

# Interstate Natural Gas Pipeline Industry

# 2018 Cost of Capital Study



# Table of Contents

Purpose of the Cost of Capital Study .....	1
Introduction and Scope .....	1
Executive Summary - Cost of Capital .....	1
Interstate Natural Gas Pipeline Property Tax Forum .....	2
2018 Economic Projections .....	3
Natural Gas Pipeline Industry - 2018 .....	6
Pipeline MLPs (Master Limited Partnerships) .....	6
The Pipeline MLP Industry Is Facing Identity Crisis .....	6
Production Volumes Appear to be Firming Up .....	7
Are The Distributions Safe? .....	8
Pipeline Projects/Networks .....	8
Summary of Natural Gas Transportation .....	9
Gas Pipeline Transportation Business Locations .....	9
Gas Pipeline Transportation Risk Rating .....	10
Structural Risk Analysis .....	10
Growth Risk Analysis .....	11
Sensitivity Risk Analysis .....	11
Barriers to Entry .....	11
Basis of Competition .....	11
Natural Gas Pipeline Transportation Outlook .....	12
Natural Gas Economics .....	13
Summary .....	13
Weighted Average Cost of Capital (WACC) .....	13
Cost of Capital Study Results .....	15
Capital Structure .....	16
Cost of Debt .....	29
Mergent Utility Bond Yields .....	35
Mergent Corporate Bond Yields .....	36
Cost of Equity .....	37
Summary of Cost of Equity Calculations .....	38
DCF Method .....	39
Risk Premium Method .....	50
Summary of Risk Premium Indicators - January 1, 2018 .....	52
US 30-Year T-Bonds, 5-Year T-Bonds, and 30-Day T-Bills .....	58

Capital Asset Pricing Model . . . . .	59
Summary of CAPM Indicators - January 1, 2018. . . . .	61
Cost of Equity Indication Using Expected Risk Premium . . . . .	67
Flotation Cost Adjustment . . . . .	76
Other Issues Regarding the Cost of Capital . . . . .	87
Geometric Mean vs. Arithmetic Mean . . . . .	87
Income Return. . . . .	88
Equity Risk Premium Puzzle . . . . .	89
Survivorship Bias . . . . .	89
Supplement to the Cost of Capital Study . . . . .	91
Impact of New Tax Law on Valuation . . . . .	91
Rates of Return . . . . .	94
Categories of Capitalization . . . . .	94
Direct Capitalization . . . . .	94
Yield Capitalization . . . . .	98
Estimation of Income to Capitalize. . . . .	100
Computation of 2018 Equity Risk Premium. . . . .	102
Computation of 2018 Equity Risk Premium (for LT Corp Bonds) . . . . .	103
Duff & Phelps Risk Premium Calculations - 2018. . . . .	104

## Common Terms

AEO	Annual Energy Outlook
Bcf/d	Billion cubic feet per day
CAPM	Capital Asset Pricing Model
CPI	Consumer Price Index
DCF	Discounted Cash Flow
EIA	Energy Information Administration
FED	Federal Reserve
FERC	Federal Energy Regulatory Commission
GDP	Gross Domestic Product
GP	General Partner
GRI	Gas Research Institute
GSR	Gas Supply Realignment
GTI	Gas Technology Institute
INGAA	Interstate Natural Gas Association of America
IBES	Institutional Brokers Estimate System
INGPC	Interstate Natural Gas Pipeline Company
INGPI	Interstate Natural Gas Pipeline Industry
INGPPTF	Interstate Natural Gas Pipeline Property Tax Forum
$K_D$	Cost of Debt
$K_E$	Cost of Equity
LDC	Local Distribution Company
LNG	Liquified Natural Gas
M&A	<i>Mergers and Acquisitions</i>
MLP	Master Limited Partnership
NUOI	Net Utility Operating Income
OCS	Outer Continental Shelf
PFRB	Philadelphia Federal Reserve Bank
PT WACC	Pre-Tax Weighted Average Cost of Capital
PUHCA	Public Utility Holding Company Act
RP	Risk Premium
SBBI	<i>Stocks, Bonds, Bills &amp; Inflation</i>
SFV	Straight Fixed Variable
S&P	Standard & Poor's
STEO	Short-Term Energy Outlook
TCJA	Tax Cuts and Jobs Act of 2017
VL	<i>The Value Line Investment Survey</i>
WACC	Weighted Average Cost of Capital
WSJ	<i>Wall Street Journal</i>
YTM	Yield to Maturity



# **2018 Cost of Capital Study of the Interstate Natural Gas Pipeline Industry for the Interstate Natural Gas Pipeline Property Tax Forum January 1, 2018**

---

## **Purpose of the Cost of Capital Study**

The purpose of the cost of capital study is to provide the Interstate Natural Gas Pipeline Property Tax Forum (INGPPTF) with a cost of capital study for the Interstate Natural Gas Pipeline Industry (INGPI) as of January 1, 2018. This cost of capital can be used to capitalize the net cash flow for the typical interstate natural gas pipeline company for the purpose of estimating market value. The cost of capital derived in this study is the cost of capital for the typical interstate natural gas pipeline company at January 1, 2018, and is not representative of any particular interstate pipeline company. Thus, we advise against its random use by anyone without first examining and determining the differences between the specific pipeline company and the typical pipeline represented by the cost of capital herein and adjusting for the differences accordingly. For example, additional adjustments must be made to reflect the enhanced risk associated with an investment in the operating assets of companies which are considered below investment grade.

## **Introduction and Scope**

This copyrighted study was prepared for the Interstate Natural Gas Pipeline Property Tax Forum (INGPPTF), and any use of this material by any entity other than those approved by the INGPPTF is expressly prohibited by the authors, who reserve all rights to any reproduction. We have reviewed financial and economic information, analytical reports, and statistical data in order to estimate the cost of capital of the Interstate Natural Gas Pipeline Industry as of January 1, 2018.

## **Executive Summary - Cost of Capital**

Based on our analysis and investigation, we have calculated the weighted average cost of capital (WACC) for the INGPI to be **10.65%** as of January 1, 2018. The cost of capital

developed in this study is also known as the discount rate<sup>1</sup> and is appropriate to use in discounting the after-tax operating cash flows projected as of January 1, 2018, for determination of the market value of the operating assets, tangible and intangible, of the typical interstate natural gas pipeline. After-tax operating cash flows are known as earnings before the deduction of interest, depreciation and amortization and after the deduction of taxes and capital expenditures. For market valuation purposes, this level of cash flow is estimated typically by assuming that depreciation and amortization equals capital expenditures. Thus, the cash flow to be discounted is assumed to be equal to what is commonly known in the INGPI as net utility operating income (NUOI). The detailed discussion of the derivation of the weighted average cost of capital along with supporting documentation begins on page 14.

## Interstate Natural Gas Pipeline Property Tax Forum

The INGPPTF represents approximately 67 companies engaged in the transportation of natural gas. Only a few of the parents of these companies have common equity traded on the major financial markets. Thus, the financial information from the actually traded INGPPTF members (primarily parent companies) may not, by itself, be indicative of the actual cost of capital for the interstate natural gas pipeline industry. The 2018 membership roster of the INGPPTF is listed below:

Boardwalk Pipeline	Spectra Energy Income Fund
Texas Gas Transmission, LLC	Sarina Airport Storage L.P.
Centerpoint Energy	Enbridge, Inc.
Centerpoint Energy Gas Transmission	Texas Eastern Transmission
Centerpoint Energy Mississippi River Transmission	Algonquin Gas Transmission
Colonial Pipeline Company	Gulf Stream Natural Gas Transmission
Dominion Transmission Corporation	Maritimes and Northeast Pipeline
Enbridge, Inc. - Canada	East Tennessee Natural Gas
West Cast Pipelines & Field Services	Sabal Trail Transmission
West Coast Gas Services	Southeast Supply Header
Maritimes and Northeast Pipeline (Canada)	Enable Midstream Partners
Spectra Energy Empress L.P.	Enable Gas Transmission
Union Gas Limited	Kern River Gas Transmission
St. Clair Pipelines (1996)	Kinder Morgan, Inc.
Market Hub Partners	Tennessee Gas Pipeline

---

<sup>1</sup> A rate of return used to convert a monetary sum, payable or receivable in the future, into present value. Theoretically it should reflect the opportunity cost of capital, i.e., the rate of return the capital can earn if put to other uses having similar risk. [See *The Dictionary of Real Estate Appraisal*, 5<sup>th</sup> ed., (Chicago: Appraisal Institute, 2010) 246.]

