Regulatory Finance: Cost of Capital and Rate of Return

Steve Kihm, CFA
Principal and Chief Economist

Michigan State Institute of Public Utilities
Fundamentals Course

August 7, 2019
Major Topics

• setting the return on equity

• the fundamental difference between the return on equity and the cost of equity

• where to obtain accurate financial information (and how to avoid seemingly valuable, but misleading data)

• setting the return on equity without referencing the cost of equity, while satisfying all the requirements set forth by the U.S. Supreme Court in the process
Terms

**cost of capital**: weighted expected (required) return on a company’s stocks and bonds (all capital)

**cost of equity**: expected (required) return on a company's stock

**return on capital or rate of return**: company’s earned return on debt and equity combined (all capital)

**return on equity**: company’s earned return on its equity capital

*equity* → *stock*  
*debt* → *bonds*
Finance and ratemaking
Where finance enters utility ratemaking

revenue requirement = 
operating expenses +
depreciation expense +
+ rate of return \times (net rate base)
<table>
<thead>
<tr>
<th>What the Utility Owns</th>
<th>Who It Owes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant: $1,000,000</td>
<td>Debt: $500,000</td>
</tr>
<tr>
<td></td>
<td>Equity: $500,000</td>
</tr>
<tr>
<td>Total: $1,000,000</td>
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</tr>
</tbody>
</table>
## Really simple balance sheet

<table>
<thead>
<tr>
<th>What the Utility Owns</th>
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<tbody>
<tr>
<td>Plant $1,000,000</td>
<td>Debt $400,000</td>
</tr>
<tr>
<td>Accum Depr $200,000</td>
<td>Equity $400,000</td>
</tr>
<tr>
<td>Total $800,000</td>
<td>Total $800,000</td>
</tr>
</tbody>
</table>
## Hawaiian Electric

<table>
<thead>
<tr>
<th>(in thousands)</th>
<th>Hawaiian Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Property, plant and equipment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Utility property, plant and equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>$ 40,449</td>
</tr>
<tr>
<td>Plant and equipment</td>
<td>4,456,090</td>
</tr>
<tr>
<td>Less accumulated depreciation</td>
<td>(1,523,861)</td>
</tr>
<tr>
<td>Construction in progress</td>
<td>193,677</td>
</tr>
<tr>
<td><strong>Utility property, plant and equipment, net</strong></td>
<td>3,166,355</td>
</tr>
<tr>
<td><strong>Nonutility property, plant and equipment, less accumulated depreciation</strong></td>
<td>5,314</td>
</tr>
<tr>
<td><strong>Total property, plant and equipment, net</strong></td>
<td>3,171,669</td>
</tr>
<tr>
<td>(in thousands)</td>
<td>Hawaiian Electric</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Revenues</strong></td>
<td>$ 1,802,550</td>
</tr>
<tr>
<td><strong>Expenses</strong></td>
<td></td>
</tr>
<tr>
<td>Fuel oil</td>
<td>523,706</td>
</tr>
<tr>
<td>Purchased power</td>
<td>494,450</td>
</tr>
<tr>
<td>Other operation and maintenance</td>
<td>313,346</td>
</tr>
<tr>
<td>Depreciation</td>
<td>137,410</td>
</tr>
<tr>
<td>Taxes, other than income taxes</td>
<td>170,363</td>
</tr>
<tr>
<td><strong>Total expenses</strong></td>
<td>1,639,275</td>
</tr>
<tr>
<td><strong>Operating income</strong></td>
<td>163,275</td>
</tr>
<tr>
<td>Allowance for equity funds used during</td>
<td></td>
</tr>
<tr>
<td>construction</td>
<td>9,208</td>
</tr>
<tr>
<td>Equity in earnings of subsidiaries</td>
<td>45,393</td>
</tr>
<tr>
<td>Retirement defined benefits expense—other than service costs</td>
<td>(2,649)</td>
</tr>
<tr>
<td>Interest expense and other charges, net</td>
<td>(52,180)</td>
</tr>
<tr>
<td>Allowance for borrowed funds used during construction</td>
<td>4,019</td>
</tr>
<tr>
<td><strong>Income before income taxes</strong></td>
<td>167,066</td>
</tr>
<tr>
<td>Income taxes</td>
<td>22,333</td>
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<tr>
<td><strong>Net income</strong></td>
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revenue requirement = $1,501,865 + $137,410 + 
+ rate of return \times ($3,166,355)

