Appendix A
Educational Background, Research, and Related Business Experience
J. Randall Woolridge

J. Randall Woolridge is a Professor of Finance and the Goldman, Sachs & Co. and Frank P. Smeal Endowed Faculty Fellow in Business Administration in the College of Business Administration of the Pennsylvania State University in University Park, PA. In addition, Professor Woolridge is Director of the Smeal College Trading Room and President and CEO of the Nittany Lion Fund, LLC.

Professor Woolridge received a Bachelor of Arts degree in Economics from the University of North Carolina, a Master of Business Administration degree from the Pennsylvania State University, and a Doctor of Philosophy degree in Business Administration (major area-finance, minor area-statistics) from the University of Iowa. He has taught Finance courses including corporation finance, commercial and investment banking, and investments at the undergraduate, graduate, and executive MBA levels.

Professor Woolridge's research has centered on empirical issues in corporation finance and financial markets. He has published over 35 articles in the best academic and professional journals in the field, including the *Journal of Finance,* the *Journal of Financial Economics,* and the *Harvard Business Review.* His research has been cited extensively in the business press. His work has been featured in the *New York Times*, *Forbes, Fortune, The Economist*, *Barron's*, *Wall Street Journal*, *Business Week*, *Investors' Business Daily*, *USA Today*, and other publications. In addition, Dr. Woolridge has appeared as a guest to discuss the implications of his research on CNN's *Money Line*, CNBC's *Morning Call* and *Business Today*, and Bloomberg's *Morning Call*.

Professor Woolridge's stock valuation book, *The StreetSmart Guide to Valuing a Stock* (McGraw-Hill, 2003), was released in its second edition. He has also co-authored *Spinoffs and Equity Carve-Outs: Achieving Faster Growth and Better Performance* (Financial Executives Research Foundation, 1999) as well as a textbook entitled *Basic Principles of Finance* (Kendall Hunt, 2011).

Professor Woolridge has also consulted with corporations, financial institutions, and government agencies. In addition, he has directed and participated in university- and company-sponsored professional development programs for executives in 25 countries in North and South America, Europe, Asia, and Africa.

Over the past twenty-five years Dr. Woolridge has prepared testimony and/or provided consultation services in regulatory rate cases in the rate of return area in following states: Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Hawaii, Indiana, Kansas, Kentucky, Maryland, Massachusetts, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Washington, D.C. He has also testified before the Federal Energy Regulatory Commission.

J. Randall Woolridge

Office Address

302 Business Building
The Pennsylvania State University
University Park, PA 16802
814-865-1160

Home Address

120 Haymaker Circle
State College, PA 16801
814-238-9428

Academic Experience

Professor of Finance, the Smeal College of Business Administration, the Pennsylvania State University (July 1, 1990 to the present).

> **President, Nittany Lion Fund LLC,** (January 1, 2005 to the present)
> **Director, the Smeal College Trading Room** (January 1, 2001 to the present)
> **Goldman, Sachs & Co. and Frank P. Smeal Endowed University Fellow in Business Administration** (July 1, 1987 to the present).

Associate Professor of Finance, College of Business Administration, the Pennsylvania State University (July 1, 1984 to June 30, 1990).

Assistant Professor of Finance, College of Business Administration, the Pennsylvania State University (September, 1979 to June 30, 1984).

Education

Doctor of Philosophy in Business Administration, the University of Iowa. Major field: Finance.
Master of Business Administration, the Pennsylvania State University.
Bachelor of Arts, the University of North Carolina Major field: Economics.

Books

James A. Miles and J. Randall Woolridge*, Spinoffs and Equity Carve-Outs: Achieving Faster Growth and Better Performance* (Financial Executives Research Foundation), 1999
Patrick Cusatis, Gary Gray, and J. Randall Woolridge, *The StreetSmart Guide to Valuing a Stock* (2nd Edition, McGraw-Hill), 2003.
J. Randall Woolridge and Gary Gray, *The New Corporate Finance, Capital Markets, and Valuation: An Introductory Text* (Kendall Hunt, 2003).

Research

Dr. Woolridge has published over 35 articles in the best academic and professional journals in the field, including the *Journal of Finance,* the *Journal of Financial Economics,* and the *Harvard Business Review*.

CAPITAL COSTS IN TODAY'S MARKETS

Historic Interest Rates and Capital Costs

Long-term capital cost rates for U.S. corporations are a function of the required returns on

risk-free securities plus a risk premium. The risk-free rate of interest is the yield on long-term

U.S. Treasury bonds. The yields on 10-year U.S. Treasury bonds from 1953 to the present are

provided on Panel A of Exhibit JRW-2. These yields peaked in the early 1980s and have

generally declined since that time. These yields fell to below 3.0% in 2008 as a result of the

financial crisis. In 2012, the yields on 10-year Treasuries declined from 2.5% to 1.5% as the

Federal Reserve initiated the third stage of its quantitative easing program ("QE III") to support a

low interest rate environment. These yields increased to 3.0% as of December 2013 on

speculation of a tapering of the Federal Reserve's QE III policy. The Federal Reserve ended the

QE III program in 2015 and increased the federal funds rate in December 2015. Nonetheless,

due to slow economic growth and low inflation, the 10-year Treasury yield subsequently

declined to 1.5% in 2016. The 10-year Treasury yield has since increased to the 2.40% range,

with much of that increase coming in response to the November 8, 2016 U.S. presidential

election.

Panel B on Exhibit JRW-2 shows the differences in yields between ten-year Treasuries and

Moody's Baa-rated bonds since the year 2000. This differential primarily reflects the additional

risk premium required by bond investors for the risk associated with investing in corporate bonds

as opposed to obligations of the U.S. Treasury. The difference also reflects, to some degree,

yield curve changes over time. The Baa rating is the lowest of the investment grade bond ratings

for corporate bonds. The yield differential hovered in the 2.0% to 3.5% range until 2005, declined to 1.5% until late 2007, and then increased significantly in response to the financial crisis. This differential peaked at 6.0% at the height of the financial crisis in early 2009 due to tightening in credit markets, which increased corporate bond yields, and the "flight to quality," which decreased Treasury yields. The differential subsequently declined and bottomed out at 2.4%. The differential has since increased to the 2.80% range.

> The risk premium is the return premium required by investors to purchase riskier securities.

The risk premium required by investors to buy corporate bonds is observable based on yield differentials in the markets. The market risk premium is the return premium required to purchase stocks as opposed to bonds. The market or equity risk premium is not readily observable in the markets (like bond risk premiums) because expected stock market returns are not readily observable. As a result, equity risk premiums must be estimated using market data. There are alternative methodologies to estimate the equity risk premium, and these alternative approaches and equity risk premium results are subject to much debate. One way to estimate the equity risk premium is to compare the mean returns on bonds and stocks over long historical periods. Measured in this manner, the equity risk premium has been in the 5% to 7% range.[1] However, studies by leading academics indicate that the forward-looking equity risk premium is actually in the 4.0% to 6.0% range. These lower equity risk premium results are in line with the findings of equity risk premium surveys of CFOs, academics, analysts, companies, and financial forecasters.

. Panel A of Exhibit JRW-3 provides the yields on A-rated public utility bonds. These yields peaked in November 2008 at 7.75% and henceforth declined significantly. These yields dropped below 4.0% on three occasions - in mid-2013, in the first quarter of 2015, and then

---

[1] See Exhibit JRW-11, p. 5-6.

again in the summer of 2016. These yields have increased to the 4.0% range, with much of the increase coming in the wake of the U.S. presidential election.

Panel B of Exhibit JRW-3 provides the yield spreads between long-term A-rated public utility bonds relative to the yields on 20-year U.S. Treasury bonds. These yield spreads increased dramatically in the third quarter of 2008 during the peak of the financial crisis and have decreased significantly since that time. The yield spreads between 20-year U.S. Treasury bonds and A-rated utility bonds peaked at 3.4% in November 2008, then declined to about 1.5% in the summer of 2012 as investor return requirements declined. The differential has gradually increased in recent years, and is now close to 2.0%.

Capital Market Conditions and Outlook for Interest Rates

A company's rate of return is its overall cost of capital. Capital costs, including the cost of debt and equity financing, are established in capital markets and reflect investors' return requirements on alternative investments based on risk and capital market conditions. These capital market conditions are a function of investors' expectations concerning many factors, including economic growth, inflation, government monetary and fiscal policies, and international developments, among others. In the wake of the financial crisis, much of the focus in the capital markets has been on the interaction of economic growth, interest rates, and the actions of the Federal Reserve (the "Fed"). In addition, capital markets capital costs are impacted by global events.

Regarding interest rates, over the last decade, there have been continual forecasts of higher long-term interest rates. However, these forecasts have proven to be wrong. For

example, after the announcement of the end of the QE III program in 2014, all the economists in

Bloomberg's interest rate survey forecasted interest rates would increase in 2014, and <u>100% of</u>

<u>the economists were wrong</u>. According to the *Market Watch* article:[2]

> The survey of economists' yield projections is generally skewed
> toward rising rates — only a few times since early 2009 have a
> majority of respondents to the Bloomberg survey thought rates would
> fall. But the unanimity of the rising rate forecasts in the spring was a
> stark reminder of how one-sided market views can become. It also
> teaches us that economists can be universally wrong.

Two other financial publications have produced studies on how economists consistently predict

higher interest rates, and yet they have been wrong. The first publication, entitled "How Interest

Rates Keep Making People on Wall Street Look Like Fools," evaluated economists' forecasts for

the yield on ten-year Treasury bonds at the beginning of the year for the last ten years.[3] The

results demonstrated that economists consistently predict that interest rates will go higher, and

interest rates have not fulfilled those predictions.