Southern Natural Gas  
El Paso Natural Gas  
Mojave Pipeline  
Colorado Interstate Gas  
Cheyenne Plains Pipeline  
Wyoming Interstate Company  
Natural Gas Pipeline Company of America  
Midcontinent Express Pipeline  
TransColorado Gas Pipeline  
Louisiana Pipeline  
Elba Express  
Ruby Pipeline, LLC  
MDU Resources Group, Inc.  
National Fuel Gas Supply Corporation  
Northern Natural Gas Company  
Oneok Inc.  
Guardian Pipeline Company  
Midwestern Gas Transmission Company  
OKTEX Pipeline  
Viking Gas Transmission Company

Questar Pipeline Company  
Southern Star Central Gas Pipeline, Inc.  
TransCanada Corporation  
TransCanada Pipelines Limited  
TransCanada Corp – US Pipelines  
ANR Pipeline  
North Baja Pipeline  
Portland Natural Gas Transmission  
GTN Pipeline System  
Tuscarora Gas Transmission  
Great Lakes Gas Transmission  
Iroquois Gas Transmission  
Bisan Pipeline LLC  
Northern Border Pipeline Company  
Columbia Gas Transmission LLC  
Columbia Gulf Transmission Corporation LLC  
Williams Companies, Inc.  
Transcontinental Gas Pipeline Company LLC  
Northwest Pipeline Company LLC

## 2018 Economic Projections

The economy and the stock market were buoyant in 2017. According to the Schwab Newsroom at Charles SCHWAB, broad-based global economic growth and strong earnings helped push the S&P 500 Index higher by year-ended 2017. (The S&P Dow Jones Indices reported the S&P 500 Annual Total Return was 21.83% for calendar year 2017.)<sup>2</sup>

The United States economy began 2018 with strong growth momentum and an unemployment rate already below levels that Federal Reserve officials view as sustainable and the bull market deep into its ninth year. The combination of solid widespread global growth, strong labor markets, low inflation, improving commodity prices, a slightly weaker dollar, and continued easy monetary policy from most central banks sets the stage for a good year. Moreover, the recently passed front-loaded tax cuts in the United States will help by adding a pleasant tailwind to the domestic economy. The possibility of increases in infrastructure and defense spending, along with the continued deregulatory efforts of the Trump administration, make the domestic economic landscape in 2018 as strong as it has been since the end of the Great

---

<sup>2</sup> Schwab Newsroom, “2018 Market Outlook: It’s Getting Late,” January 8, 2018, <https://www.schwab.com/resource-center/insights/content/2018-market-outlook-its-getting-late> and S&P CompuStat 2017 database.

Recession, reports Dr. Elliot Eisenberg, the “Bowtie Economist,” reported in SAHBA.<sup>3</sup>

According to the Schwab Center for Financial Research’s (SCFR) 2018 Schwab Market Outlook, global economic growth is projected to continue to lift earnings in 2018. “We anticipate solid growth in 2018 and don’t see a recession on the horizon,” SCFR experts say. “However, with markets priced for ongoing moderate growth and low volatility, the risks we’re monitoring include the potential for higher inflation and more central bank tightening than expected.”

Some of the highlights of Schwab’s 2018 outlook: Economic growth likely will lift earnings, benefitting stocks. With a tight labor market, wage growth may accelerate, along with inflation. Schwab Chief Investment Strategist Liz Ann Sonders says capital spending by businesses and improving productivity should keep the economy growing in 2018.

A tight labor market may lead to accelerating wage growth according to Schwab, which in turn could drive inflation. That could prompt the Federal Reserve to tighten monetary policy by raising short-term interest rates more than expected to help keep inflation in check and prevent the economy from overheating.<sup>4</sup> Chief Economist Jan Hatzius (chief economist of investment bank Goldman Sachs) expects the Federal Reserve to lean against the market strength with four rate hikes in 2018 despite a still-firming inflation backdrop.<sup>5</sup>

“Stocks tend to correctly anticipate economic recessions, and although we don’t see one on the horizon in 2018, tighter monetary policy could bring bouts of volatility and elevated risk,” Schwab Chief Investment Strategist Liz Ann Sonders says.

The Federal Reserve has been tightening monetary policy for two years through rate hikes, and more recently by reducing its bond holdings. Stronger economic growth, a tight labor market and the prospect of tax cuts could mean U.S. inflation reaches or exceeds the Federal Reserve’s 2% target in 2018. That is likely to keep the Federal Reserve on track to tighten short-term interest rates at least two or three times in 2018, according to Kathy Jones, chief fixed income strategist at the Schwab Center for Financial Research.

During 2018, the yield on 10-year Treasury bonds may exceed 2.6%. Strong investor demand for bonds has kept bond yields (which move inversely to bond prices) low for years. The 10-year Treasury bond yield hasn’t moved above 2.6% in three years. “2018 could be the year that Treasury bond yields rise above the three-year high of 2.6%,” Kathy says. “Economic

---

<sup>3</sup> Eisenberg, Elliot, Ph.D., “Economic Forecast for 2018,” January 4, 2018, <https://www.sahba.org/economic-forecast-2018/>.

<sup>4</sup> *Op. Cit.*, Schwab Newsroom.

<sup>5</sup> “Macroeconomic Outlook 2018,” Goldman Sachs online, printed January 16, 2018, <http://www.goldmansachs.com/our-thinking/pages/outlook-2018/?videoid=154422&mediaIndex>.

growth is picking up both globally and domestically and fiscal policy is becoming more expansive.” More importantly, Kathy says, the era of extremely easy money is coming to an end.<sup>6</sup>

According to Dr. Eisenberg not all predictions are rosy for 2018. He says there are economic headwinds. The fear of inflation could spook the Federal Reserve to raise rates more rapidly than expected, which would slow growth and unsettle financial markets. A large confidence-shattering drop in the stock market, for any number of reasons, might hurt the economy. With the now low tax rate on repatriated earnings, American firms might bring back substantial profits from abroad, and in the process, boost the dollar, which will hurt manufacturing activity. Lastly, geopolitical problems always lurk and could easily have negative growth implications.<sup>7</sup>

In review of the 2018 United States economic projections, 2018 will be a prosperous year as we continue to say goodbye to the effects of the financial crisis. Be on the lookout for irrational exuberance in the stock market. That usually signals the peak of the business cycle. That means another recession is probably two to three years out. It all depends on whether President Trump's tax cuts will create the jobs he promised.<sup>8</sup>

Broadly speaking, the prospects for continued economic expansion in 2018 look reasonably bright. The economy is likely to continue to grow at an above-trend pace, which should lead to a tighter labor market and faster wage growth. Under such conditions, William Dudley, President and CEO of the Federal Reserve Bank of NY, expects the inflation rate to drift higher toward the Federal Open Market Committee's (FOMC) 2 percent long-run objective.

Over the longer term, however, Dudley is considerably more cautious about the economic outlook. Keeping the economy on a sustainable path may become more challenging. While the recently passed Tax Cuts and Jobs Act of 2017 likely will provide additional support to growth over the near term, it will come at a cost. The legislation will increase the nation's longer-term fiscal burden, which is already facing other pressures, such as higher debt service costs and entitlement spending as the baby-boom generation retires. While this does not seem to be a great concern to market participants today, the current fiscal path is unsustainable. In the long run, ignoring the budget math risks driving up longer-term interest rates, crowding out private sector investment and diminishing the country's creditworthiness. These dynamics could counteract

---

<sup>6</sup> *Op. Cit.*, Schwab Newsroom.

<sup>7</sup> *Op. Cit.*, Eisenberg.

<sup>8</sup> Amadeo, Kimberly. “US Economic Outlook: For 2018 and Beyond,” January 1, 2018, <https://www.thebalance.com/us-economic-outlook-3305669>.

any favorable direct effects the tax package might have on capital spending and potential output.<sup>9</sup>

## Natural Gas Pipeline Industry - 2018

Interstate natural gas pipelines have both utility and merchant energy characteristics and are considered the midstream segment of natural gas industry. The midstream segment comprises interstate pipeline, or “transmission,” companies, which build and operate pipelines to transport gas from producing regions to demand centers. The FERC, which has jurisdiction over interstate commerce in natural gas, regulates transmission companies.

### Pipeline MLPs (Master Limited Partnerships)

The MLP Industry consists of tax-advantaged oil and gas transporting, processing, and distribution companies. They do not pay state or federal corporate income taxes. Instead, the general partnerships (GP) typically pay out all of their distributable income to unitholders (usually, earnings plus depreciation and other noncash expenses, minus maintenance capital spending and payouts to the general partner) less a small portion retained to fund growth. MLPs own storage, processing, and transportation assets and charge customers fees for usage. They do not typically take title to hydrocarbons and, thus, are not generally directly exposed to commodity prices. MLPs are operated by a GP, which often trades separately. The Pipeline Master Limited Partnership (MLP) Industry is ranked in the bottom quartile of all industries covered in *The Value Line Investment Survey*.<sup>10</sup>

### The Pipeline MLP Industry Is Facing Identity Crisis

Even as U.S. drillers produce at near record levels, a key part of the shale boom’s support system is undergoing an identity crisis that’s leaving investors perplexed. The pipeline and storage companies known as master limited partnerships have seen shares drop by 18 percent in 2017, and as of November 15, 2017 they’ve slumped 52 percent on the Alerian MLP index since hitting a high in August 2014. Of 39 companies in the index, only six have gained in 2017.

