the long term average ERP (the unconditional ERP) is constant and deviations from that average over an economic cycle can be measured by reference to deviations from the long term average of the default spread (Baa - Aaa).[69]

  At the end of December 2015 and January 2016, the conditional ERP calculated using the DSM model was 5.51% and 5.65% respectively. For perspective, the last time this model resulted in an implied ERP in excess of 5.5% was back in August 2012. This model notably removes the risk-free rate itself as an input in the estimation of ERP. However, the ERP estimate resulting from the DSM is still interpreted as an estimate of the relative return of stocks in excess of risk-free securities.

[**Note:** Appendix B summarizes the conditional U.S. ERP (CERP) implied by the Default Spread Model since December 31, 2008.]

- **Hassett Implied ERP (Hassett)** – Stephen Hassett has developed a model for estimating the implied ERP, as well as the estimated S&P 500 index level, based on the current yield on long-term U.S. government bonds and a risk premium factor (RPF).[70] The RPF is the empirically derived relationship between the risk-free rate, S&P 500 earnings, real interest rates, and real GDP growth to the S&P 500 index over time. The RPF appears to change only infrequently. The model can be used monthly to estimate the S&P 500 index level and the conditional ERP based on the current level of interest rates.[71]

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[69] The Default Spread Model presented herein is based on Jagannathan, Ravi, and Wang, Zhenyu," The Conditional CAPM and the Cross -Section of Expected Returns," *The Journal of Finance*, Volume 51, Issue 1, March 1996: 3-53. See also Elton, Edwin J. and Gruber, Martin J., Agrawal, Deepak, and Mann, Christopher "Is There a Risk Premium in Corporate bonds?", Working Paper, http://pages.stern.nyu.edu/~eelton/working_papers/corp%20bonds/Is%20there%20a%20risk%20premium%20in%20corporate%20bonds.pdf. Duff & Phelps uses (as did Jagannathan, Ravi, and Wang) the spread of high-grade corporates against lesser grade corporates. Corporate bond series used in analysis herein: Barclays US Corp Baa Long Yld USD (Yield) and Barclays US Corp Aaa Long Yld USD (Yield); Source: Morningstar *Direct*.

[70] Stephen D. Hassett, ''The RPF Model for Calculating the Equity Risk Premium and Explaining the Value of the S&P with Two Variables,'' *Journal of Applied Corporate Finance* 22, 2 (Spring 2010): 118–130.

[71] For a more detailed description of Hassett's Risk Premium Factor model see Pratt and Grabowski, op.cit., Chapter 8A, "Deriving ERP Estimates": 167-168".

Hassett's analysis uses the spot 10-year risk-free rate for the period from January 2008 through July 2011; thereafter, his analysis uses a normalized yield on U.S. Treasuries of 4.5% (2.0% real risk-free rate plus 2.5% inflation).[72] Using a normalized 4.5% risk-free rate at both December 2015 and January 2016, the S&P 500 index appeared to be slightly overvalued based on the Hassett model's predictions. Alternatively, based on the S&P 500 index level at the end of December 2015, the implied risk-free rate commensurate with the index closing price was 3.90%. At the end of January 2016, the implied risk-free rate was slightly up at 4.08%. Both of these indications for the risk-free rate are very close to the Duff & Phelps concluded normalized risk-free rate of 4.0% at both dates.

While these additional models may be useful in suggesting the direction of changes in the conditional ERP, they are, like all methods of estimating the ERP, imperfect. The Damodaran Implied ERP Model, the Default Spread Model, and the Hassett Implied ERP Model all utilize assumptions that are subjective in nature. For example, the Damodaran Implied ERP Model assumes a long-term growth rate for dividends and buybacks that is largely a matter of judgment. Likewise, in the default spread model, the changes in spread are applied to a "benchmark" ERP estimate; the choice of that benchmark ERP is largely a matter of judgment.

Again, the inherent "imperfection" of any single ERP estimation model is precisely why Duff & Phelps takes into account a broad range of economic information and multiple ERP estimation methodologies to arrive at our conditional ERP recommendation.

Taking these factors together, we find support for increasing our ERP recommendation relative to our previous recommendation

TO BE CLEAR:

- Many valuations are done at year-end. The Duff & Phelps U.S. ERP recommendation for use with December 31, 2015 valuations is 5.0%, matched with a normalized risk-free rate of 4.0%. This implies a 9.0% (4.0% + 5.0%) "base" U.S. cost of equity capital estimate as of December 31, 2015.