The second study tracked economists' forecasts for the yield on ten-year Treasury bonds

on an ongoing basis from 2010 until 2015.[4] The results of this study, which was entitled

"Interest Rate Forecasters are Shockingly Wrong Almost All of the Time," are shown in Figure 1

and demonstrate how economists continually forecast that interest rates are going up, yet they do

not. Indeed, as Bloomberg has reported, economists' continued failure in forecasting increasing

---

[2] Ben Eisen, "Yes, 100% of economists were dead wrong about yields, *Market Watch*," October 22, 2014**.** Perhaps reflecting this fact, *Bloomberg* reported that the Federal Reserve Bank of New York has stopped using the interest rate estimates of professional forecasters in the Bank's interest rate model due to the unreliability of those forecasters' interest rate forecasts. See Susanne Walker and Liz Capo McCormick, "Unstoppable $100 Trillion Bond Market Renders Models Useless," *Bloomberg.com* (June 2, 2014). http://www.bloomberg.com/news/2014-06-01/the-unstoppable-100-trillion-bond-market-renders-models-useless.html.
[3] Joe Weisenthal, "How Interest Rates Keep Making People on Wall Street Look Like Fools," Bloomberg.com, March 16, 2015. http://www.bloomberg.com/news/articles/2015-03-16/how-interest-rates-keep-making-people-on-wall-street-look-like-fools.
[4] Akin Oyedele, "Interest Rate Forecasters are Shockingly Wrong Almost All of the Time," *Business Insider*, July 18, 2015. http://www.businessinsider.com/interest-rate-forecasts-are-wrong-most-of-the-time-2015-7.

interest rates has caused the Federal Reserve Bank of New York to stop using the interest rate

estimates of professional forecasters in the Bank's interest rate model due to the unreliability of

those forecasters' interest rate forecasts.[5]

Figure 1

Economists' Forecasts of the Ten-Year Treasury Yield

2010-2015
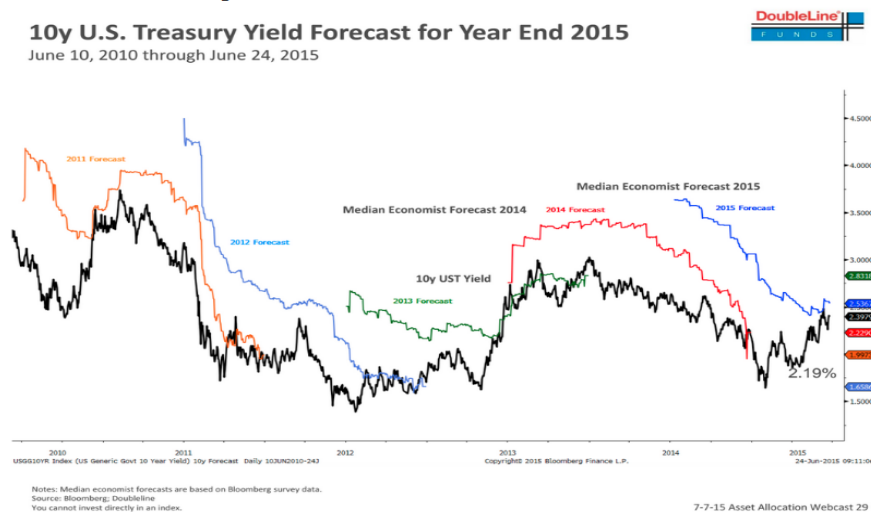
Source: Akin Oyedele, "Interest Rate Forecasters are Shockingly Wrong Almost All of the Time," *Business Insider*, July 18, 2015. .

The Federal Reserve's Decision to Increase the Federal Fund Rate

On December 16, 2015, the Fed decided to increase the target rate for federal funds to

0.25 – 0.50 percent. This increase came after the rate was kept in the 0.0 to 0.25 percent range

for

over five years in order to spur economic growth in the wake of the financial crisis. The move

occurred almost two years after the end of QE III program, the Federal Reserve's bond buying

---

[5] "*Market Watch*," October 22, 2014.

program.   The Federal Reserve has been cautious in its approach to scaling its monetary intervention, and has paid close attention to a number of economic variables, including GDP growth, retail sales, consumer confidence, unemployment, the housing market, and inflation.

Long-term interest rates in the U.S. bottomed out in August 2016 and have increased since that time with improvements in the economy and the outcome of the U.S. Presidential election. Notable improvements include lower unemployment and improving economic growth and corporate earnings.   Then came November 8, 2016, and financial markets moved significantly in the wake of the unexpected results in the U.S. presidential election. The stock market gained more than 15% and the 30-year Treasury yield increased more than 50 basis points to about 3.2%.   These market adjustments reflected the expectation that the new administration will make changes in fiscal, regulatory, and possibly monetary policies which could lead to higher economic growth and inflation. Partly due to these developments, the Federal Reserve's decision at its December 13-14, 2016, meeting to raise its federal funds target rate to 0.50 - .075 percent was broadly expected and there was no significant market reaction.

The Federal Reserve again increased the federal funds rate target rate range to 0.75 – 1.00 percent at its March 13-14, 2017 meetings. And the yield on 30-year Treasury yields declined! Subsequently, on June 14, 2017 and December 19, 2017, the Federal Reserve again increased the federal funds rate target rate by 25 basis points. Despite these increases, the 30-year Treasury yield has not increased and has remained below 3.0%. Furthermore, it is expected that the Fed will increase the federal funds rate again on 2018.

Increases in the federal fund rate will not necessarily result in an increase in long-term interest rates. As the Federal Reserve increased the federal funds rate in March and June, the yield on 30-year Treasury bonds have drifted downward, to the current level of about 2.80%. As
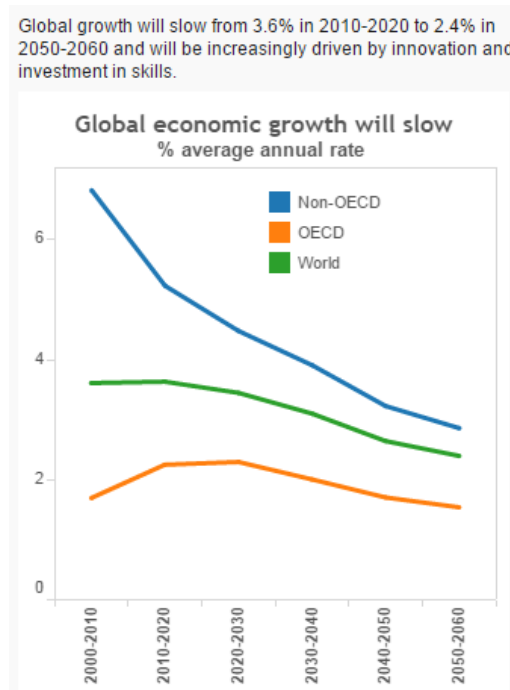
discussed below, the Federal Reserve does not directly determine long-term rates. Long-term rates are primarily driven by economic growth and inflation.

The Long-Term Driver's of GDP and Interest Rates

In the long term, the key drivers of economic growth measured in nominal dollars are population growth, the advancement and diffusion of science and technology, and currency inflation. Although the U.S. experienced rapid economic growth during the "post-war" period (the 63 years that separated the end of World War II and the 2008 financial crisis), the post-war period is not necessarily reflective of expected future growth. It was marked by a near-trebling of global population, from under 2.5 billion to approximately 6.7 billion. Over the next 50 years, according to United Nations projections, the global population will grow considerably more slowly, reaching approximately 10.3 billion in 2070. With population growth slowing, life expectancies lengthening, and post-war "baby boomers" reaching retirement age, median ages in developed-economy nations have risen and continue to rise. The postwar period was also marked by rapid catch-up growth as Europe, Japan, and China recovered from successive devastations and as regions such as India and China deployed and leapfrogged technologies that had been developed over a much longer period in earlier-industrialized nations. That period of rapid catch-up growth is coming to an end. For example, although China remains one of the world's fastest-growing regions, its growth is now widely expected to slow substantially. This convergence of projected growth in the former "second world" and "third world" towards the slower growth of the nations that have long been considered "first world" is illustrated in this "key findings" chart published by the Organization for Economic Co-operation and Development.

Figure 2

Projected Global Growth[6]

Global growth will slow from 3.6% in 2010-2020 to 2.4% in 2050-2060 and will be increasingly driven by innovation and investment in skills.

As to dollar inflation, it has declined to far below the level it reached in the 1970s. The Federal Reserve targets a 2% inflation rate; however, actual inflation has been below this figure. Indeed, inflation has been below the Fed's target rate for over five years due to a number of factors, including slow global economic growth, slack in the economy, and declining energy and commodity prices. The slow pace of inflation is also reflected in the decline in forecasts of future inflation. The Energy Information Administration's annual Energy Outlook includes in its nominal GDP growth projection a long-term inflation component, which the EIA projects at only 2.1% per year for its forecast period through 2040.[7]

All of this translates into slowed growth in annual economic production and income, even when measured in nominal rather than real dollars. Meanwhile, the stored wealth that is available
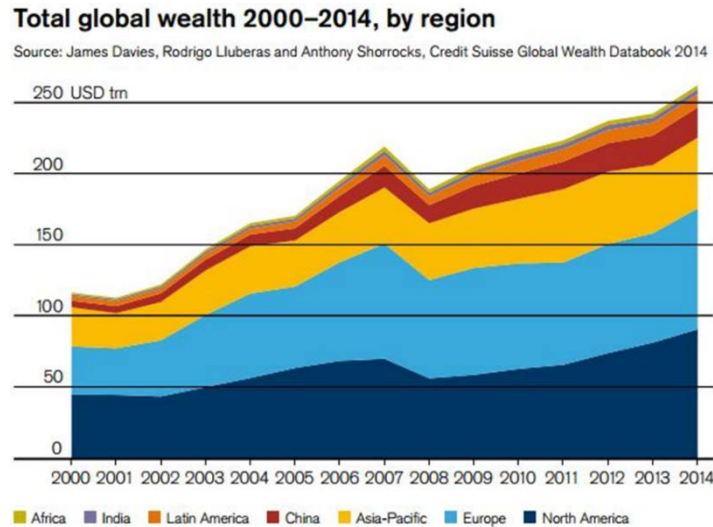
---

[6] See http://www.oecd.org/eco/outlook/lookingto2060.htm.