With most MLPs, limited partners work in concert with general partners that manage and administer the facilities. The structure allows MLPs to avoid paying corporate taxes, helping stabilize investor returns. But growth has a dark side, as well. Built-in mandates tied to

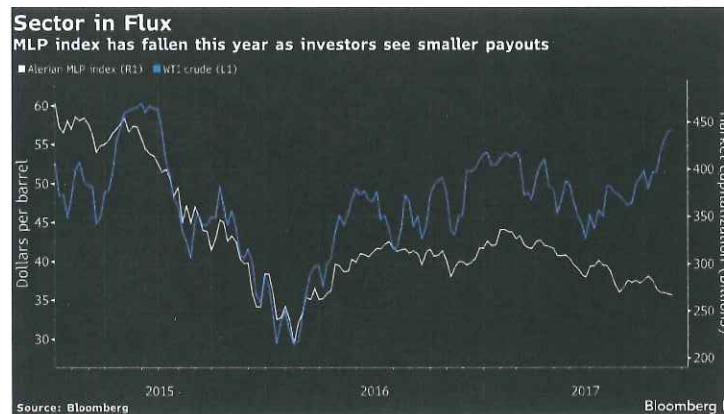
---

<sup>9</sup> Dudley, William C., “The Outlook for the U.S. Economy in 2018 and Beyond,” January 11, 2018, Federal Reserve Bank of New York, <https://www.newyorkfed.org/newsevents/speeches/2018/dud180111>

<sup>10</sup> Fong, Bryan J. “Pipeline MLPs”, *The Value Line Investment Survey*, December 1, 2017, 618.

expansion continually boost what general partners are paid, forcing MLPs to either add debt to maintain their growth or become more financially conservative. Which results in investors getting less, dimming their enthusiasm.

A change in the investor mix, now less dominated by retail investors, is, in part, forcing the sector toward a new model. As the flow of money from funds has slowed, MLPs are seeking to appeal to a broader audience to thrive. See *Bloomberg* graph below. The result: Some MLPs are, for the first time, cutting their costs to trim debt and looking to internally fund growth projects, according to Tyler Rosenlicht, vice president and portfolio manager at Cohen & Steers.<sup>11</sup>



### Production Volumes Appear to be Firming Up

Oil and gas production had been trending higher for many years reported Bryan Fong of *Value Line*. This growth has come largely from the much publicized domestic shale regions. Those formations have been gaining traction due to several years of strong price realizations, as well as the controversial drilling technique known as hydraulic fracturing, which made them economically viable. However, with the downturn in commodity prices in the spring of 2017 and warmer-than-normal weather patterns, the United States’ natural gas production has slowed a bit as many producers dial back wellhead volumes while awaiting the eventual return of higher prices. That said, it appears that trend may be shifting course. Natural gas production volumes began logging year-over-year gains back in June of 2017 and have continued to do so. Overall, natural gas marketed production registered a modest advance of 1.9% on a year-to-year basis for the month of August of 2017 (the latest period for which data were available), to 2.441 trillion

<sup>11</sup> Vamburkay, Meenal. “Pipeline Partnerships Face Identity Crisis That’s Killing Shares,” Bloomberg online, November 15, 2017, [www.bloomberg.com/news/articles/2017-11-15/pipeline-partnerships-face-identity-crisis-that-s-killing-shares](http://www.bloomberg.com/news/articles/2017-11-15/pipeline-partnerships-face-identity-crisis-that-s-killing-shares).

cubic feet, or about 78.7 billion cubic feet per day.<sup>12</sup>

### **Are The Distributions Safe?**

The depressed commodity prices during 2017 have resulted in reduced system throughput at many MLPs. A good number of the companies in the Pipeline MLP Industry grouping of *Value Line* have utilized bolt-on acquisitions as a means to expand geographically and continue to grow their distributable cash flows, despite the challenging operating environment. However, some regions of expansion have not been panning out as well as previously anticipated, and MLPs operating in those regions have seen their financial performance fall off. In some instances companies have needed to slash their quarterly distributions in an effort slow the cash burn and shore up their balance sheets. Back in 2014 Boardwalk Pipeline reduced its payout. And more recently, Enbridge Energy Partners and Suburban Propane fell into this category. Considering that MLPs' main appeal comes from their above-average payouts, investors will only want to consider committing funds to the companies in this space that have a decent track record of weathering a downturn, solid reserves, and good distribution coverage.<sup>13</sup>

### **Pipeline Projects/Networks**

There is a flurry of investments in new and expanding pipeline networks. According to Marcus and Chuah of *Center for Financial Research and Analysis (CFRA)*, *S&P Global* there are 44 natural gas pipeline projects (either announced or under construction) in North America, according to SNL Financial (SNL). Each of these projects is longer than 10 miles. In addition, there are seven storage projects, according to SNL, each with a capacity of more than 0.1 Bcf. Among the largest pipeline projects in the U.S. (based on estimated construction cost) are the Westcoast Connector Gas Transmission project, to be completed in 2020 (\$8.0 billion); the Atlantic Coast Pipeline project, to be completed in 2019 (\$5.5 billion); the Prince Rupert Gas Transmission project, to be completed in 2020 (\$5.0 billion); the Coastal GasLink Pipeline project, to be completed in 2019 (\$4.8 billion); and the Mountain Valley Pipeline project, to be completed in 2018 (\$3.7 billion). There are additional projects that have been postponed, or are in early or advanced stages of development.<sup>14</sup>

---

<sup>12</sup> *Op. Cit.*, Fong, *Value Line*.

<sup>13</sup> *Ibid.*

<sup>14</sup> Marcus, Paige, Equity Analyst and Shang Yang Chuah, Industry Analyst, "Industry Surveys: Gas Utilities," *Center for Financial Research and Analysis (CFRA)*, *S&P Global*, January 2018, 23. [On October 1, 2016, *CFRA* acquired S&P Global's Equity and Fund Research business, a leading provider of independent research and commentary with offerings focused on



## Summary of Natural Gas Transportation

The Gas Pipeline Transportation industry has experienced a variety of conditions over the past five years. As a whole, natural gas consumption has increased, spurring production and demand from industry operators. Despite higher levels of natural gas production, however, consistently low prices have prevented the industry from achieving significant revenue growth. In addition, the drop in oil prices beginning in late 2014 ignited demand for competing oil transporters.

Industry operators generally do not own the natural gas they transport, instead generating revenue from the fees paid by distributors and set by the Federal Energy Regulatory Committee reported Viraj D'Costa of *IBISWorld*. Higher volumes of natural gas production have encouraged industry operators to extend their pipeline capacity throughout the country. Advances in hydraulic fracturing technology have enabled previously untapped reserves to be used. For example, large discoveries of natural gas reserves in the Marcellus Shale Basin, located in the northern Appalachians, have led to substantial growth in the amount of natural gas that requires transporting. Increased supply has maintained low gas prices, encouraging higher demand. Industry operators are investing heavily in expanding their infrastructure to maintain capacity which resulted in higher capital spending between 2012 and 2017.

Industry growth is forecast to continue from 2017 to 2022. Electricity generation operators will continue to demand natural gas as prices remain near historic lows. Natural gas extractors will also expand production in shale basins during the outlook period, which will lead to continued growth in the amount of gas that needs to be transported. To accommodate the increase in production from shale deposits, industry operators will continue to extend their pipelines, which will cause rates to rebound.<sup>15</sup>

## Gas Pipeline Transportation Business Locations

The geographic spread of the Gas Pipeline Transportation industry is difficult to isolate because many pipelines extend across state and regional boundaries. Therefore, the starting point of interstate pipelines (where natural gas is sourced) and the volume of gas delivered is used as the basis for geographic spread.

Using this framework, the Southwest region is the most prominent (accounting for more than 30.7% of interstate natural gas shipments), closely followed by the Southeast (30.5%) and the Plains (10.2%). The most significant states are Texas, which account for 21.3% of

---

stocks, ETFs and mutual funds as well as sectors and industries.]

<sup>15</sup> D'Costa, Viraj. "Gas Pipeline Transportation in the US," *IBISWorld* Industry Report 48621, December 2017, 4.

establishments, and Louisiana, which account for 8.9% of establishments. About 6.0% of natural gas shipments originate in the Gulf of Mexico and are split between the Southeast and Southwest regions for the purposes of this analysis reports Viraj D/Costa in the Gas Pipeline Transportation industry report.

Regional gas markets in the U.S. have different demographics, differing weather patterns and distinct natural gas customer profiles. In the colder, seasonal markets, regional transportation and distribution systems are designed to meet space-heating demands by residential and commercial customers, and they are interlaced with backup storage and peaking facilities. In markets where seasonality is not a main issue, natural gas demand is mainly determined by electric power generation or industrial use. In these regions, storage is needed to support short-term demand fluctuations and system balancing.<sup>16</sup>

### **Gas Pipeline Transportation Risk Rating**

*IBISWorld Inc.* annually produces an *IBISWorld* Industry Risk Rating Report. In December 2017, the “Gas Pipeline Transportation in the US: 48621” Risk Rating Report was released. This industry group comprises establishments whose primary activities are natural gas storage, natural gas transportation, and natural gas-pipeline operation. The forecast period encompasses all of 2018. Three types of risk are recognized in their analysis. These are: risk arising from within the industry itself (structural risk), risks arising from the expected future performance of the industry (growth risk) and risk arising from economic forces (sensitivity risk). The results follow.<sup>17</sup>

Structural Risk Analysis — is forecast to be MEDIUM-LOW over the outlook period. A modest concern is the medium level of competition, which exacerbates risk by pressuring prices and profits downward. Operators are exposed to moderate revenue volatility, requiring prudent cash flow management and planning in times of uncertain demand. Businesses failing to account for these challenges risk sudden losses or diminished margins. This industry is currently in the mature phase of its life cycle, which exhibits limited growth in demand opportunities, which forces operators to compete for the remaining sales in order to survive. Existing operators will benefit from steady, low levels of assistance from outside organizations, as this assistance mitigates some risk experienced elsewhere.<sup>18</sup>

---

<sup>16</sup> *Ibid*, 16.

<sup>17</sup> “IBISWorld Industry Risk Rating Report 48621, Gas Pipeline Transportation in the US,” *IBISWorld*, December 2017, 2.