Where finance enters utility ratemaking
## Calculating the rate of return

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<tbody>
<tr>
<td>Debt</td>
<td>50%</td>
<td>4.2%</td>
<td>2.1%</td>
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<td>50%</td>
<td>9.5%</td>
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Rate of return: 6.9%
Calculating the rate of return

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Rate of return

This is not the cost of capital, it is the return on capital 6.9%
Calculating the rate of return

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Rate of return

This is not the cost of equity, it is the return on equity. 6.9%
Determining the **return on debt**

Most recent figure = 4.46%
Determining the return on debt

If a utility had issued debt at each of these points (and it is still outstanding) we calculate a weighted average rate
Determining the return on equity
Alternative Rate of Return Concepts and Their Implications for Utility Regulation (Solomon)

Understanding that book rate measures [the return on equity] and DCF rate measures [the cost of equity] are not different estimates of the same thing but rather estimates of different things should eliminate at least part of the confusion surrounding “rates of return on investment.”
Apple

2018 return on equity = 49.8%

Even if Apple could continue to earn 49.8% on its equity capital, would you expect to make 49.8% per year if you bought Apple stock?

You shouldn’t. Apple’s cost of equity is not 49.8% (it’s about 9%)
Apple

Apple makes 49.8% on its $23.01 per-share book value.

To buy a share of Apple stock, you must pay $203.96.

Apple earns the same amount of money ($) no matter what investors pay for the stock.

The high stock price dilutes a 49.8% return on $23.01 to about a 9% return on $203.96.
commonly-espoused view of proper regulatory practice

10.0% cost of equity → 10.0% return on equity
The Regulation of Public Utilities (Phillips)

The frequently used cost of capital standard is a beginning and represents a significant improvement over the earlier commission practices of basing the allowable return on a customary or traditional figure. But such a return is a minimum.
Setting the return on equity equal to the cost of equity makes sense only if we live in a static world (which we don’t). The return on equity is a tool to promote economic progress, which we can do if the return on equity exceeds the cost of equity.
Firms can create value for investors if they can earn returns on the capital they raise that exceeds the cost of raising it.
The proper return that the regulatory process seeks and should seek to ascertain is not itself an objective phenomenon: what is a “just” or “fair and reasonable” return is a political, not a scientific question.
Cedar Rapids Gas Light Co. v. Cedar Rapids, 223 U.S. 655 (1912)

On setting rates of return:

This is not a matter of economic theory, but of fair interpretation of a bargain.
Morningstar report on Xcel Energy

We think Xcel Energy’s constructive regulation and investments in critical energy infrastructure projects support a narrow moat. State and federal regulators grant Xcel exclusive rights to charge customers rates that allow it to earn a fair return on and return of the capital it invests to build, operate and maintain its distribution networks. In exchange for Xcel’s service territory monopolies, state and federal regulators set returns at levels that aim to minimize customer costs while offering fair returns for capital providers.

Xcel has significantly improved the regulatory structures and asset mix in its primary jurisdictions since 2014 such that we now have good confidence that it can consistently earn above its cost of capital. Management has achieved political and regulatory support for rate structures that are among the best in the industry and reduce regulatory lag to less than a year.
Proper model based on institutional analysis

- 7.5% cost of equity
- 10.0% return on equity

Policy matters
- Dynamic economics (incentives) and non-economic concerns
- Minimum return
- Static economics
- No incentives

Fair return
Beyond 2021, we assume a systemwide normalized 10% average allowed ROE and 0.3% average annual long-term usage growth.