[7] See EIA Annual Energy Outlook 2016, Table 20 (available at http://www.eia.gov/forecasts/aeo/tables_ref.cfm).

to fund investments has continued to rise. According to the most recent release of the Credit Suisse global wealth report, global wealth has more than doubled since the turn of this century, notwithstanding the temporary setback following the 2008 financial crisis:

Figure 3

Global Wealth – 2000-2014

Total global wealth 2000–2014, by region

Source: James Davies, Rodrigo Lluberas and Anthony Shorrocks, Credit Suisse Global Wealth Databook 2014

Africa · India · Latin America · China · Asia-Pacific · Europe · North America

These long-term trends mean that overall, and relative to what had been the post-war norm, the world now has more wealth chasing fewer opportunities for investment rewards. Ben Bernanke, the former Chairman of the Federal Reserve, called this phenomenon a "global savings glut."[8] Like any other liquid market, capital markets are subject to the law of supply and demand. With a large supply of capital available for investment and relatively scarce demand for investment capital, it should be no surprise to see the cost of investment capital decline, keeping interest rates low.

Former Federal Reserve Chairman Benjamin Bernanke addressed the issue of the continuing low interest rates in his weekly Brookings Blog. He indicated that the focus should

---

[8] Ben S. Bernanke, *The Global Saving Glut and the U.S. Current Account Deficit* (Mar. 10, 2005), available at http://www.federalreserve.gov/boarddocs/speeches/2005/200503102/.

be on real and not nominal interest rates and noted that, in the long term, these rates are *not*

determined by the Federal Reserve:[9]

> If you asked the person in the street, "Why are interest rates so low?," he or she would likely answer that the Fed is keeping them low. That's true only in a very narrow sense. The Fed does, of course, set the benchmark nominal short-term interest rate. The Fed's policies are also the primary determinant of inflation and inflation expectations over the longer term, and inflation trends affect interest rates, as the figure above shows. But what matters most for the economy is the real, or inflation-adjusted, interest rate (the market, or nominal, interest rate minus the inflation rate). The real interest rate is most relevant for capital investment decisions, for example. The Fed's ability to affect real rates of return, especially longer-term real rates, is transitory and limited. Except in the short run, real interest rates are determined by a wide range of economic factors, including prospects for economic growth—not by the Fed.

Mr. Bernanke also addressed the issue about whether low-interest rates are a short-term

aberration or a long-term trend:[10]

> Low interest rates are not a short-term aberration, but part of a long-term trend. As the figure below shows, ten-year government bond yields in the United States were relatively low in the 1960s, rose to a peak above 15 percent in 1981, and have been declining ever since. That pattern is partly explained by the rise and fall of inflation, also shown in the figure. All else equal, investors demand higher yields when inflation is high to compensate them for the declining purchasing power of the dollars with which they expect to be repaid. But yields on inflation-protected bonds are also very low today; the real or inflation-adjusted return on lending to the U.S. government for five years is currently about minus 0.1 percent.

Figure 4
Interest Rates and Inflation
1960-2015

---

[9] Ben S. Bernanke, "Why are Interest Rates So Low," Weekly Blog, Brookings, March 30, 2015. https://www.brookings.edu/blog/ben-bernanke/2015/03/30/why-are-interest-rates-so-low/.
[10] Ibid.
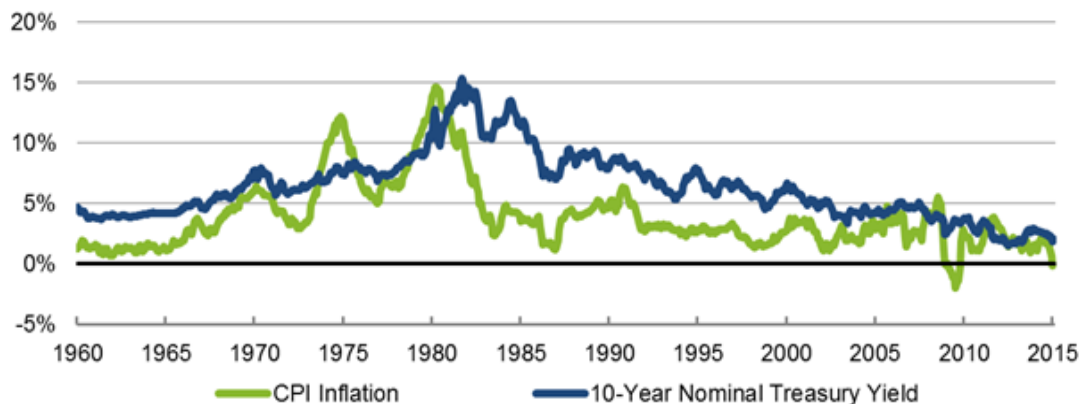
As far as the future outlook for interest rates and capital costs, first, the U.S. economy has been growing for over seven years, and, as noted above, the Federal Reserve sees continuing strength in the economy. The labor market has improved, with unemployment now below 5.0%, and the stock market is near an all-time high.

Second, interest rates remain at relatively low levels and are likely to remain low. There are two factors driving the continued lower interest rates: (1) inflationary expectations in the U.S. which remain low; and (2) global economic growth – including Europe, where growth is slow, and China, where growth has declined significantly. As a result, while the yields on long-term U.S. Treasury bonds are low by historical standards, these yields are well above the government bond yields in Germany, Japan, and the United Kingdom. Thus, U.S. Treasuries offer an attractive yield relative to those of other major governments around the world, thereby attracting capital to the U.S. and keeping U.S. interest rates down.

As the above studies indicate, economists are always predicting that interest rates are going up, and yet they are almost always wrong. Obviously, investors are well aware of the consistently wrong forecasts of higher interest rates, and therefore place little weight on such forecasts. Moreover, investors would not be buying long-term Treasury bonds or utility stocks at their current

yields if they expected interest rates to suddenly increase, thereby producing higher yields and negative returns. For example, consider a utility that pays a dividend of $2.00 with a stock price of $50.00. The current dividend yield is 4.0%. If higher return requirements led the dividend yield to increase from 4.0% to 5.0% in the next year, the stock price would have to decline to $40, which would be a negative 20% return on the stock.[11] Obviously, investors would not buy the utility stock with an expected return of negative 20% due to higher dividend yield requirements.

In sum, it appears to be impossible to accurately forecast prices and rates that are determined in the financial markets, such as interest rates, the stock market, and gold prices. For interest rates, I have never seen a study that suggests one forecasting service is consistently better than others or that interest rate forecasts are consistently better than just assuming that the current interest rate will be the rate in the future. Investors would not be buying long-term Treasury bonds or utility stocks at their current yields if they expected interest rates to suddenly increase, thereby producing higher yields and negative returns.

---

[11] In this example, for a stock with a $2.00 dividend, a 5.0% dividend yield would require a stock price of $40 ($2.00/$40 = 5.0%).

THE COST OF COMMON EQUITY CAPITAL

Determining the Costs of Capital or Fair Rate of Return for Public Utilities

In a competitive industry, the return on a firm's common equity capital is determined through the competitive market for its goods and services. Due to the capital requirements needed to provide utility services and the economic benefit to society from avoiding duplication of these services, some public utilities are monopolies. Because of the lack of competition and the essential nature of their services, it is not appropriate to permit monopoly utilities to set their own prices. Thus, regulation seeks to establish prices that are fair to consumers and, at the same time, sufficient to meet the operating and capital costs of the utility (i.e., provide an adequate return on capital to attract investors).

The total cost of operating a business includes the cost of capital. The cost of common equity capital is the expected return on a firm's common stock that the marginal investor would deem sufficient to compensate for risk and the time value of money. In equilibrium, the expected and required rates of return on a company's common stock are equal.

Normative economic models of a company or firm, developed under very restrictive assumptions, provide insight into the relationship between firm performance or profitability, capital costs, and the value of the firm. Under the economist's ideal model of perfect competition, where entry and exit are costless, products are undifferentiated, and there are increasing marginal costs of production, firms produce up to the point where price equals marginal cost. Over time, a long-run equilibrium is established where price equals average cost, including the firm's capital costs. In equilibrium, total revenues equal total costs, and because

capital costs represent investors' required return on the firm's capital, actual returns equal

required returns, and the market value must equal the book value of the firm's securities.

In the real world, firms can achieve competitive advantage due to product market

imperfections. Most notably, companies can gain competitive advantage through product

differentiation (adding real or perceived value to products) and by achieving economies of scale

(decreasing marginal costs of production). Competitive advantage allows firms to price products

above average cost and thereby earn accounting profits greater than those required to cover

capital costs. When these profits are in excess of that required by investors, or when a firm earns

a return on equity in excess of its cost of equity, investors respond by valuing the firm's equity in

excess of its book value.

James M. McTaggart, founder of the international management consulting firm Marakon

Associates, described this essential relationship between the return on equity, the cost of equity,

and the market-to-book ratio in the following manner:[1]

> Fundamentally, the value of a company is determined by the
> cash flow it generates over time for its owners, and the minimum
> acceptable rate of return required by capital investors. This "cost of
> equity capital" is used to discount the expected equity cash flow,
> converting it to a present value. The cash flow is, in turn, produced by
> the interaction of a company's return on equity and the annual rate of
> equity growth. High return on equity (ROE) companies in low-growth
> markets, such as Kellogg, are prodigious generators of cash flow, while
> low ROE companies in high-growth markets, such as Texas
> Instruments, barely generate enough cash flow to finance growth.
>
> A company's ROE over time, relative to its cost of equity, also
> determines whether it is worth more or less than its book value. If its
> ROE is consistently greater than the cost of equity capital (the
> investor's minimum acceptable return), the business is economically
> profitable and its market value will exceed book value. If, however, the
> business earns an ROE consistently less than its cost of equity, it is

---

[1] James M. McTaggart, "The Ultimate Poison Pill: Closing the Value Gap," *Commentary* (Spring 1986), p.3.

economically unprofitable and its market value will be less than book value.