<sup>18</sup> *Ibid.*, 2-3.

**Growth Risk Analysis** — is expected to be MEDIUM-LOW over the outlook period. *IBISWorld* forecasts that annual industry revenue will grow 4.2% to \$25.5 billion. In comparison, revenue shrank 3.1% per year between 2015 and 2017.<sup>19</sup>

**Sensitivity Risk Analysis** — is forecast to be MEDIUM-LOW over the outlook period, down from MEDIUM in 2017. The two factors with the most significant impacts on the industry are electric power consumption and industrial production index. A rise in either of these factors will lower industry risk.<sup>20</sup>

### **Barriers to Entry**

Barriers to entry into the Gas Pipeline Transportation industry are high and tend to be surmountable only by large industry enterprises. Typically, opportunities to enter the industry arise when the construction of new pipelines is necessary or consolidation occurs. For example, the recent sale of some of the assets formerly owned by Enron gave potential entrants a chance to enter the industry or enabled active industry players to expand their existing market position.

The amount of capital required to fund construction of gas pipelines is the most significant entry barrier. Pipeline infrastructure is a costly endeavor, and potential entrants must incur high initial investments before securing supply of natural gas and demand for transport services. Additionally, gas-pipeline operations require skilled construction, engineering and managerial staff.

In addition, large initial contracts must be secured to make the pipeline viable. Large contracts are typically awarded to existing operators with extensive infrastructure and a history of regulation compliance. Potential entrants could find it difficult to compete with established enterprises in securing these contracts

Lastly, state and federal regulation on safety and energy act as strong barriers to entry. Compliance with various state laws that regulate energy transport and Federal Energy Regulatory Commission standards must be achieved before commencing operations. Since most pipeline infrastructure cross state boundaries, compliance with many governing authorities at the federal level is often required.<sup>21</sup>

### **Basis of Competition**

The Gas Pipeline Transportation industry has a moderate level of competition according to *IBISWorld*. The fixed nature of natural gas pipelines, federal regulation and shared source of

---

<sup>19</sup> *Ibid.*, 3.

<sup>20</sup> *Ibid.*, 3.

<sup>21</sup> *Ibid.*, 5.

natural gas limits competition between industry operators in the short term. However, in the longer term, the potential for new pipeline infrastructure and expanded capacity to meet demand and volume growth will spur competition.

Since 1993, operators in the Gas Pipeline Transportation industry have been prevented from buying and selling gas and are only permitted to charge for gas transportation. This standardized the fees charged to pipeline users. The Federal Energy Regulatory Commission is in charge of regulating these fees at the interstate level, whereas state authorities are in charge of intrastate pipelines.<sup>22</sup>

### **Natural Gas Pipeline Transportation Outlook**

The Gas Pipeline Transportation industry is projected to expand in the five years to 2022. The industry is highly regulated and charges customers based on rates established by the Federal Energy Regulatory Commission. Over the next five years, the FERC will accept more rate-increase applications, as industry operators continue expanding capacity and building new pipelines. The need for greater capacity will come from rising demand from electricity generators and increasing production in regions close to natural gas reserves. Additionally, supply pushes, a financing mechanism in which gas producers provide capital for pipeline extensions, will become more common.<sup>23</sup>

*Value Line's* Michael Napoli also agreed with *IBISWorld's* future outlook. According to Napoli, some members of the Natural Gas (Diversified) Industry,<sup>24</sup> have reported solid operating improvement in recent times. This was supported by a moderate rise in prices in the last quarter of 2017, along with greater volume and improvements in productivity. Some natural gas companies will likely continue to report favorable comparisons in the coming quarters, according to Napoli. Looking further out, long-term prospects appear relatively bright. *Value Line* anticipates a better industry environment in the near future, and improved operating performance for a number of participants from 2018 onward.<sup>25</sup>

---

<sup>22</sup> *Ibid.*, 6.

<sup>23</sup> *Op. Cit.*, D'Costa, 8.

<sup>24</sup> The Diversified Natural Gas Industry consists of companies that produce, market, and transport natural gas. It is labeled "diversified" because operations can vary widely among natural gas companies.

<sup>25</sup> Napoli, Michael F. "Natural Gas (Diversified) Industry," *Value Line Investment Survey*, December 1, 2017, 525.

## **Natural Gas Economics**

Natural gas touches everyone's lives. It heats 76 million homes, generates 30 percent of the nation's electricity, is a key component of the fertilizer that helps grow our crops and is used by manufacturers to make a wide range of products from trash bags to lipstick to toys. Pipelines make the use of natural gas possible by delivering the gas safely and reliably across the country.

Consumers and producers alike have benefitted from the recent boom in domestic natural gas at the end of 2017. Gas now provides a full quarter of the energy used in the United States, as power plants, factories and homeowners enjoy the savings offered by the abundance of natural gas.

Natural gas is the cleanest burning fossil fuel, so its increased use is helping to reduce pollution. At the same time, the growth in domestic production is fueling America's economy. Abundant natural gas is creating thousands of jobs in the production and pipeline sector, and it's driving a resurgence in the U.S. manufacturing sector.

As gas production and use increases nationwide, more pipelines will be constructed to deliver the natural gas to market. This should provide over 350,000 Americans with well-paying jobs throughout the next 20 years reported the Interstate Natural Gas Association of America (INGAA) website.<sup>26</sup>

## **Summary**

Whether evaluating a natural gas transmission pipeline company or an oil pipeline transportation company, it is as important to assess the underlying business risk as it is to determine the company's financial risk. Both of these risk elements are heavily influenced by volatility, which is ever present in both pipeline industries mentioned above, and are elevated for the 2018 appraisal year.

All of the political and economic factors discussed in this section and the "2018 Economic section" will affect the typical investor's cost of capital as the elements of business and financial risk increases. The additional risk attributable to the natural gas pipeline industry should be reflected in the development of the cost of capital.

## **Weighted Average Cost of Capital (WACC)**

The return investors require on investments of comparable risk is what the cost of capital measures. Rational investors will not accept a particular investment opportunity if the expected return on that opportunity is less than the cost of capital required to compensate for the risk

---

<sup>26</sup> "Economics," INGAA online, January 31, 2018, <http://www.ingaa.org/Pipelines/101/Economics.aspx>. The INGAA is a trade organization dedicated to advocating for the legislative and regulatory position of gas pipeline operators in the US and Canada.

involved. The weighted average cost of capital (WACC) is also known in the appraisal and financial community as the opportunity cost of capital. The WACC is used primarily for making long-term capital investment decisions by investors and purchasers. Accordingly, the WACC is used by appraisers to estimate *market value*.<sup>27</sup> To calculate market value, the appraiser discounts expected future income (cash flow) by the rate of return offered by comparable investment alternatives. [All of the annual “income” figures used in appraising income-producing properties are *cash flows* rather than accrual accounting incomes.<sup>28</sup>] This rate of return is often referred to as the discount rate or the opportunity cost of capital.<sup>29</sup> The Appraisal Institute has defined opportunity cost as quoted below:

*Opportunity cost is the net cost of opportunities not chosen or options foregone, denied or lost. An investor who selects one investment forgoes the opportunity to invest in other available investments...Opportunity cost is related to the principle of substitution, and is particularly significant in estimating the rates of return necessary to attract capital. By analyzing and comparing the prospective rates of return offered by alternative investment opportunities, an appraiser can estimate the required rate of return for the property being appraised.*<sup>30</sup>

The estimated cost of capital in this report for the Interstate Natural Gas Pipeline Industry as of January 1, 2018, is based on the generally accepted appraisal methodology known as the band of investment technique. The band of investment technique consists of the following steps:

1. Analyze and determine the appropriate capital structure.
2. Identify the appropriate cost for each financing band of the capital structure.
3. Weight the appropriate cost for each financing band by the relative proportion of

---

<sup>27</sup> Market value is defined by the Appraisal Institute as, “The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress.” See *The Appraisal of Real Estate*, 14<sup>th</sup> ed., (Chicago: Appraisal Institute, 2013), 58.

<sup>28</sup> William N. Kinnard, Jr., *Income Property Valuation*, (Lexington: Heath Lexington Books, 1982), 70.

<sup>29</sup> Richard A. Brealey and Stewart C. Meyers, *Principles of Corporate Finance*, 4<sup>th</sup> ed., (New York: McGraw-Hill, 1991), 13.

<sup>30</sup> *The Appraisal of Real Estate*, 11<sup>th</sup> ed. (Chicago: Appraisal Institute, 1996) 44. See also *The Dictionary of Real Estate Appraisal*, 5<sup>th</sup> ed., (Chicago: Appraisal Institute, 2010) 139.

the capital structure represented by each financing band.

The sum of the weighted costs for the financing bands represents the weighted average cost of capital. This weighted cost of capital is typically known as the discount rate in appraisal literature and the algebraic formula is shown in Figure 1.

In explaining the estimation of the cost of capital, Ibbotson Associates states:

$$K = (D \times K_d) + (E \times K_e)$$

where

*K* = Weighted Average Cost of Capital  
*D* = Proportion of Debt in Capital Structure  
*K<sub>d</sub>* = Cost of Debt  
*E* = Proportion of Equity in Capital Structure  
*K<sub>e</sub>* = Cost of Equity

Figure 1

The cost of capital is always an expectational or forward-looking concept. While the past performance of an investment and other historical information can be good guides and are often used to estimate the required rate of return on capital, the expectations of future events are the only factors that actually determine the cost of capital. An investor contributes capital to a firm with the expectation that the business' future performance will provide a fair return on the investment. If past performance were the criterion most important to investors, no one would invest in start-up ventures. It should also be noted that the cost of capital is a function of the investment, not the investor.<sup>31</sup>

## Cost of Capital Study Results

The cost of capital for the Interstate Natural Gas Pipeline Industry as of January 1, 2018 is estimated to be **10.65%** as the shown on the following chart. Following the chart are explanations of the derivation of each of the component parts of the cost of capital study.