We assume a 7.5% cost of equity in our discounted cash flow valuation. This is lower than the 9% rate of return we expect investors will demand of a diversified equity portfolio. A 2.25% long-term inflation outlook underpins our capital cost assumptions. Our cost of capital assumption is 6.0%.
Market test

If the stock price exceeds the book value, the return on equity exceeds the cost of equity (see any of these)
Xcel Energy book value per share = $23.95

Xcel Energy stock price = $60.77

The return on equity then must be noticeably higher than the cost of equity (or the cost of equity must be noticeably lower than the return on equity)
Residual earnings model cost of equity estimate (will cover the details this afternoon)

\[
price = book\ value + \frac{(return\ on\ equity - cost\ of\ equity)book\ value}{cost\ of\ equity - long\ term\ growth}
\]

\[
$60.77 = $23.95 + \frac{(0.100 - cost\ of\ equity)$23.95}{cost\ of\ equity - 0.045}
\]

\[
$60.77 = $23.95 + \frac{(0.100 - 0.067)$23.95}{0.067 - 0.045}
\]
Residual earnings model cost of equity estimate (will cover the details this afternoon)

\[ \text{price} = \text{book value} + \frac{(\text{return on equity} - \text{cost of equity}) \cdot \text{book value}}{\text{cost of equity} - \text{long term growth}} \]

\[ $60.77 = $23.95 + \frac{(0.100 - \text{cost of equity}) \cdot $23.95}{\text{cost of equity} - 0.045} \]

\[ This \ is \ the \ minimum \ return, \ not \ the \ fair \ return \]

\[ $60.77 = $23.95 + \frac{(0.100 - 0.067) \cdot $23.95}{0.067 - 0.045} \]
Note, however, that this model will appear to work if we **overstate the cost of equity**
Testing your financial intuition
Yield on 10-Year U.S. Treasury Note (1960 - present)

- **Low**: 1.4%
- **High**: 15.8%
- **Current**: 2.1%
If interest rates change, then required returns on other securities do as well.
• Which method is likely to produce the most accurate forecast of the average yield on the 10-year U.S. Treasury Note for the year 2020?

A. The current (August 7, 2019) yield on the Treasury Note

B. The average yield on the Treasury Note over the past two years (August 7, 2017 – August 7, 2019)

C. The consensus forecast of Wall Street economists for the 2020 Treasury Note yield as reported by the Federal Reserve Bank of Philadelphia in its quarterly *Survey of Professional Forecasters*
Lewis Alexander, Nomura Securities; Scott Anderson, Bank of the West (BNP Paribas Group); Robert J. Barbera, Johns Hopkins University Center for Financial Economics; Peter Bernstein, RCF Economic and Financial Consulting, Inc.; Wayne Best and Michael Brown, Visa, Inc.; Jay Bryson, Wells Fargo; Christine Chmura, Ph.D., and Xiaobing Shuai, Ph.D., Chmura Economics & Analytics; Gary Ciminero, CFA, GLC Financial Economics; Nathaniel Curtis, Ankura Consulting Group, LLC; Gregory Daco, Oxford Economics USA, Inc.; Rajeev Dhawan, Georgia State University; Bill Diviney, ABN AMRO Bank NV; Gabriel Ehrlich, Danii Manaenkov, Owen Nie, and Aditi Thapar, RSQE, University of Michigan; Michael R. Englund, Action Economics, LLC; J.D. Foster, U.S. Chamber of Commerce; Michael Gapen, Barclays Capital; Sacha Gelfer, Bentley University; James Glassman, JPMorgan Chase & Co.; Jan Hatzis, Goldman Sachs; Keith Hembre, Nuveen Asset Management; Peter Hooper, Deutsche Bank Securities, Inc.; Fred Joutz, Benchmark Forecasts; Sam Kahan, Kahan Consulting Ltd. (ACT Research LLC); N. Karp, BBVA Research USA; Walter Kemmsies, Jones Lang LaSalle; Jack Kleinhenz, Kleinhenz & Associates, Inc.; Thomas Lam, Sim Kee Boon Institute, Singapore Management University; L. Douglas Lee, Economics from Washington; John Lonski, Moody's Capital Markets Group; Macroeconomic Advisers, IHS Markit; Robert McNab, Old Dominion University; R. Anthony Metz, Pareto Optimal Economics; R. M. Monaco, TitanRM; Michael Moran, Daiwa Capital Markets America; Joel L. Naroff, Naroff Economic Advisors; Mark Nielson, Ph.D., MacroEcon Global Advisors; Brendon Ogmundson, BC Real Estate Association; Arun Raha and Maira Trimble, Eaton Corporation; Philip Rothman, East Carolina University; Chris Rupkey, MUFG Union Bank; Sean M. Snaith, Ph.D., University of Central Florida; Constantine G. Soros, Ph.D., CGS Economic Consulting/Montclair State University; Stephen Stanley, Amherst Pierpont Securities; Charles Steindel, Ramapo College of New Jersey; Susan M. Sterne, Economic Analysis Associates, Inc.; James Sweeney, Credit Suisse; Mark Zandi, Moody's Analytics; Ellen Zentner, Morgan Stanley.
Long-term growth estimates