As such, the relationship between a firm's return on equity, cost of equity, and market-to-book ratio is relatively straightforward. A firm that earns a return on equity above its cost of equity will see its common stock sell at a price above its book value. Conversely, a firm that earns a return on equity below its cost of equity will see its common stock sell at a price below its book value.

This relationship between ROE and market-to-book ratios is discussed in a classic Harvard Business School case study entitled "Note on Value Drivers." On page 2 of that case study, the author describes the relationship very succinctly:[2]

> For a given industry, more profitable firms – those able to generate higher returns per dollar of equity– should have higher market-to-book ratios. Conversely, firms which are unable to generate returns in excess of their cost of equity should sell for less than book value.

Profitability	Value
If ROE > K	then Market/Book > 1
If ROE = K	then Market/Book =1
If ROE < K	then Market/Book < 1

To assess the relationship by industry, as suggested above, I performed a regression study between estimated ROE and market-to-book ratios using natural gas distribution, electric utility, and water utility companies. I used all companies in these three industries that are covered by *Value Line* and have estimated ROE and market-to-book ratio data. The results are presented in Panels A-C of Exhibit JRW-6. The average R-squares for the electric, gas, and water companies

---

[2] Benjamin Esty, "Note on Value Drivers," Harvard Business School, Case No. 9-297-082, April 7, 1997.

are 0.78, 0.63, and 0.49, respectively.[3] This demonstrates the strong positive relationship between ROEs and market-to-book ratios for public utilities.

Economic Factors, Investor Expectations, and Investment Risk

Certain economic factors have affected the cost of equity captial for public utilities. Ex.-CUB-Woolridge-2, Exhibit JRW-7 provides indicators of public utility equity cost rates over the past decade.

Page 1 shows the yields on long-term A-rated public utility bonds. These yields decreased from 2000 until 2003, and then hovered in the 5.50%-6.50% range from mid-2003 until mid-2008. These yields peaked in November 2008 at 7.75% during the Great Recession. Henceforth, these yields have generally declined since then, dropping below 4.0% on three occasions - in mid-2013, in the first quarter of 2015, and then again in the summer of 2016. These yields have increased to about 4.25% in the year, with much of the increase coming in the wake of the November 2016 U.S. presidential election.

Page 2 Exhibit JRW-7 provides the dividend yields for electric utilities over the past 16years. The dividend yields for this electric group have declined from the year 2000 to 2007, increased to 5.2% in 2009, and have declined steadily since that time. The average dividend yield was 3.40% in 2016. Average earned returns on common equity and market-to-book ratios for electric utilities are on page 3 of Exhibit JRW-7. For the electric group, earned returns on common equity have declined gradually since the year 2000 and have been in the 9.0% range in recent years. The average market-to-book ratios for this group peaked at 1.68X in 2007, declined to 1.07X in 2009, and have increased since that time. As of 2016, the average market-

---

[3] R-square measures the percent of variation in one variable (e.g., market-to-book ratios) explained by another variable (e.g., expected ROE). R-squares vary between zero and 1.0, with values closer to 1.0 indicating a higher relationship between two variables.

to-book for the group was 1.75X. This means that, for at least the last decade, returns on common equity have been greater than the cost of capital, or more than necessary to meet investors' required returns. This also means that customers have been paying more than necessary to support an appropriate profit level for regulated utilities.

Regarding investors' expectations, the expected or required rate of return on common stock

is a function of market-wide as well as company-specific factors. The most important market factor is the time value of money as indicated by the level of interest rates in the economy. Common stock investor requirements generally increase and decrease with like changes in interest rates. The perceived risk of a firm is the predominant factor that influences investor return requirements on a company-specific basis. A firm's investment risk is often separated into business and financial risk. Business risk encompasses all factors that affect a firm's operating revenues and expenses. Financial risk results from incurring fixed obligations in the form of debt in financing its assets.

Due to the essential nature of their service as well as their regulated status, public utilities are exposed to a lesser degree of business risk than other, non-regulated businesses. The relatively low level of business risk allows public utilities to meet much of their capital requirements through borrowing in the financial markets, thereby incurring greater than average financial risk. Nonetheless, the overall investment risk of public utilities is below most other industries.

Exhibit JRW-8 provides an assessment of investment risk for 97 industries as measured by beta, which according to modern capital market theory, is the only relevant measure of investment risk. These betas come from the *Value Line Investment Survey.* The study shows that

the investment risk of utilities is very low. The average betas for electric, water, and gas utility companies are 0.74, 0.74, and 0.80, respectively. As such, the cost of equity for utilities is among the lowest of all industries in the U.S.

The Cost of Common Equity Capital and Determining the Required Rate of Return

The costs of debt and preferred stock are normally based on historical or book values and can be determined with a great degree of accuracy. The cost of common equity capital, however, cannot be determined precisely and must instead be estimated from market data and informed judgment. This return to the stockholder should be commensurate with returns on investments in other enterprises having comparable risks.

According to valuation principles, the present value of an asset equals the discounted value of its expected future cash flows. Investors discount these expected cash flows at their required rate of return that, as noted above, reflects the time value of money and the perceived riskiness of the expected future cash flows. As such, the cost of common equity is the rate at which investors discount expected cash flows associated with common stock ownership.

Models have been developed to ascertain the cost of common equity capital for a firm. Each model, however, has been developed using restrictive economic assumptions. Consequently, judgment is required in selecting appropriate financial valuation models to estimate a firm's cost of common equity capital, in determining the data inputs for these models, and in interpreting the models' results. All of these decisions must take into consideration the firm involved as well as current conditions in the economy and the financial markets.

Exhibit JRW--1

Northern Utilities, Inc.
Recommended Cost of Capital

Capital Source	Capitalization Ratio	Cost Rate	Weighted Cost Rate
Long-Term Debt	**48.30%**	**6.16%**	**2.98%**
Common Equity	**51.70%**	**8.55%**	**4.42%**
Totals	100.00%		7.40%

Exhibit JRW--2

Panel A
Ten-Year Treasury Yields
1953-Present

Source: http://research.stlouisfed.org/fred2/data/GS10.txt
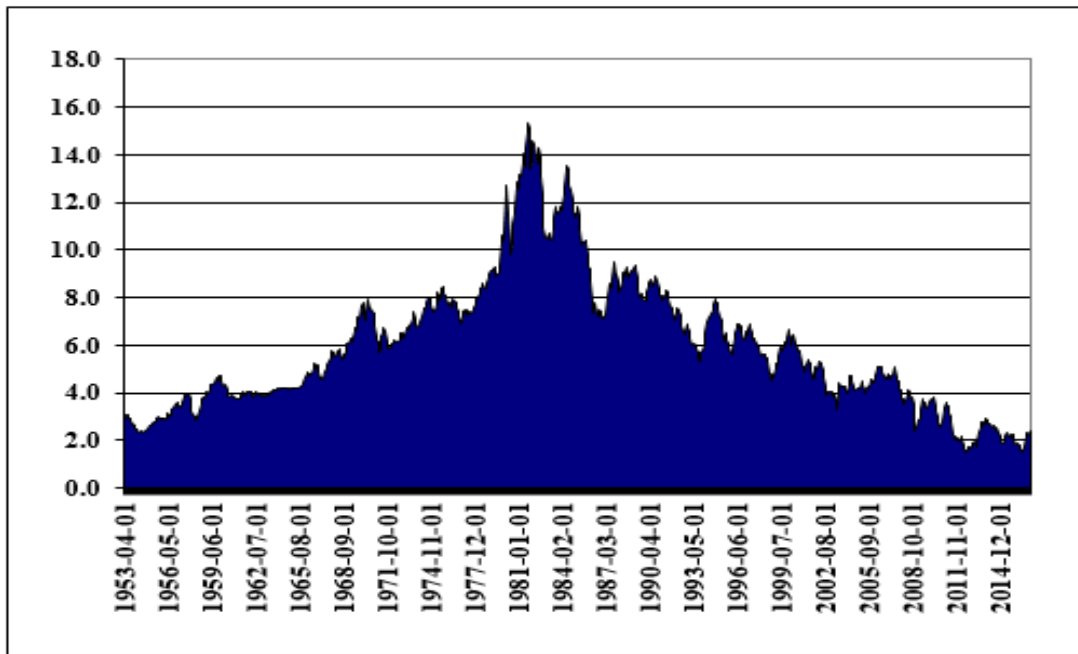
Panel B
Long-Term Moody's Baa Yields Minus Ten-Year Treasury Yields
2000-Present
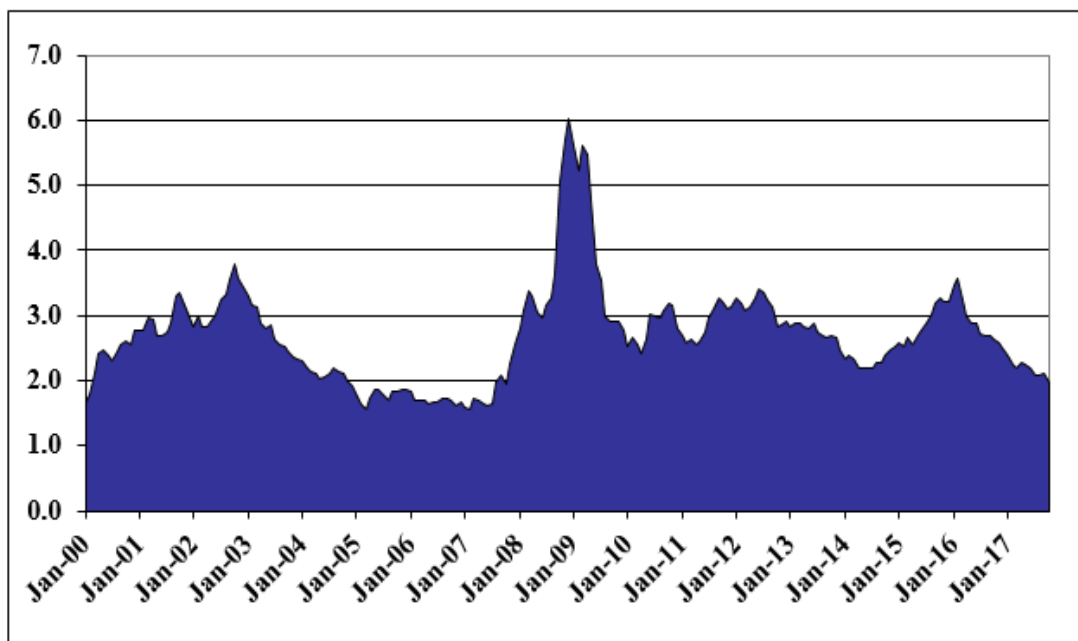
Source: Federal Reserve Bank of St. Louis, FRED Database.