Capital	Portion	Cost	Product
Debt	30.00%	5.04%	1.51%
Equity	70.00%	13.05%	9.14%
Totals	100.00%		10.65%

<sup>31</sup> *SBBI (Stocks, Bonds, Bills and Inflation)*, 2013 Yearbook: Valuation Edition, (Chicago: Morningstar, Inc., 2013), 21.

## Capital Structure

Economists and appraisers measure a firm's capital structure in terms of the market values of its debt and equity because that is the best measure of the amounts of debt and equity that investors have invested in the company on a going-forward basis. Furthermore, economists and appraisers generally agree that the goal of management is to maximize the value of the firm, where the value of the firm is the sum of the market value of the firm's debt and equity. Only by measuring a firm's capital structure in terms of market values can its managers choose a financing strategy that maximizes the value of the firm.

For estimating the cost of capital for the INGPI, it is appropriate to use the typical market capital structure for similar interstate natural gas pipeline companies. There is very little debate about this concept, however for clarity we note the following statements from Brigham and Gapenski and from Damodaran.

We are absolutely convinced that the procedures we recommend are correct — namely, firms should focus on market value capital structures and base their cost of capital calculations on market value weights. Because market values do change, it would be impossible to keep the actual capital structure on target at all times, but this fact in no way detracts from the validity of market value targets.<sup>32</sup>

The weights assigned to equity and debt in calculating the weighted average cost of capital have to be based upon market value, not book value. The rationale rests on the fact that the cost of capital measures the cost of issuing securities, stocks as well as bonds, to finance projects, and that these securities are issued at market value, not at book value.<sup>33</sup>

Ideally, a firm's target or optimal capital structure should be used in weighting the cost of equity and cost of debt. Unfortunately, many companies are either not able to obtain their target capital structure, or information to support the target capital structure is not available (as may be the case for a minority-interest shareholder). In the absence of a reliable target capital structure, the capital structure weights should be market value weighted. While it is typically a straightforward process to measure the market value of equity capital for a public company, it usually is not so simple for debt capital because so little debt is publicly traded. Therefore, in most cases the market value of debt in the capital structure is assumed to be the

---

<sup>32</sup> Eugene F. Brigham and Louis C. Gapenski, *Financial Management*, 7<sup>th</sup> ed. (New York: The Dryden Press, 1994), 599.

<sup>33</sup> Aswath Damodaran, *Investment Valuation*, (New York, NY: John Wiley & Sons, Inc., 1996), 64.



book value of debt.<sup>34</sup>

In theory, the relative weightings of debt and equity or other capital structure components are based on the market values of each of those components, not on their book values. In practice, most valuation analysts tend to assume that the carrying value of debt capital on the balance sheet is a reasonable proxy for its market value.<sup>35</sup>

In the appraisal process or in developing the cost of capital to be used in the appraisal process the appraiser must utilize the market capital structure for all types of appraisal. Even when public utilities are strictly regulated, it is necessary for the appraiser to use the market capital structure unless the book capital structure is found to be the same as the market capital structure. The market capital structure may vary significantly from the book capital structure for most interstate natural gas pipelines. Thus, investors are concerned with the capital structure they will use to finance the purchase of an interstate natural gas pipeline, and that will always be the typical market capital structure.

It is also important to note what elements of capital comprise the makeup of the *capital structure* from an appraisal standpoint. The capital structure consists only of long-term debt, common stock, and where appropriate, preferred stock. The capital structure should not be confused with *financial structure* or any other term used in financial literature. To understand what elements comprise the capital structure it is important to define capital structure and financial structure, which are defined as follows:

**CAPITAL STRUCTURE** corporation's financial framework, including LONG-TERM DEBT, PREFERRED STOCK, and NET WORTH. It is distinguished from FINANCIAL STRUCTURE, which includes additional sources of capital such as short-term debt, accounts payable, and other liabilities.<sup>36</sup>

**FINANCIAL STRUCTURE** makeup of the right-hand side of a company's BALANCE SHEET, which includes all the ways its assets are financed, such as trade accounts payable and short-term borrowings as well as long-term debt and ownership equity. Financial structure is distinguished from CAPITAL

---

<sup>34</sup> *Stocks, Bonds, Bills and Inflation, Valuation Edition 2013 Yearbook*, (Chicago: Morningstar, Inc., 2013) 14-15.

<sup>35</sup> Duff & Phelps, *2017 Valuation Handbook U.S. Guide to Cost of Capital*, (Hoboken, NJ: John Wiley & Sons, Inc., 2017), 1-15.

<sup>36</sup> John Downes and Jordan Elliot Goodman, *Dictionary of Finance and Investment Terms*, (New York: Barron's, 1985), 54.

STRUCTURE, which includes only long-term debt and equity.<sup>37</sup>

It is also important to note that neither accumulated depreciation or accumulated deferred income taxes are included in capital structure. Some appraisers have mistakenly included accumulated deferred income taxes in constructing a firm's capital structure. This is simply wrong for estimating the cost of capital and for appraisal purposes. The following quotation from *Financial Management* addresses this issue quite well:

Since depreciation-generated funds have the same cost as the firm's WACC when retained earnings are used for the equity component, it is not necessary to consider them when estimating the WACC...Therefore, deferred taxes, like depreciation, have a cost equal to the firm's WACC using retained earnings as the equity component. Indeed, deferred taxes arise solely because a firm records a different depreciation expense on its tax books than on the books used to report income to shareholders... Deferred taxes are treated the same way as depreciation cash flows: they are not included when estimating the firm's WACC...<sup>38</sup>

The appropriate capital structure for use in estimating the INGPI's cost of capital is the expected capital structure that a typical purchaser would likely use to finance the purchase of the operating assets of a company within this industry. This typical purchaser would take into account the regulatory agency's allowed rate of return in analyzing the risk profile and selecting the market capital *structure*. Thus, an analysis of the typical market capital structure used in the interstate natural gas pipeline industry is appropriate.

In order to estimate the capital structure and ultimately the cost of capital it is important to find investments of comparable risk from which to derive market data. First, it is important to know that there is no perfect set of comparables for the typical interstate natural gas pipeline property. For example, the typical interstate natural gas pipeline is only in the business of transporting natural gas for its customers. Virtually, none of the comparables used in this cost of capital study are in just that business. To be able to be included and analyzed in the estimate of the cost of capital, a company has to have traded equity. Most of these interstate natural gas pipeline companies do not have traded equity, but rather are subsidiaries of parent companies which are involved in several ventures including gathering, processing, storing, transporting, local distribution of natural gas, managing energy infrastructure, liquids processing, fractionation, crude oil pipelines, petrochemicals, natural gas liquids pipelines, offshore

---

<sup>37</sup> *Ibid.*, 132.

<sup>38</sup> Eugene F. Brigham and Louis C. Gapenski, *Financial Management*, 7<sup>th</sup> ed. (New York: The Dryden Press, 1994), 368-369.

pipelines, transporting of petroleum products, carbon dioxide pipelines, crude oil marketing, crude oil transport trucks, and motor carrier unloading facilities in addition to other operations.

Second, there is nothing wrong with using comparables that are not exactly like the interstate natural gas pipeline companies. The primary comparison is risk. The guideline comparables should be as similar as possible in riskiness of investment. The U.S. Supreme Court in *Bluefield* and *Hope* consistently ruled relative risk is the important criteria in evaluating the cost of capital for a utility, not the particular line of business activity or degree of regulation. The cost of capital is an opportunity cost based on the returns that investors could realize by putting their money in other alternatives of comparable risk.

“A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.” [*Bluefield Water Works & Imp. Co. v. Public Service Comm'n*, 262 U.S. 679, 692-3 (1923).]

“From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock .... By that standard the return to equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital.” [*Federal Power Comm'n v. Hope Natural Gas Co.*, 320 U.S. 591, 603 (1944) (Douglas, J.)]

As a member of the Tennessee Public Service Commission staff, I was aware of many rate cases during my 15+ years of service. It was not uncommon for expert testimony to be provided by various cost of capital experts on the cost of common equity for a particular utility company in which many diverse companies were utilized to provide comparable risk estimates. One continues to see testimony from cost of capital experts today around the country in various regulatory commission cost of capital hearings for setting the authorized rates of return for its regulated companies. This is because the investor is not relegated to investing only in natural gas pipelines, but can invest in any comparable risk investment opportunity.