- The Duff & Phelps U.S. ERP recommendation as of January 31, 2016 (and thereafter, until further notice) is 5.5%, matched with a normalized risk-free rate of 4.0%. This implies a 9.5% (4.0% + 5.5%) "base" U.S. cost of equity capital estimate as of January 31, 2016.

5.5%

The Duff & Phelps U.S. Equity Risk Premium Recommendation effective January 31, 2016

[72] "Dissecting S&P 500 2015 Performance Using The RPF Model" by Steve Hassett, Retrieved from: http://seekingalpha.com/article/3811186-dissecting-s-and-p-500-2015-performance-using-rpf-model.

Section 05

Conclusion

Conclusion

Duff & Phelps U.S. Equity Risk Premium and Risk-Free Rate Guidance as of January 31, 2016

- Equity Risk Premium: Increase from 5.0% to 5.5%
- Risk-Free Rate: 4.0% (normalized)
- Base U.S. Cost of Equity Capital: 9.5% (4.0% + 5.5%)

Based on the foregoing, we find evidence to adjust our ERP recommendation upwards to 5.5% relative to our previous guidance issued on February 28, 2013, when the U.S. ERP was adjusted downward (from 5.5% to 5.0%). During 2015, we started seeing some signs of increased risk in financial markets. As further explained below, while the evidence was somewhat mixed as of December, 31, 2015, we can now see clear indications that equity risk in financial markets has increased significantly as of January 31, 2016. Exhibit 14 summarizes the factors considered in our U.S. ERP recommendation.[73]

Exhibit 14: Factors Considered in U.S. ERP Recommendation

Factor	Change	Effect on ERP
U.S. Equity Markets	↓	↑
Implied Equity Volatility	↑	↑
Corporate Spreads	↑	↑
Historical Real GDP Growth and Forecasts	↔	↔
Unemployment Environment	↓	↓
Consumer and Business Sentiment	↔	↔
Sovereign Credit Ratings	↔	↔
Damodaran Implied ERP Model	↑	↑
Default Spread Model	↑	↑

[73] Exhibit 14 is identical to the previous Exhibit 1 (see "Executive Summary") as well as to Exhibit 12-B, and is reproduced here for reader convenience. The factors listed in Exhibit 14 are the factors that were considered the most relevant at the end of January 2016. The factors that Duff & Phelps considers in its monthly review of its ERP recommendation can vary, depending on the economic situation at the time.

Recent economic indicators point to a positive, yet below-pace, real growth for the U.S. economy. The U.S. economy has been expanding at a modest rate, but generally better than other major developed economies, and with the risks of a recession seemingly tempered. The employment situation is reaching a level of stability, with the U.S. economy reaching close to full employment. Consumer confidence and business sentiment are generally stable, with the former still above its long-term average.

On the other hand, inflation has been persistently below the Federal Reserve Bank's (Fed) target of 2.0%. The sharp decline in oil prices since 2014 has put additional pressure in an already very low inflation environment. For perspective, the price of Brent crude oil was at $115/barrel in mid-June 2014; since then prices declined to $38/barrel at the end of 2015, a cumulative 67% decline in the space of a year and a half.

Concerns about a slowing global economy and deflationary pressures have troubled investors in 2015. Tumbling oil and other commodity prices have reinforced investor anxiety over stagnant growth in the Eurozone and Japan, as well as a deceleration in several emerging-market countries, with a particular focus on China (considered by many analysts as the engine of growth for the global economy). Global financial markets reacted negatively to these trends in August and September of 2015, but settled down towards year-end. Since the beginning of 2016, however, broad equity indices (e.g., the S&P 500) across the globe have suffered significant losses, market volatility has spiked, and credit spreads of U.S. high-yield bonds over U.S. investment grade corporate bonds continued to widen substantially (now affecting companies outside the oil and mining sectors).

This has led global investors to seek safe haven investments, such as securities issued by the U.S., Germany, and United Kingdom governments, to name a few, causing sharp declines in government bond yields for these countries. Despite the fact that in December 2015 the Fed decided to raise U.S. interest rates for the first time since the beginning of the 2008 global financial crisis, financial markets are now attaching a lower probability of further increases in the near term.