Exhibit JRW--3
Panel A
Long-Term, A-Rated Public Utility Yields

Panel B
Long-Term, A-Rated Public Utility Yields minus -Twenty-Year Treasury Yields
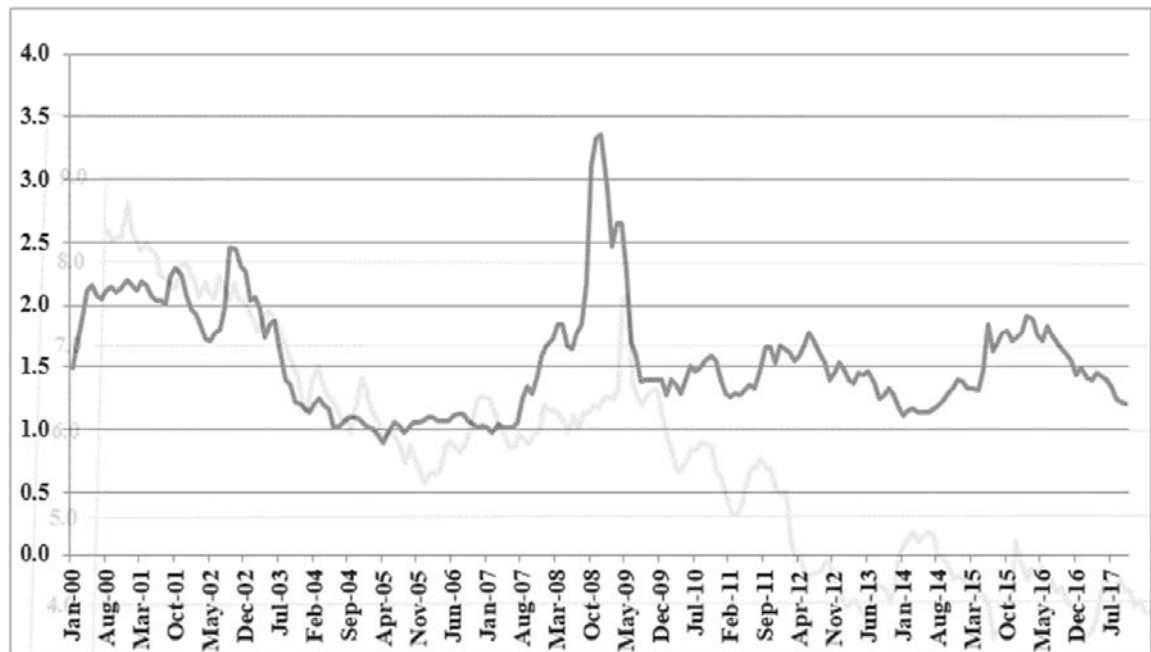
Source: Mergent Bond Record, Federal Reserve Bank of St. Louis, FRED Database.

Exhibit JRW--4

Northern Utilities, Inc.

Panel A
Gas Proxy Group

Company	Operating Revenue ($mil)	Percent Elec Revenue	Percent Gas Revenue	Net Plant ($mil)	Market Cap ($mil)	S&P Issuer Credit Rating	Pre-Tax Interest Coverage	Primary Service Area	Common Equity Ratio	Return on Equity	Market to Book Ratio
Atmos Energy Corporation (NYSE-ATO)	$2,454.6	0	95	$8,268.6	$8.6	A	5.72	Ten States	51.4%	10.5%	2.46
New Jersey Resources Corp. (NYSE-NJR)	$1,880.9	0	31	$2,407.7	$3.6	A	5.69	NJ	48.5%	11.6%	3.02
Northwest Natural Gas Co. (NYSE-NWN)	$676.0	0	100	$2,260.9	$1.7	A+	3.55	OR,WA	52.4%	7.2%	2.02
ONE Gas, Inc.(NYSE-OGS)	$1,427.2	0	100	$3,731.6	$3.3	A-	6.15	OK,KS,TX	58.5%	7.5%	1.76
South Jersey Industries, Inc. (NYSE-SJI)	$1,036.5	0	44	$2,623.8	$2.8	BBB+	6.34	NJ	49.1%	10.2%	2.16
Southwest Gas Corporation (NYSE-SWX)	$2,460.5	0	54	$4,132.0	$3.7	BBB+	4.14	AZ,NV,CA	50.9%	9.4%	2.20
Spire (NYSE-SR)	$1,537.3	0	95	$3,287.2	$3.4	A-	3.77	MO	41.7%	8.6%	1.81
Mean	$1,639.0	0	74	$3,816.0	$3.87	A-	5.05		50.4%	9.3%	2.20
Median	$1,537.3	0	95	$3,287.2	$3.40	A-	5.69		50.9%	9.4%	2.16

Data Source: Company 2016 SEC 10-K filings *Value Line Investment Survey*, 2017.

Panel B
Hevert Proxy Group

Company	Operating Revenue ($mil)	Percent Elec Revenue	Percent Gas Revenue	Net Plant ($mil)	Market Cap ($mil)	S&P Issuer Credit Rating	Pre-Tax Interest Coverage	Primary Service Area	Common Equity Ratio	Return on Equity	Market to Book Ratio
Black Hills Corp (NYSE-BKH)	$1,573.0	42%	53%	$4,469.0	$3.7	BBB	1.66	CO,MT,WY,SD	34.3%	4.57%	1.89
CenterPoint Energy (NYSE-CNP)	$7,528.0	41%	44%	$12,307.0	$10.6	A-	3.03		28.7%	12.48%	3.07
Sempra Energy (NYSE-SRE)	$10,183.0	37%	39%	$32,931.0	$25.2	BBB+	4.26	DE,MD,FL	47.1%	2.51%	1.65
Vectren (NYSE-VVR)	$2,448.3	25%	31%	$4,406.8	$4.3	A-	4.80	IN,OH	48.1%	12.26%	2.45
Atmos Energy Corporation (NYSE-ATO)	$2,454.6	0	95	$8,268.6	$8.6	A	5.72	Ten States	51.4%	10.5%	2.46
Northwest Natural Gas Co. (NYSE-NWN)	$676.0	0	100	$2,260.9	$1.7	A+	3.55	OR,WA	52.4%	7.2%	2.02
Southwest Gas Corporation (NYSE-SWX)	$2,460.5	0	54	$4,132.0	$3.7	BBB+	4.14	AZ,NV,CA	50.9%	9.4%	2.20
Spire (NYSE-SR)	$1,537.3	0	95	$3,287.2	$3.4	A-	3.77	MO	41.7%	8.6%	1.81
Mean	$3,607.6	0	43	$9,007.8	$7.65	A-	3.87		44.3%	8.4%	2.19
Median	$2,451.5	0	27	$4,437.9	$4.00	A-	3.96		47.6%	9.0%	2.11

Data Source: Company 2016 SEC 10-K filings *Value Line Investment Survey*, 2017.

Exhibit JRW--4

Northern Utilities, Inc.
***Value Line* Risk Metrics**

Panel A
Gas Proxy Group

Company	Beta	Financial Strength	Safety	Earnings Predictability	Stock Price Stability
Atmos Energy Corporation (NYSE-ATO)	0.70	A+	1	95	95
New Jersey Resources Corp. (NYSE-NJR)	0.80	A+	1	55	80
Northwest Natural Gas Co. (NYSE-NWN)	0.70	A	1	85	95
ONE Gas, Inc. (NYSE-OGS)	0.70	B++	2	NMF	85
South Jersey Industries, Inc. (NYSE-SJI)	0.85	A	2	75	85
Southwest Gas Corporation (NYSE-SWX)	0.80	B++	3	90	85
Spire (NYSE-SR)	0.70	B++	2	85	100
Mean	0.75	A	1.7	81	89

Data Source: *Value Line Investment Survey*, 2017.

Panel B
Hevert Proxy Group

Company	Beta	Financial Strength	Safety	Earnings Predictability	Stock Price Stability
Black Hills Corporation (NYSE-BKH)	0.90	A	2	50	80
CenterPoint Energy (NYSE-CNP)	0.90	B+	3	85	90
Sempra Energy (NYSE-SRE)	0.80	A	2	80	95
Vectren Corporation (NYSE-VVC)	0.75	A	2	75	90
Atmos Energy Corporation (NYSE-ATO)	0.70	A+	1	95	95
Northwest Natural Gas Co. (NYSE-NWN)	0.70	A	1	85	95
Southwest Gas Corporation (NYSE-SWX)	0.80	B++	3	90	85
Spire (NYSE-SR)	0.70	B++	2	85	100
Mean	0.78	A	2.0	81	91

Data Source: *Value Line Investment Survey*, 2017.