The market capital structure developed for the INGPI was calculated from information

obtained from *Value Line Investment Survey* data base (*Value Line*) and *Standard & Poor's Compustat* data base as of January 2018. The capital structure study involved the following companies we believe to be representative of the interstate natural gas transmission pipeline industry: 16 large (sales over \$1 billion) pipeline companies we consider to be representative of the interstate natural gas pipeline industry taken from the *Value Line* full data base of 5,981 companies); a combination of 21 large companies from both the *Value Line* natural gas (diversified) group and the large *Value Line* Natural Gas Utility distribution group; 14 companies defined by Value Line as their large Natural Gas Diversified Industry; and 13 companies heavily involved with natural gas pipelines from the Interstate Natural Gas Pipeline Property Tax Forum group, which have traded common stock listed by *Standard and Poor's*. We also considered the 31 companies from the *S&P 500* which have **BBB-** rated long-term debt (the same rating as the typical interstate natural gas pipeline company). Ultimately, to retain a particular rating status by the major rating agencies, companies must maintain a certain level of equity and the ability to pay their long-term debt obligations. Thus, it is important to consider the capital structures of companies with similar ratings and similar risk in estimating the appropriate capital structure.

The results indicate that the market capital structure for the industry is approximately 30% debt, essentially no preferred stock, and 70% equity. For each of the above mentioned groups of companies, we calculated simple average and median capital structure for each grouping using data reported both by *Value Line* and *Standard & Poor's*. As many traditional interstate natural gas pipelines have become subsidiaries of other pipelines and other energy companies, there are only a few members of the Interstate Natural Gas Pipeline Property Tax Forum group which have traded common stock. Thus, we are inclined to give less consideration to the data from the Forum group.

For purposes of analysis we used the market capital structure for each company. The market value of the common equity portion of the capital structure was determined by multiplying the number of shares outstanding times the recent price reported by *Value Line* and/or *Standard & Poor's*. As surrogates for the market value of debt and preferred stock we substituted the book value of each. The market values of both debt and equity are always preferred, if available. Since the book value of debt is usually close to market value, book value is usually used for the debt weight. Ibbotson states, "Therefore, in most cases the market value of debt in the capital structure is assumed to be the book value of debt."<sup>39</sup> Only a few companies in this industry have issued preferred stock and, like debt, we used book value as a surrogate for the market value of preferred stock. Our recent analysis indicates that book values for long-term debt and preferred stock are fairly reasonable approximations for market value at the present

---

<sup>39</sup> *SBBI (Stocks, Bonds, Bills and Inflation), 2013 Yearbook: Valuation Edition*, (Chicago: Morningstar, Inc., 2013) 14-15.

time, thus book value can be substituted as a reasonable proxy for the market value of debt and preferred stock capital.

A summary of the capital structure analysis follows along with the supporting calculations for each of the company groups.

### Summary of Capital Structure Data

<b>Value Line Data - Medians</b>	<b>Debt</b>	<b>Pref Stk</b>	<b>Com Stk</b>
Natural Gas Pipeline Industry (Large)	30.16%	0.00%	69.84%
Natural Gas Diversified & Oil/Gas Dist. (Large)	29.78%	0.00%	70.23%
Natural Gas Diversified Industry (Large)	27.72%	0.00%	72.29%
Interstate Natural Gas Pipeline Forum (Pipelines)	38.07%	0.00%	61.93%
Pipeline Screened Comparables Group	27.75%	0.00%	72.25%
All Companies in S&P 500 with "BBB-" Rated Debt	22.79%	0.00%	77.22%
<b>Averages</b>	<b>29.38%</b>	<b>0.00%</b>	<b>70.62%</b>

<b>S&amp;P Data - Medians</b>	<b>Debt</b>	<b>Pref Stk</b>	<b>Com Stk</b>
Natural Gas Pipeline Industry (Large)	34.40%	0.00%	61.88%
Natural Gas Diversified & Oil/Gas Dist. (Large)	30.73%	0.00%	69.27%
Natural Gas Diversified Industry (Large)	28.49%	0.00%	70.82%
Interstate Natural Gas Pipeline Forum (Pipelines)	37.65%	0.00%	62.36%
Pipeline Screened Comparables Group	29.57%	0.00%	70.43%
All Companies in S&P 500 with "BBB-" Rated Debt	23.01%	0.00%	76.99%
<b>Averages</b>	<b>32.17%</b>	<b>0.00%</b>	<b>66.95%</b>

**Natural Gas Pipeline Industry (Large)**  
**Capital Structure (VL Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
Boardwalk Pipeline	BWP	52.43%	0.00%	47.57%
CenterPoint Energy	CNP	38.50%	0.00%	61.50%
DCP Midstream LP	DCP	46.21%	0.00%	53.79%
Enable Midstream Part.	ENBL	29.44%	0.00%	70.56%
Energy Transfer Equity	ETE	70.52%	0.00%	29.48%
EnLink Midstream Part.	ENLK	36.68%	0.00%	63.32%
Enterprise Products	EPD	26.59%	0.00%	73.41%
EQT Corp.	EQT	20.88%	0.00%	79.12%
Kinder Morgan Inc.	KMI	45.48%	0.00%	54.52%
National Fuel Gas	NFG	30.09%	0.00%	69.91%
ONEOK Inc.	OKE	27.21%	0.00%	72.79%
Spectra Energy Part.	SEP	30.16%	0.00%	69.84%
TransCanada Corp.	TRP			
Western Gas Part.	WES	27.75%	0.00%	72.25%
Williams Cos.	WMB	43.36%	0.00%	56.64%
Williams Partners L.P.	WPZ	28.44%	0.00%	71.56%
	Average	36.92%	0.00%	63.08%
	Median	30.16%	0.00%	69.84%

Source: Value Line, January 2018.

**Natural Gas Pipeline Industry (Large)**  
**Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
BOARDWALK PIPELINE PRTNRS-LP	BWP	52.60%	0.00%	47.40%
CENTERPOINT ENERGY INC	CNP	38.12%	0.00%	61.88%
DCP MIDSTREAM LP	DCP	47.50%	0.00%	52.50%
ENABLE MIDSTREAM PARTNERS LP	ENBL	29.07%	3.94%	66.99%
ENERGY TRANSFER EQUITY LP	ETE	70.07%	0.59%	29.33%
ENLINK MIDSTREAM PARTNERS LP	ENLK	34.40%	12.42%	53.18%
ENTERPRISE PRODS PRTNRS -LP	EPD	27.56%	0.00%	72.44%
EQT CORP	EQT	21.43%	0.00%	78.57%
KINDER MORGAN INC	KMI	46.55%	0.00%	53.45%
NATIONAL FUEL GAS CO	NFG	30.73%	0.00%	69.27%
ONEOK INC	OKE	28.42%	0.00%	71.58%
SPECTRA ENERGY PARTNERS LP	SEP	31.73%	0.00%	68.27%
TRANSCANADA CORP	TRP	39.56%	4.21%	56.23%
WESTERN GAS PARTNERS LP	WES	29.57%	0.00%	70.43%
WILLIAMS COS INC	WMB	44.95%	0.00%	55.05%
WILLIAMS PARTNERS LP	WPZ			
	Average	38.15%	1.41%	60.44%
	Median	34.40%	0.00%	61.88%

Source: S&P Compustat, January 2018.



**Natural Gas Diversified & Oil/Gas Dist. (Large)**  
**Capital Structure (VL Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
Antero Resources	AR	42.24%	0.00%	57.76%
Cabot Oil & Gas 'A'	COG	8.78%	0.00%	91.22%
Chesapeake Energy	CHK	73.39%	0.00%	26.61%
Cimarex Energy	XEC	10.84%	0.00%	89.16%
Concho Resources	CXO	10.54%	0.00%	89.46%
Devon Energy	DVN	31.35%	0.00%	68.65%
Enbridge Inc.	ENB.TO			
EOG Resources	EOG	8.89%	0.00%	91.11%
EQT Corp.	EQT	20.88%	0.00%	79.12%
Kinder Morgan Inc.	KMI	45.48%	0.00%	54.52%
MDU Resources	MDU	23.50%	0.00%	76.50%
National Fuel Gas	NFG	30.09%	0.00%	69.91%
Newfield Exploration	NFX	25.97%	0.00%	74.03%
ONEOK Inc.	OKE	27.21%	0.00%	72.79%
Pembina Pipeline	PPL.TO			
QEP Resources	QEP	42.24%	0.00%	57.76%
Southwestern Energy	SWN	60.15%	0.00%	39.85%
Targa Resources	TRGP	29.46%	0.00%	70.54%
TransCanada Corp.	TRP			
Williams Cos.	WMB	43.36%	0.00%	56.64%
World Fuel Services	INT	37.18%	0.00%	62.82%
	Average	31.75%	0.00%	68.25%
	Median	29.78%	0.00%	70.23%

Source: Value Line, January 2018.

**Natural Gas Diversified & Oil/Gas Dist. (Large)**  
**Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
ANTERO RESOURCES CORP	AR	42.94%	0.00%	57.06%
CABOT OIL & GAS CORP	COG	8.85%	0.00%	91.15%
CHESAPEAKE ENERGY CORP	CHK	65.30%	11.02%	23.68%
CIMAREX ENERGY CO	XEC	11.34%	0.00%	88.66%
CONCHO RESOURCES INC	CXO	10.92%	0.00%	89.08%
DEVON ENERGY CORP	DVN	32.33%	0.00%	67.67%
ENBRIDGE INC	ENB	41.08%	4.85%	54.07%
EOG RESOURCES INC	EOG	9.28%	0.00%	90.72%
EQT CORP	EQT	21.43%	0.00%	78.57%
KINDER MORGAN INC	KMI	46.55%	0.00%	53.45%
MDU RESOURCES GROUP INC	MDU	23.27%	0.00%	76.73%
NATIONAL FUEL GAS CO	NFG	30.73%	0.00%	69.27%
NEWFIELD EXPLORATION CO	NFX	27.88%	0.00%	72.12%
ONEOK INC	OKE	28.42%	0.00%	71.58%
PEMBINA PIPELINE CORP	PBA	20.65%	6.06%	73.29%
QEP RESOURCES INC	QEP	45.05%	0.00%	54.95%
SOUTHWESTERN ENERGY CO	SWN	60.74%	0.00%	39.26%
TARGA RESOURCES CORP	TRGP	29.09%	1.40%	69.52%
TRANSCANADA CORP	TRP	39.56%	4.21%	56.23%
WILLIAMS COS INC	WMB	44.95%	0.00%	55.05%
WORLD FUEL SERVICES CORP	INT	37.19%	0.00%	62.81%
	Average	32.26%	1.31%	66.42%
	Median	30.73%	0.00%	69.27%

Source: S&P Compustat, January 2018.