Dividend Discount Model (DDM)
Also referred to as the Discounted Cash Flow (DCF) Model

\[
\text{cost of equity (required return)} = \frac{\text{dividends per share}}{\text{stock price}} + \text{long term growth}
\]
S&P 500 Earnings Per Share
1960 - 2018

$1

$10

$100

$1,000

S&P 500 Earnings Per Share
1960 - 2018

growth = 6.5% per year

$y = 3.1567e^{0.065x}$
S&P 500 Earnings Per Share
1960 - 2018

with inflation
6.5%

inflation removed
2.4%
Which method is least likely to produce the most accurate forecast of long-run future earnings per share (EPS) growth for the S&P 500?

A. A projected trend of the historical EPS data (includes inflation)

B. The median of stock analysts’ forecasted long-term growth rates for S&P 500 companies (includes inflation)

C. A projected trend of the EPS data with inflation removed (with forecasted future inflation added back)

D. A consensus forecasted real GDP growth rate (with forecasted future inflation added back)
Forecasting track record
Required reading

SUPERFORECASTING
THE ART & SCIENCE OF PREDICTION
PHILIP TETLOCK  DAN GARDNER

"A manual for thinking clearly in an uncertain world. Read it"
Daniel Kahneman, author of Thinking Fast and Slow
Major conclusion

• The more famous an expert, the less accurate their forecasts.
Experts and the troubling notion of “one big idea”

Kudlow: We are about to enter the 7th year of an economic boom. (???)

Real GDP Growth (annual)
Which method is likely to produce the most accurate forecast of the average yield on the 10-year U.S. Treasury Note for the year 2020?

A. The current (August 7, 2019) yield on the Treasury Note

B. The average yield on the Treasury Note over the past two years (August 7, 2017 – August 7, 2019)

C. The consensus forecast of Wall Street economists for the 2020 Treasury Note yield as reported by the Federal Reserve Bank of Philadelphia in its quarterly Survey of Professional Forecasters
While all of this is true...

50 years of expert forecasts
(Philadelphia Fed Press Release)

Produced within the economic research department of the Philadelphia Fed, the SPF [Survey of Professional Forecasters] is widely followed by macroeconomists, business analysts, and policymakers across the world because it provides a timely consensus outlook for the macroeconomy.

The history of the survey is significant because these forecasts are instrumental in testing macroeconomic theories, evaluating the forecast accuracy of economists who serve on the panel, and studying how professional forecasters adjust their projections over time.
• It’s not surprising that economists forecasts are less accurate than the random walk forecast...what is surprising is how much worse the economists’ forecasts are.

Interest Rate Forecast Accuracy
(Forecast - Actual)
1993 - 2018

Average Annual Error (Basis Points)

Professionals: 74
2-Year Historical Average: 48
Random Walk: 21
The professional forecast was too high... 18 years in a row.
Let’s make the test easier: Just predict the direction of change

- From 1981 to 1996 long-term interest rates changed by more than 100 basis point 10 times over six month periods. How many times did the consensus forecast get the direction of change correct?
2 times (20% accuracy)

[A coin flip would have likely produced 5 correct]

How is this possible?

• **Ignorance**—economists don’t realize they can’t forecast interest rates (highly unlikely if they are trained economists because the economic literature is unequivocal that they can’t)

• **Need to protect their job**

  Tell a story

  Herd

How is this possible?

There are only three types of interest rate forecasters:

• Those that don't know where rates are going.

• Those that don't know they don't know.

• Those that know they don't know but get paid lots of money to pretend they do.