Value Line Risk Metrics

Beta

A relative measure of the historical sensitivity of a stock's price to overall fluctuations in the New York Stock Exchange Composite Index. A of 1.50 indicates a stock tends to rise (or fall) 50% more than the New York Stock Exchange Composite Index. The ''coefficient'' is derived from a regression analysis of the relationship between weekly percent-age changes in the price of a stock and weekly percentage changes in the NYSE Index over a period of five years. In the case of shorter price histories, a smaller time period is used, but two years is the minimum. Betas are adjusted for their long-term tendency to converge toward 1.00.

Financial Strength

A relative measure of of the companies reviewed by Value Line. The relative ratings range from A++ (strongest) down to C (weakest).

Safety Rank

A measurement of potential risk associated with individual common stocks. The Safety Rank is computed by averaging two other Value Line indexes the Price Stability Index and the Financial strength Rating. Safety Ranks range from 1 (Highest) to 5 (Lowest). Conservative investors should try to limit their purchases to equities ranked 1 (Highest) and 2 (Above Average) for Safety.   .

Earnings Predictability

A measure of the reliability of an earnings forecast. Earnings Predictability is based upon the stability of year-to-year comparisons, with recent years being weighted more heavily that earlier ones. The most reliable forecasts tend to be those with the highest rating (100); the least reliable, the lowest (5). The earnings stability is derived from the standard deviation of percentage changes in quarterly earnbings over an eight-year period. Special adjustments are made for comparisons around zero and from plus to minus.

Stock Price Stability

A measure of the stability of a stock's price It includes sensitivity to the market (see Beta as well as the stock's inherent volatility. Value Line Stability ratings range from 1 (highest) to 5 (lowest).

Source: *Value Line Investment Analyzer* .

Exhibit JRW--5

Northern Utilities, Inc.
Capital Structure Ratios and Debt Cost Rates

Panel A - Northern Utilities, Inc.'s Proposed Capitalization Ratios and Senior Capital Cost Rate

Capital Source	Capitalization Ratio	Cost Rate
Long-Term Debt	50.00%	4.43%
Common Equity	50.00%	
Total	100.00%	

Panel B - Northern Utilities, Inc.'s Updated Proforma Capitalization Ratios and Senior Capital C

Capital Source	Capitalization Amount	Capitalization Ratio
Short-Term Debt	0.95%	2.49%
Long-Term Debt	49.85%	4.39%
Common Equity	49.21%	
Total	100.00%	

Panel C - Staff's Proposed Capitalization Ratios and Cost Rates

Capital Source	Capitalization Amount	Capitalization Ratio
Short-Term Debt	0.95%	2.49%
Long-Term Debt	49.85%	4.39%
Common Equity	49.21%	
Total	100.00%	

Exhibit JRW--6
Electric Utilities
Panel A

Market-to-Book
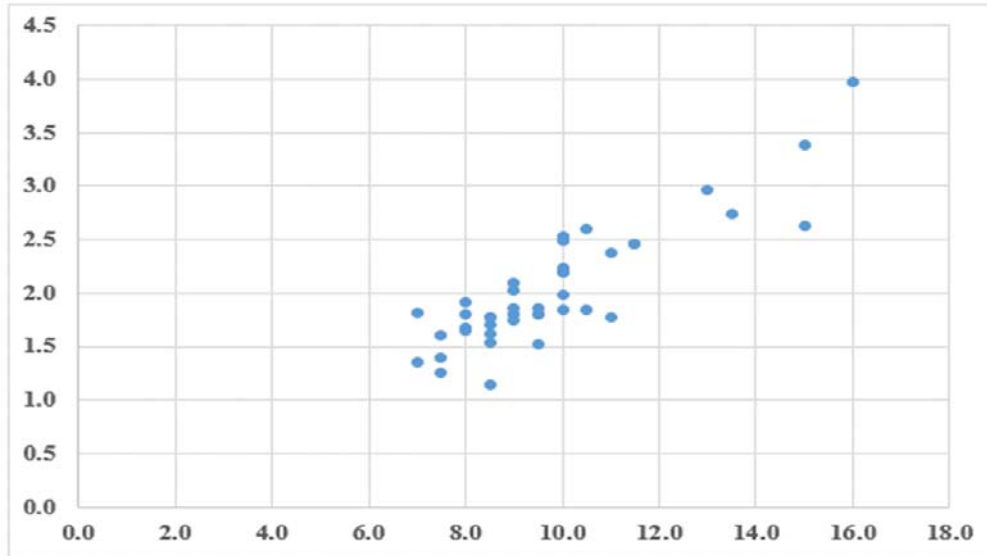
Expected Return on Equity
R-Square = .77, N=42

Source: *Value Line Investment Survey*, 2016.

Panel B
Gas Companies

Market-to-Book
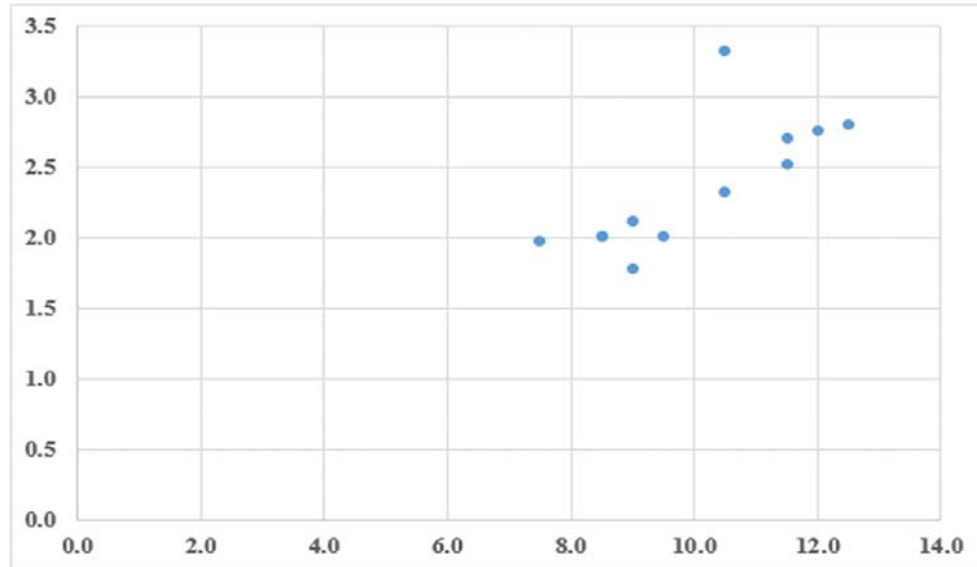
Expected Return on Equity
R-Square = .56, N=12

Source: *Value Line Investment Survey*, 2016.

Exhibit JRW--6
Water Companies
Panel C

Market-to-Book
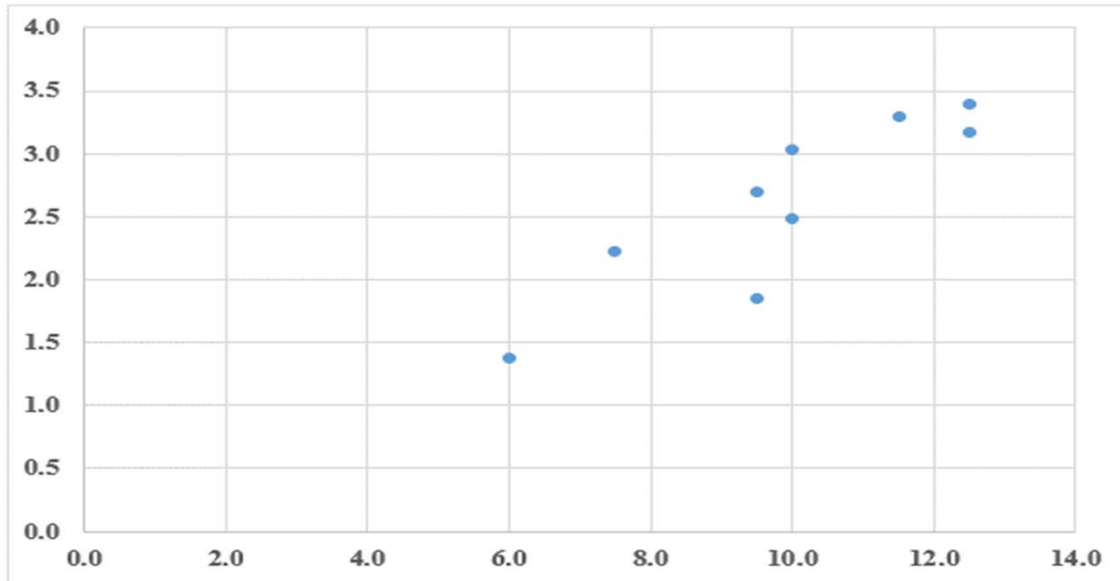
Expected Return on Equity
R-Square = .75, N=9

Source: *Value Line Investment Survey*, 2016.