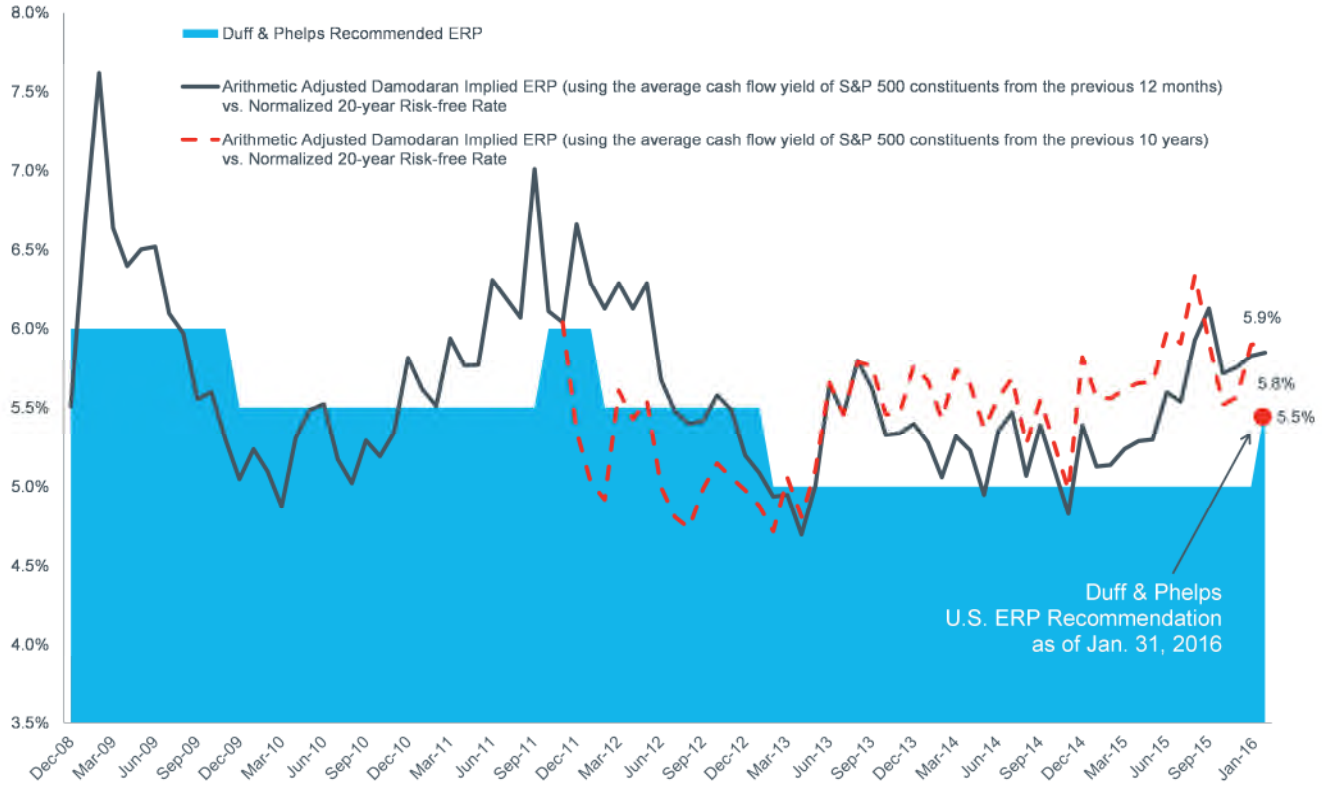
Duff & Phelps monitors two additional quantitative models as corroboration of the qualitative factors discussed above: 1) the Damodaran Implied ERP Model and (2) the Default Spread Model. Both of these models indicated a higher ERP at the end of January 2016 relative to our prior recommendation issued back February 2013.

Taken together, we found sufficient support for increasing our ERP recommendation relative to our previous recommendation. Accordingly, Duff & Phelps recommends a U.S. Equity Risk Premium of 5.5% when developing discount rates as of January 31, 2016 and thereafter, to be used in conjunction with a normalized risk-free rate of 4.0%.