How is your financial intuition?
• Which method is least likely to produce the most accurate forecast of long-run future earnings per share (EPS) growth for the S&P 500?

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The sustainable long-run growth rate for any company cannot exceed the growth rate of the economy in which the firm operates.

S&P 500 Earnings Per Share
1960 - 2018

GDP growth = 6.6% per year

EPS growth = 6.5% per year
Practitioners say the same thing

- Growth targets for many companies are unrealistic. We know of one company with sales already in excess of $5 billion who announced growth targets of 20 percent per year for the next 20 years. Since annual world growth is typically less than 4 percent [3 percent in the U.S.] in real terms company targets need to be more pragmatic.
Estimating long-run annual EPS growth rates

Historical Growth
Real Growth + Inflation
Real GDP + Inflation
Stock analysts (median)
Required reading

How Finance Works
THE HBR GUIDE TO THINKING SMART ABOUT THE NUMBERS
MIHIR A. DESAI
HARVARD BUSINESS REVIEW PRESS
It would be wonderful if the only incentive for analysts was to work hard and do their job. Unfortunately, that’s not the case. They tend to be positively biased, and some “herd” by copying other analysts while others say extreme things.
Aswath Damodaran, New York University

Use conceptually valid models and rational inputs

Try to avoid expert opinion whenever possible. Use facts and develop your own rational assumptions.

ETF Analyzer

Select Sector SPDR Edition

- Evaluate Sector SPDRs based on investment merit using fundamental data and analysis
- Compare Sector SPDRs with ease on a variety of forward-looking valuation metrics
- Succinct reports in three easy-to-read sections:
  Investment Summary, Fundamentals, and Composition
<table>
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</tr>
<tr>
<td>Discretionary (XLY)</td>
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<td>Staples (XLP)</td>
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<td>Energy (XLE)</td>
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Yield* vs. long-term EPS growth of fund constituents

GDP growth—any growth rate beyond this line is unsustainable
if you use economist interest rate forecasts and stock analyst growth rates, you will overstate the cost of equity and obfuscate the entire process...

Note, however, that this model will appear to work if we overstate the cost of equity
Risk-Return Tradeoff for Investors

If interest rates change, then required returns on other securities do as well.

- Impact of interest rate forecasts
- Impact of analyst growth rate forecasts

- S&P 500
- Utilities
- Banks
It is not theory, but the impact of the rate order, which counts...The fact that the method employed to reach that result may contain infirmities is not then important.

...but paradoxically in terms of setting the return on equity you might end up in a reasonable place for all the wrong reasons—in regulation 5 wrongs can make a right

but there’s a better, more logically consistent way (stay tuned)
Financial Rules of the Road in Ratemaking

Bluefield Water Works v. Public Service Comm’n, 262 U.S. 679 (1923)

Bluefield Water Works v. Public Service Comm'n, 262 U.S. 679 (1923)

Rates of return must:

1. Allow the utility to **maintain its credit rating**

2. Allow the utility to **raise capital**

3. Be **comparable** to the returns earned by similarly-situated firms, but not equal to returns earned by highly profitable firms or those with greater risk
It is not theory, but the impact of the rate order, which counts...The fact that the method employed to reach that result may contain infirmities is not then important.
Bluefield Water Works v. Public Service Comm'n, 262 U.S. 679 (1923)

Rates which are not sufficient to yield a reasonable return on the value of the property used at the time it is being used to render the service are unjust, unreasonable, and confiscatory, and their enforcement deprives the public utility company of its property in violation of the Fourteenth Amendment.

This is so well settled by numerous decisions of this Court that citation of the cases is scarcely necessary.
The heart of the matter is that rates cannot be made to depend upon "fair value" when the value of the going enterprise depends on earnings under whatever rates may be anticipated.
Try to avoid expert opinion whenever possible. Use facts and develop your own rational assumptions.

Setting return on equity with an equation
Setting return on equity with an equation

Observable Input Data
2003-2018

- S&P 500 Earned ROE
- Utility Portfolio Earned ROE
- Corporate Aaa Bond Yield
- Avg of S&P ROE and Aaa Yield
Questions

Steve Kihm
Principal and Chief Economist, Slipstream