Exhibit JRW--7
Long-Term 'A' Rated Public Utility Bonds

Data Source: Mergent Bond Record

Exhibit JRW--7

Gas Distribution Company Average Dividend Yield

Data Source: *Value Line Investment Survey.*

Exhibit JRW--7

Gas Distribution Company Average Return on Equity and Market-to-Book Ratios

Data Source: *Value Line Investment Survey.*

Exhibit JRW--8

Industry Average Betas

Industry Name	Beta	Industry Name	Beta	Industry Name	Beta
Petroleum (Producing)	1.67	Newspaper	1.17	Retail (Softlines)	1.02
Natural Gas (Div.)	1.54	E-Commerce	1.16	Telecom. Utility	1.02
Metals & Mining (Div.)	1.53	Air Transport	1.16	Telecom. Services	1.01
Maritime	1.49	Financial Svcs. (Div.)	1.15	IT Services	1.01
Oilfield Svcs/Equip.	1.49	Entertainment	1.15	Healthcare Information	1.00
Steel	1.47	Diversified Co.	1.15	Drug	1.00
Homebuilding	1.41	Computer Software	1.14	Information Services	0.99
Engineering & Const	1.35	Furn/Home Furnishings	1.14	Funeral Services	0.99
Building Materials	1.34	Entertainment Tech	1.14	Retail Store	0.98
Heavy Truck & Equip	1.32	Trucking	1.13	Investment Co.(Foreign)	0.97
Metal Fabricating	1.32	Computers/Peripherals	1.13	Medical Services	0.97
Oil/Gas Distribution	1.31	Publishing	1.13	Med Supp Non-Invasive	0.96
Railroad	1.31	Precision Instrument	1.13	Med Supp Invasive	0.95
Chemical (Diversified)	1.30	Retail (Hardlines)	1.12	Environmental	0.94
Auto Parts	1.28	Paper/Forest Products	1.12	Precious Metals	0.94
Petroleum (Integrated)	1.26	Wireless Networking	1.12	Pharmacy Services	0.93
Insurance (Life)	1.26	Educational Services	1.12	Cable TV	0.92
Pipeline MLPs	1.26	Bank (Midwest)	1.10	R.E.I.T.	0.91
Hotel/Gaming	1.25	Internet	1.10	Beverage	0.90
Electrical Equipment	1.25	Semiconductor Equip	1.10	Thrift	0.89
Chemical (Specialty)	1.24	Retail Building Supply	1.09	Food Processing	0.88
Semiconductor	1.22	Foreign Electronics	1.09	Restaurant	0.88
Power	1.21	Apparel	1.08	Reinsurance	0.87
Telecom. Equipment	1.20	Bank	1.07	Household Products	0.85
Biotechnology	1.20	Advertising	1.07	Insurance (Prop/Cas.)	0.85
Automotive	1.20	Industrial Services	1.07	Investment Co.	0.84
Human Resources	1.20	Recreation	1.06	Retail/Wholesale Food	0.83
Office Equip/Supplies	1.19	Retail Automotive	1.06	Tobacco	0.79
Electronics	1.19	Shoe	1.05	Natural Gas Utility	0.76
Public/Private Equity	1.18	Packaging & Container	1.05	Water Utility	0.73
Machinery	1.17	Aerospace/Defense	1.02	Electric Util. (Central)	0.73
Chemical (Basic)	1.17	Toiletries/Cosmetics	1.02	Electric Utility (West)	0.70
				Electric Utility (East)	0.65

Source: ValueLine Investment Survey, February, 2017.

Exhibit JRW--9
DCF Model

$

Growth Stage
Earnings Grow
Faster Than
Dividends

Earnings

Transition Stage
Dividends Grow
Faster Than
Earnings

Maturity Stage
Dividends and
Earnings Grow
At Same Rate

Dividends

Time

Exhibit JRW--9

DCF Model
Consensus Earnings Estimates
Atmos Energy Corporatrion (ATO)
www.reuters.com
10/31/2017

Line	Date	# of Estimates	Mean	High	Low
1	Quarter Ending Sep -17	9	$ 0.34	$ 0.37	$ 0.32
2	Quarter Ending Dec-17	9	$ 1.55	$ 1.59	$ 1.53
3	Year Ending Dec-17	11	$ 3.61	$ 3.65	$ 3.57
4	Year Ending Dec-18	11	$ 3.83	$ 3.99	$ 3.00
5	LT Growth Rate (%)	1	6.70%	6.70%	6.70%

Exhibit JRW--10

Northern Utilities, Inc.
Discounted Cash Flow Analysis

Panel A
Gas Proxy Group

Dividend Yield*	2.50%
Adjustment Factor	1.02925
Adjusted Dividend Yield	2.57%
Growth Rate**	5.85%
Equity Cost Rate	8.45%

*   Page 2 of Exhibit JRW--10

** Based on data provided on pages 3, 4, 5, and
     6 of Exhibit JRW--10

Panel B
Hevert Proxy Group

Dividend Yield*	2.80%
Adjustment Factor	1.0285
Adjusted Dividend Yield	2.88%
Growth Rate**	5.70%
Equity Cost Rate	8.60%

*   Page 2 of Exhibit JRW--10

** Based on data provided on pages 3, 4, 5, and
     6 of Exhibit JRW--10

Exhibit JRW--10

Northern Utilities, Inc.
Monthly Dividend Yields

Panel A
Gas Proxy Group

Company	Annual Dividend	Dividend Yield 30 Day	Dividend Yield 90 Day	Dividend Yield 180 Day
Atmos Energy Corporation (NYSE-ATO)	$1.94	2.2%	2.2%	2.3%
New Jersey Resources Corp. (NYSE-NJR)	$1.09	2.5%	2.5%	2.6%
Northwest Natural Gas Co. (NYSE-NWN)	$1.89	2.8%	2.9%	3.0%
One Gas, Inc. (NYSE-OGS)	$1.68	2.2%	2.2%	2.3%
South Jersey Industries, Inc. (NYSE-SJI)	$1.12	3.4%	3.3%	3.2%
Southwest Gas Corporation (NYSE-SWX)	$1.98	2.4%	2.5%	2.5%
Spire (NYSE-SR)	$2.25	2.9%	2.9%	3.1%
Mean		2.6%	2.6%	2.7%
Median		2.5%	2.5%	2.6%

Data Sources: http://quote.yahoo.com, November 30, 2017.

Panel B
Hevert Proxy Group

Company	Annual Dividend	Dividend Yield 30 Day	Dividend Yield 90 Day	Dividend Yield 180 Day
Black Hills Corporation (NYSE-BKH)	$ 1.90	3.2%	2.9%	2.8%
CenterPoint Energy (NYSE-CNP)	$ 1.07	3.6%	3.6%	3.7%
Sempra Energy (NYSE-SRE)	$ 3.29	2.8%	2.8%	2.9%
Vectren Corporation (NYSE-VVC)	$ 1.80	2.7%	2.7%	2.9%
Atmos Energy Corporation (NYSE-ATO)	$ 1.94	2.2%	2.2%	2.3%
Northwest Natural Gas Co. (NYSE-NWN)	$ 1.89	2.8%	2.9%	3.0%
Southwest Gas Corporation (NYSE-SWX)	$ 1.98	2.4%	2.5%	2.5%
Spire (NYSE-SR)	$ 2.25	2.9%	2.9%	3.1%
Mean		2.8%	2.8%	2.9%
Median		2.8%	2.8%	2.9%

Data Sources: http://quote.yahoo.com, November 30, 2017.

Exhibit JRW--10

Northern Utilities, Inc.
DCF Equity Cost Growth Rate Measures
Value Line **Historic Growth Rates**

Panel A
Gas Proxy Group

Company	*Value Line* Historic Growth					
	Past 10 Years			Past 5 Years		
	Earnings	Dividends	Book Value	Earnings	Dividends	Book Value
Atmos Energy Corporation (NYSE-ATO)	6.0	2.5	5.0	8.0	3.5	5.5
New Jersey Resources Corp. (NYSE-NJR)	7.5	7.5	7.5	8.0	6.5	7.5
Northwest Natural Gas Co. (NYSE-NWN)		3.5	3.0	-4.5	2.0	2.0
ONE Gas, Inc. (NYSE-OGS)						
South Jersey Industries, Inc. (NYSE-SJI)	4.0	9.0	8.0	1.5	8.5	9.0
Southwest Gas Corporation (NYSE-SWX)	6.5	7.0	5.5	6.5	10.0	5.5
Spire (NYSE-SR)	4.0	3.5	7.5	4.0	4.0	9.0
Mean	5.6	5.5	6.1	3.9	5.8	6.4
Median	6.0	5.3	6.5	5.3	5.3	6.5

Data Source: *Value Line Investment Survey.*

Average of Median Figures =	5.8

Panel B
Gas Proxy Group

Company	*Value Line* Historic Growth					
	Past 10 Years			Past 5 Years		
	Earnings	Dividends	Book Value	Earnings	Dividends	Book Value
Black Hills Corporation (NYSE-BKH)	3.5	2.5	2.5	11.0	2.5	1.5
CenterPoint Energy (NYSE-CNP)	3.0	8.0	7.5	1.0	5.0	2.0
Sempra Energy (NYSE-SRE)	2.0	9.5	7.0	1.0	11.0	5.0
Vectren Corporation (NYSE-VVC)	4.0	2.5	3.0	6.0	2.5	3.0
Atmos Energy Corporation (NYSE-ATO)	6.0	2.5	5.0	8.0	3.5	5.5
Northwest Natural Gas Co. (NYSE-NWN)		3.5	3.0	-4.5	2.0	2.0
Southwest Gas Corporation (NYSE-SWX)	6.5	7.0	5.5	6.5	10.0	5.5
Spire (NYSE-SR)	4.0	3.5	7.5	4.0	4.0	9.0
Mean	4.1	4.9	5.1	4.1	5.1	4.2
Median	4.0	3.5	5.3	5.0	3.8	4.0

Data Source: *Value Line Investment Survey.*

Average of Median Figures =	4.3

Exhibit JRW--10

Northern Utilities, Inc.
DCF Equity Cost Growth Rate Measures
***Value Line* Projected Growth Rates**