Section 06

Appendices

Appendix A – Damodaran Implied ERP Model



Additional Indicators: The Damodaran Implied ERP Model

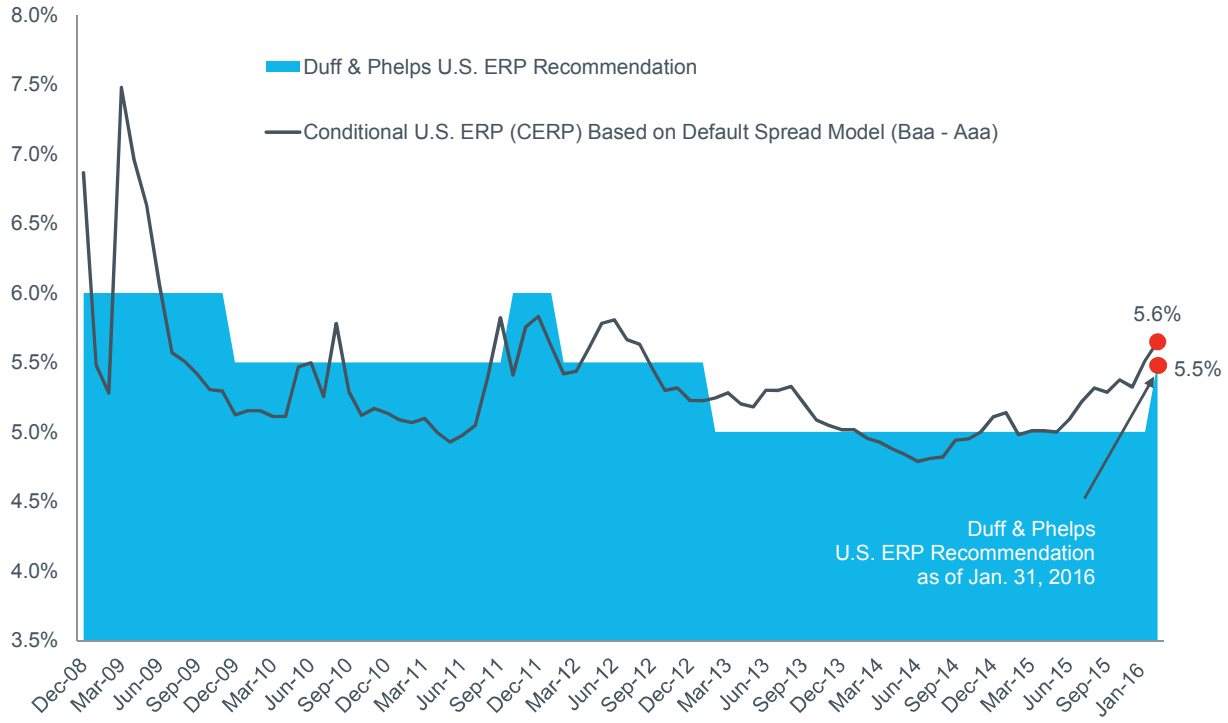
The graph illustrates the Damodaran Implied U.S. ERP model over the time period December 2008 through January 2016 (estimated using a "normalized" 20-year U.S. Treasury yield) as compared to the Duff & Phelps U.S. ERP recommendation.

- At the end of January 2016, the U.S. ERP implied by the Damodaran Model was 5.8% using the average cash flow yield of S&P 500 constituents from the *previous 12 months*, and a normalized 4.0% risk free rate.

- At the end of January 2016, the U.S. ERP implied by the Damodaran Model was 5.9% using the average cash flow yield of S&P 500 constituents from the *previous 10 years*, and a normalized 4.0% risk free rate.

Duff & Phelps regularly reviews fluctuations in global economic and financial conditions that warrant periodic reassessments of ERP. As of January 31, 2016, Duff & Phelps' U.S. ERP recommendation is 5.5%, used in conjunction with a 4.0% normalized risk-free rate.

Appendix B – Default Spread Model



Additional Indicators: The Default Spread Model

The graph illustrates the Default Spread Model used to estimate a conditional U.S. ERP (CERP) over the time period December 2008 through January 2016 as compared to the Duff & Phelps U.S. ERP recommendation. This model notably removes the risk-free rate itself as an *input* in the estimation of ERP. However, the ERP estimate resulting from the Default Spread Model is still interpreted as an estimate of the relative return of stocks *in excess* of risk-free securities.

- At the end of January 2016, the U.S. ERP implied by the Default Spread Model was 5.6%.

Duff & Phelps regularly reviews fluctuations in global economic and financial conditions that warrant periodic reassessments of ERP. As of January 31, 2016, Duff & Phelps' U.S. ERP recommendation is 5.5%, used in conjunction with a 4.0% normalized risk-free rate.

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AFFIRMATION

I affirm, under the penalties for perjury, that the foregoing representations are true.

Crystal L. Thacker
Indiana Office of Utility Consumer Counselor

June 24, 2016
Date

Cause No. 44752
Aqua Indiana, Inc.
Aboite Wastewater Division

CERTIFICATE OF SERVICE

This is to certify that a copy of the foregoing ***OUCC Testimony of Crystal L. Thacker: Public's Exhibit No. 4*** has been served upon the following counsel of record in the captioned proceeding by electronic service on June 24, 2016.

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