**Natural Gas Diversified Industry (Large)  
Capital Structure (VL Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
Antero Resources	AR	42.24%	0.00%	57.76%
Cabot Oil & Gas 'A'	COG	8.78%	0.00%	91.22%
Chesapeake Energy	CHK	73.39%	0.00%	26.61%
Cimarex Energy	XEC	10.84%	0.00%	89.16%
Concho Resources	CXO	10.54%	0.00%	89.46%
Devon Energy	DVN	31.35%	0.00%	68.65%
EOG Resources	EOG	8.89%	0.00%	91.11%
EQT Corp.	EQT	20.88%	0.00%	79.12%
MDU Resources	MDU	23.50%	0.00%	76.50%
National Fuel Gas	NFG	30.09%	0.00%	69.91%
Newfield Exploration	NFX	25.97%	0.00%	74.03%
QEP Resources	QEP	42.24%	0.00%	57.76%
Southwestern Energy	SWN	60.15%	0.00%	39.85%
Targa Resources	TRGP	29.46%	0.00%	70.54%
	Average	29.88%	0.00%	70.12%
	Median	27.72%	0.00%	72.29%

Source: Value Line, January 2018.

**Natural Gas Diversified Industry (Large)  
Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
ANTERO RESOURCES CORP	AR	42.94%	0.00%	57.06%
CABOT OIL & GAS CORP	COG	8.85%	0.00%	91.15%
CHESAPEAKE ENERGY CORP	CHK	65.30%	11.02%	23.68%
CIMAREX ENERGY CO	XEC	11.34%	0.00%	88.66%
CONCHO RESOURCES INC	CXO	10.92%	0.00%	89.08%
DEVON ENERGY CORP	DVN	32.33%	0.00%	67.67%
EOG RESOURCES INC	EOG	9.28%	0.00%	90.72%
EQT CORP	EQT	21.43%	0.00%	78.57%
MDU RESOURCES GROUP INC	MDU	23.27%	0.00%	76.73%
NATIONAL FUEL GAS CO	NFG	30.73%	0.00%	69.27%
NEWFIELD EXPLORATION CO	NFX	27.88%	0.00%	72.12%
QEP RESOURCES INC	QEP	45.05%	0.00%	54.95%
SOUTHWESTERN ENERGY CO	SWN	60.74%	0.00%	39.26%
TARGA RESOURCES CORP	TRGP	29.09%	1.40%	69.52%
	Average	29.94%	0.89%	69.17%
	Median	28.49%	0.00%	70.82%

Source: S&P Compustat, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)  
Capital Structure (VL Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
Boardwalk Pipeline	BWP	52.48%	0.00%	47.52%
CenterPoint Energy	CNP	38.39%	0.00%	61.61%
Dominion Energy	D	38.07%	0.00%	61.93%
Enable Midstream Part.	ENBL	29.55%	0.00%	70.45%
Enbridge Energy Mgmt LLC	EEQ	0.00%	0.00%	100.00%
Enbridge Energy Part.	EEP	58.53%	0.00%	41.47%
Enbridge Inc.	ENB.TO			
Kinder Morgan Inc.	KMI	45.49%	0.00%	54.51%
MDU Resources	MDU	23.45%	0.00%	76.55%
National Fuel Gas	NFG	30.11%	0.00%	69.89%
ONEOK Inc.	OKE	27.26%	0.00%	72.74%
TransCanada Corp.	TRP			
Williams Cos.	WMB	43.32%	0.00%	56.68%
	Average	35.15%	0.00%	64.85%
	Median	38.07%	0.00%	61.93%

Source: Value Line, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)  
Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
BOARDWALK PIPELINE PRTRNS-LP	BWP	52.60%	0.00%	47.40%
CENTERPOINT ENERGY INC	CNP	38.12%	0.00%	61.88%
DOMINION ENERGY INC	D	37.17%	0.00%	62.83%
ENABLE MIDSTREAM PARTNERS LP	ENBL	29.07%	3.94%	66.99%
ENBRIDGE ENERGY MGMT LLC	EEQ	0.00%	0.00%	100.00%
ENBRIDGE ENERGY PRTRNS -LP	EEP			
ENBRIDGE INC	ENB	41.08%	4.85%	54.07%
KINDER MORGAN INC	KMI	46.55%	0.00%	53.45%
MDU RESOURCES GROUP INC	MDU	23.27%	0.00%	76.73%
NATIONAL FUEL GAS CO	NFG	30.73%	0.00%	69.27%
ONEOK INC	OKE	28.42%	0.00%	71.58%
TRANSCANADA CORP	TRP	39.56%	4.21%	56.23%
WILLIAMS COS INC	WMB	44.95%	0.00%	55.05%
	Average	34.29%	1.08%	64.62%
	Median	37.65%	0.00%	62.36%

Source: S&P Compustat, January 2018.

**All Companies in S&P 500 with "BBB-" Rated Debt  
Capital Structure (VL Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
Advance Auto Parts	AAP	11.26%	0.00%	88.74%
Amer. Tower 'A'	AMT	23.36%	0.00%	76.64%
Andeavor	ANDV	29.67%	0.00%	70.33%
Apartment Investment	AIV			
Arconic Inc.	ARNC	32.20%	0.00%	67.80%
Best Buy Co.	BBY	3.66%	0.00%	96.34%
Cimarex Energy	XEC	10.85%	0.00%	89.15%
Constellation Brands	STZ	15.93%	0.00%	84.07%
Crown Castle Int'l	CCI	25.53%	0.00%	74.47%
Delta Air Lines	DAL	16.29%	0.00%	83.71%
Discover Fin'l Svcs.	DFS	48.50%	0.00%	51.50%
Expedia Inc.	EXPE	16.06%	0.00%	83.94%
Flowserve Corp.	FLS	20.91%	0.00%	79.09%
FMC Corp.	FMC	10.17%	0.00%	89.83%
Harris Corp.	HRS	16.30%	0.00%	83.70%
Hess Corp.	HES	27.64%	2.41%	69.94%
Horton D.R.	DHI	11.01%	0.00%	88.99%
Huntington Ingalls	HII	10.71%	0.00%	89.29%
Kansas City South'n	KSU	16.41%	0.00%	83.59%
Kinder Morgan Inc.	KMI	45.49%	0.00%	54.51%
Kohl's Corp.	KSS	31.61%	0.00%	68.39%
Kraft Heinz Co.	KHC	22.84%	0.00%	77.16%
Molson Coors Brewing	TAP	36.94%	0.00%	63.06%
Mosaic Company	MOS	28.74%	0.00%	71.26%
Motorola Solutions	MSI	22.73%	0.00%	77.27%
Newell Brands	NWL	39.31%	0.00%	60.69%
Synchrony Financial	SYF	39.31%	0.00%	60.69%
Tapestry Inc.	TPR	12.79%	0.00%	87.21%
Total System Svcs.	TSS	13.81%	0.00%	86.19%
Viacom Inc. 'B'	VIAB	48.60%	0.00%	51.40%
Zions Bancorp.	ZION	33.12%	0.00%	66.88%
	Average	24.06%	0.08%	75.86%
	Median	22.79%	0.00%	77.22%

Source: Value Line, January 2018.



**S&P 500 Companies with "BBB-" Rated Debt  
Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	LTD %	PS %	CS %
ADVANCE AUTO PARTS INC	AAP	12.42%	0.00%	87.58%
AMERICAN TOWER CORP	AMT	23.28%	0.00%	76.72%
ANDEAVOR	ANDV	29.97%	0.00%	70.03%
APARTMENT INVST & MGMT CO	AIV	36.60%	1.13%	62.27%
ARCONIC INC	ARNC	35.98%	0.31%	63.72%
BEST BUY CO INC	BBY	3.72%	0.00%	96.28%
CIMAREX ENERGY CO	XEC	11.34%	0.00%	88.66%
CONSTELLATION BRANDS -CL A	STZ	15.42%	0.00%	84.58%
CROWN CASTLE INTL CORP	CCI	25.07%	0.00%	74.93%
D R HORTON INC	DHI	9.64%	0.00%	90.36%
DELTA AIR LINES INC	DAL	15.96%	0.00%	84.04%
DISCOVER FINANCIAL SVCS	DFS	48.22%	1.01%	50.77%
EXPEDIA INC	EXPE	17.00%	0.00%	83.00%
FLOWSERVE CORP	FLS	21.53%	0.00%	78.47%
FMC CORP	FMC	10.51%	0.00%	89.49%
HARRIS CORP	HRS	16.76%	0.00%	83.24%
HESS CORP	HES	30.41%	0.00%	69.58%
HUNTINGTON INGALLS IND INC	HII	10.72%	0.00%	89.28%
KANSAS CITY SOUTHERN	KSU	17.02%	0.05%	82.94%
KINDER MORGAN INC	KMI	46.55%	0.00%	53.45%
KOHL'S CORP	KSS	32.66%	0.00%	67.34%
KRAFT HEINZ CO	KHC	23.01%	0.00%	76.99%
MOLSON COORS BREWING CO	TAP	37.43%	0.00%	62.57%
MOSAIC CO	MOS	29.24%	0.00%	70.76%
MOTOROLA SOLUTIONS INC	MSI	23.21%	0.00%	76.79%
NEWELL BRANDS INC	NWL	40.21%	0.00%	59.79%
SYNCHRONY FINANCIAL	SYF	39.71%	0.00%	60.29%
TAPESTRY INC	TPR	13.06%	0.00%	86.94%
TOTAL SYSTEM SERVICES INC	TSS	14.12%	0.00%	85.88%
VIACOM INC	VIAB	47.24%	0.00%	52.76%
ZIONS BANCORPORATION	ZION	3.45%	5.10%	91.45%
	Average	23.92%	0.25%	75.84%
	Median	23.01%	0.00%	76.99%

Source: S&P Compustat, January 2018.