Panel A
Gas Proxy Group

Company	*Value Line* Projected Growth Est'd. '14-'16 to '20-'22			*Value Line* Sustainable Growth		
	Earnings	Dividends	Book Value	Return on Equity	Retention Rate	Internal Growth
Atmos Energy Corporation (NYSE-ATO)	6.0	6.5	3.5	11.5%	49.0%	5.6%
New Jersey Resources Corp. (NYSE-NJR)	2.0	3.5	6.0	11.5%	46.0%	5.3%
Northwest Natural Gas Co. (NYSE-NWN)	7.0	1.0	2.0	10.0%	36.0%	3.6%
ONE Gas, Inc. (NYSE-OGS)	9.5	13.5	3.0	9.5%	39.0%	3.7%
South Jersey Industries, Inc. (NYSE-SJI)	5.5	4.0	6.0	9.5%	36.0%	3.4%
Southwest Gas Corporation (NYSE-SWX)	8.0	7.5	7.0	10.0%	49.0%	4.9%
Spire (NYSE-SR)	8.0	5.0	4.5	9.5%	46.0%	4.4%
Mean	6.6	5.9	4.6	10.2%	43.0%	4.4%
Median	7.0	5.0	4.5	10.0%	46.0%	4.4%
Average of Median Figures =		5.5			Median =	4.4%

* 'Est'd. '14-'16 to '20-'22' is the estimated growth rate from the base period 2014 to 2016 until the future period 2020 to 2022.
Data Source: *Value Line Investment Survey.*

Panel B
Hevert Proxy Group

Company	*Value Line* Projected Growth Est'd. '14-'16 to '20-'22			*Value Line* Sustainable Growth		
	Earnings	Dividends	Book Value	Return on Equity	Retention Rate	Internal Growth
Black Hills Corporation (NYSE-BKH)	7.5	5.0	5.5	10.5%	49.0%	5.1%
CenterPoint Energy (NYSE-CNP)	6.0	3.5	2.0	16.5%	25.0%	4.1%
Sempra Energy (NYSE-SRE)	7.0	8.5	3.0	13.0%	38.0%	
Vectren Corporation (NYSE-VVC)	6.5	4.5	6.0	12.0%	41.0%	4.9%
Atmos Energy Corporation (NYSE-ATO)	6.0	6.5	3.5	11.5%	49.0%	5.6%
Northwest Natural Gas Co. (NYSE-NWN)	7.0	1.0	2.0	10.0%	36.0%	3.6%
Southwest Gas Corporation (NYSE-SWX)	8.0	7.5	7.0	10.0%	49.0%	4.9%
Spire (NYSE-SR)	8.0	5.0	4.5	9.5%	46.0%	4.4%
Mean	7.0	5.2	4.2	11.6%	41.6%	4.7%
Median	7.0	5.0	4.0	11.0%	43.5%	4.9%
Average of Median Figures =		5.3			Median =	4.9%

* 'Est'd. '14-'16 to '20-'22' is the estimated growth rate from the base period 2014 to 2016 until the future period 2020 to 2022.
Data Source: *Value Line Investment Survey.*

Exhibit JRW--10

Northern Utilities, Inc.
DCF Equity Cost Growth Rate Measures
Analysts Projected EPS Growth Rate Estimates

Panel A
Gas Proxy Group

Company	Yahoo	Reuters	Zacks	Mean
Atmos Energy Corporation (NYSE-ATO)	6.5%	6.5%	6.5%	6.5%
New Jersey Resources Corp. (NYSE-NJR)	6.0%	NA	6.0%	6.0%
Northwest Natural Gas Co. (NYSE-NWN)	4.0%	NA	4.5%	4.3%
ONE Gas, Inc. (NYSE-OGS)	6.0%	6.0%	6.3%	6.1%
South Jersey Industries, Inc. (NYSE-SJI)	6.0%	NA	7.5%	6.8%
Southwest Gas Corporation (NYSE-SWX)	4.0%	NA	6.5%	5.2%
Spire (NYSE-SR)	4.5%	4.5%	5.3%	4.8%
Mean	5.3%	5.7%	6.1%	5.7%
Median	6.0%	6.0%	6.3%	6.0%

Data Sources: www.reuters.com, www.zacks.com, http://quote.yahoo.com, December 1, 2017.

Panel B
Gas Proxy Group

Company	Yahoo	Reuters	Zacks	Mean
Black Hills Corporation (NYSE-BKH)	4.3%	4.3%	5.6%	4.7%
CenterPoint Energy (NYSE-CNP)	7.4%	7.4%	5.5%	6.8%
Sempra Energy (NYSE-SRE)	9.9%	9.9%	8.7%	9.5%
Vectren Corporation (NYSE-VVC)	6.0%	NA	5.7%	5.8%
Atmos Energy Corporation (NYSE-ATO)	6.5%	6.5%	6.5%	6.5%
Northwest Natural Gas Co. (NYSE-NWN)	4.0%	NA	4.5%	4.3%
Southwest Gas Corporation (NYSE-SWX)	4.0%	NA	6.5%	5.2%
Spire (NYSE-SR)	4.5%	4.5%	5.3%	4.8%
Mean	5.8%	6.5%	6.0%	5.9%
Median	5.3%	6.5%	5.6%	5.5%

Data Sources: www.reuters.com, www.zacks.com, http://quote.yahoo.com, December 1, 2017.

Exhibit JRW--10

Northern Utilities, Inc.
DCF Growth Rate Indicators

Gas Proxy Group

Growth Rate Indicator	Gas Proxy Group	Hevert Proxy Group
Historic *Value Line* Growth in EPS, DPS, and BVPS	5.8%	4.3%
Projected *Value Line* Growth in EPS, DPS, and BVPS	5.5%	5.3%
Sustainable Growth ROE * Retention Rate	4.4%	4.9%
Projected EPS Growth from Yahoo, Zacks, and Reuters - Mean/Median	5.7%/6.0%	5.9%/5.5%

Exhibit JRW--11

Northern Utilities, Inc.
Capital Asset Pricing Model

Panel A
Gas Proxy Group

Risk-Free Interest Rate	**4.00%**
Beta*	**0.70**
Ex Ante Equity Risk Premium**	**5.50%**
CAPM Cost of Equity	**7.9%**

* See page 3 of Exhibit JRW--11

** See pages 5 and 6 of Exhibit JRW--11

Panel B
Hevert Proxy Group

Risk-Free Interest Rate	**4.00%**
Beta*	**0.78**
Ex Ante Equity Risk Premium**	**5.50%**
CAPM Cost of Equity	**8.3%**

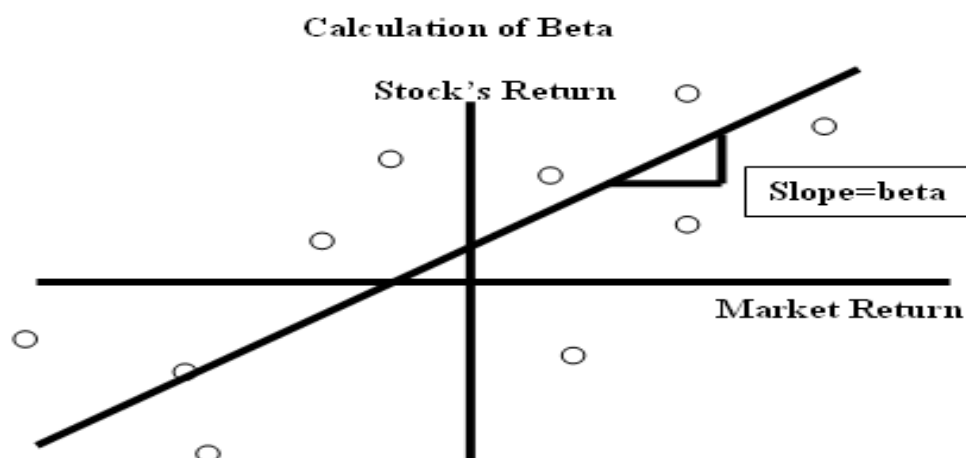* See page 3 of Exhibit JRW--11

** See pages 5 and 6 of Exhibit JRW--11

Exhibit JRW--11

Thirty-Year U.S. Treasury Yields
2012-2017

Source: Federal Reserve Bank of St. Louis, FRED Database.

Calculation of Beta

Panel A
Gas Proxy Group

Company	Beta
Atmos Energy Corporation (NYSE-ATO)	0.70
New Jersey Resources Corp. (NYSE-NJR)	0.80
Northwest Natural Gas Co. (NYSE-NWN)	0.70
ONE Gas, Inc. (NYSE-OGS)	0.70
South Jersey Industries, Inc. (NYSE-SJI)	0.85
Southwest Gas Corporation (NYSE-SWX)	0.80
Spire (NYSE-SR)	0.70
Mean	0.75
Median	0.70

Data Source: *Value Line Investment Survey*, 2017.

Panel B
Hevert Proxy Group

Company	Beta
Black Hills Corporation (NYSE-BKH)	0.90
CenterPoint Energy (NYSE-CNP)	0.90
Sempra Energy (NYSE-SRE)	0.80
Vectren Corporation (NYSE-VVC)	0.75
Atmos Energy Corporation (NYSE-ATO)	0.70
Northwest Natural Gas Co. (NYSE-NWN)	0.70
Southwest Gas Corporation (NYSE-SWX)	0.80
Spire (NYSE-SR)	0.70
Mean	0.78
Median	0.78

Data Source: *Value Line Investment Survey*, 2017.

Exhibit JRW--11
Risk Premium Approaches

	Historical Ex Post Returns	Surveys	Expected Return Models and Market Data
Means of Assessing The Market Risk Premium	Historical Average Stock Minus Bond Returns	Surveys of CFOs, Financial Forecasters, Companies, Analysts on Expected Returns and Market Risk Premiums	Use Market Prices and Market Fundamentals (such as Growth Rates) to Compute Expected Returns and Market Risk Premiums
Problems/Debated Issues	Time Variation in Required Returns, Measurement and Time Period Issues, and Biases such as Market and Company Survivorship Bias	Questions Regarding Survey Histories, Responses, and Representativeness Surveys may be Subject to Biases, such as Extrapolation	Assumptions Regarding Expectations, Especially Growth

Source: Adapted from Antti Ilmanen, Expected Returns on Stocks and Bonds," *Journal of Portfolio Management* , (Winter 2003).