## Cost of Debt

The expected return on debt, or the cost of debt capital ( $K_d$ ), is the rate that investors would incur when financing the purchase of the operating assets of an interstate natural gas pipeline company. It is the cost of debt that is appropriate for the cost of capital study and it is relatively simple to estimate. Unlike the cost of equity, the required return on debt is directly observable in the market. It is best approximated by the current yield to maturity (YTM) on the applicable debt. The YTM is the rate of return the existing bondholders expect to receive, and it is also a good estimate of  $K_d$  (cost of debt), the rate of return that new bondholders would require.<sup>40</sup> Often an average of recent yields is also used. The yield exemplifies the market's expectation of future returns. If the market's expectations of future debt returns were different from those implicit in the price, the market price of the debt would be bid up or down so that the market's expectations were reflected in the price.<sup>41</sup>

From information in *Standard and Poor's Compustat* and *Mergent Bond Record* databases we found the *Standard & Poor's* and *Moody's* long-term senior debt ratings to range from **BB+** to **BBB** and **Ba2** to **Baa3**, respectively, for the typical interstate natural gas pipeline. The predominant ratings were **BBB-** and **Baa3**, respectively. This information is presented in the following table:

### Summary of Pipeline Long-Term Debt Ratings - January 1, 2018

Averages	S&P Ratings		Moody's Ratings	
Natural Gas Pipeline Industry (Large)	BBB-	12	Baa3	12
Natural Gas Div. & Oil/Gas Dist. (Large)	BBB-	12	Ba2	14
Natural Gas Diversified (Large)	BB+	13	Ba2	14
Interstate Natural Gas Pipeline Forum (Pipelines)	BBB	11	Baa3	12
Screened Comparables Group	BBB-	13	Baa3	13
<b>Average</b>	<b>BBB-</b>	<b>12</b>	<b>Ba1</b>	<b>13</b>

Medians	S&P Ratings		Moody's Ratings	
Natural Gas Pipeline Industry (Large)	BBB-	12	Baa3	12
Natural Gas Div. & Oil/Gas Dist. (Large)	BBB-	11	Ba1	13
Natural Gas Diversified (Large)	BBB-	12	Ba2	14
Interstate Natural Gas Pipeline Forum (Pipelines)	BBB	11	Baa3	12
Screened Comparables Group	BBB-	12	Baa3	12
<b>Average</b>	<b>BBB-</b>	<b>12</b>	<b>Baa3</b>	<b>13</b>

<sup>40</sup> Brigham, Eugene F. & Michael C. Ehrhardt, *Financial Management: Theory and Practice*, 10<sup>th</sup> ed. (Thomson Learning, Inc.: Stamford, CT, 2002), 423.

<sup>41</sup> *Stocks, Bonds, Bills and Inflation: 2013 Yearbook, Valuation Edition* (Chicago: Morningstar, Inc., 2013), 24

The S&P and Moody's bond ratings for these groups begins below.

**Natural Gas Pipeline Industry (Large)**  
**Long-Term Debt Ratings & Corporate Bond Yields - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Mergent Rating	Numerical Rating	Bloomberg Yields
BOARDWALK PIPELINE PRTNRS-LP	BWP	BBB-	12	Baa3	12	5.00
CENTERPOINT ENERGY INC	CNP	A-	9	Baa1	10	4.11
DCP MIDSTREAM LP	DCP	BB	14	Ba2	14	6.00
ENABLE MIDSTREAM PARTNERS LP	ENBL	BBB-	12	Baa3	12	5.00
ENERGY TRANSFER EQUITY LP	ETE	BB-	15	Ba2	14	6.75
ENLINK MIDSTREAM PARTNERS LP	ENLK	BBB-	12	Ba1	13	5.00
ENTERPRISE PRODS PRTNRS -LP	EPD	BBB+	10			
EQT CORP	EQT	BBB	11	Baa3	12	4.55
KINDER MORGAN INC	KMI	BBB-	12	Baa3	12	5.00
NATIONAL FUEL GAS CO	NFG	BBB	11	Baa3	12	4.55
ONEOK INC	OKE	BBB	11	Baa3	12	4.55
SPECTRA ENERGY PARTNERS LP	SEP	BBB+	10	Baa2	11	4.30
TRANSCANADA CORP	TRP	A-	9			
WESTERN GAS PARTNERS LP	WES	BBB-	12	Ba1	13	5.00
WILLIAMS COS INC	WMB	BB+	13	Ba2	14	5.60
WILLIAMS PARTNERS LP	WPZ	BBB	11	Baa3	12	4.55
	Average	BBB-	12	Baa3	12	5.00
	Median	BBB-	12	Baa3	12	5.00

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.



**Natural Gas Diversified & Oil/Gas Dist. - Large  
Long-Term Debt Ratings & Corporate Bond Yields - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Mergent Rating	Numerical Rating	Bloomberg Yields
ANTERO RESOURCES CORP	AR	BB	14	Ba3	15	6.00
CABOT OIL & GAS CORP	COG					
CHESAPEAKE ENERGY CORP	CHK	B-	18	Caa1	19	9.82
CIMAREX ENERGY CO	XEC	BBB-	12	Baa3	12	5.00
CONCHO RESOURCES INC	CXO	BBB-	12	Ba1	13	5.00
DEVON ENERGY CORP	DVN	BBB	11	Ba1	13	4.55
ENBRIDGE INC	ENB	BBB+	10	Baa3	12	4.30
EOG RESOURCES INC	EOG	BBB+	10	Baa1	10	4.30
EQT CORP	EQT	BBB	11	Baa3	12	4.55
KINDER MORGAN INC	KMI	BBB-	12	Baa3	12	5.00
MDU RESOURCES GROUP INC	MDU	BBB+	10			
NATIONAL FUEL GAS CO	NFG	BBB	11	Baa3	12	4.55
NEWFIELD EXPLORATION CO	NFX	BB+	13	Ba2	14	5.60
ONEOK INC	OKE	BBB	11	Baa3	12	4.55
PEMBINA PIPELINE CORP	PBA	BBB	11			
QEP RESOURCES INC	QEP	BB+	13	Ba3	15	5.60
SOUTHWESTERN ENERGY CO	SWN	BB-	15	B1	16	6.75
TARGA RESOURCES CORP	TRGP	BB-	15	Ba3	15	6.75
TRANSCANADA CORP	TRP	A-	9			
WILLIAMS COS INC	WMB	BB+	13	Ba2	14	5.60
WORLD FUEL SERVICES CORP	INT					
	Average	BBB-	12	Ba2	14	5.00
	Median	BBB-	12	Ba1	13	5.00

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

**Natural Gas Diversified Industry (Large)**  
**Long-Term Debt Ratings & Corporate Bond Yields - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Mergent Rating	Numerical Rating	Bloomberg Yields
ANTERO RESOURCES CORP	AR	BB	14	Ba3	15	6.00
CABOT OIL & GAS CORP	COG					
CHESAPEAKE ENERGY CORP	CHK	B-	18	Caa1	19	9.82
CIMAREX ENERGY CO	XEC	BBB-	12	Baa3	12	5.00
CONCHO RESOURCES INC	CXO	BBB-	12	Ba1	13	5.00
DEVON ENERGY CORP	DVN	BBB	11	Ba1	13	4.55
EOG RESOURCES INC	EOG	BBB+	10	Baa1	10	4.30
EQT CORP	EQT	BBB	11	Baa3	12	4.55
MDU RESOURCES GROUP INC	MDU	BBB+	10			
NATIONAL FUEL GAS CO	NFG	BBB	11	Baa3	12	4.55
NEWFIELD EXPLORATION CO	NFX	BB+	13	Ba2	14	5.60
QEP RESOURCES INC	QEP	BB+	13	Ba3	15	5.60
SOUTHWESTERN ENERGY CO	SWN	BB-	15	B1	16	6.75
TARGA RESOURCES CORP	TRGP	BB-	15	Ba3	15	6.75
	Average	BB+	13	Ba2	14	5.60
	Median	BBB-	12	Ba2	14	5.00

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.



**Interstate Natural Gas Pipeline Forum (Pipelines)  
Long-Term Debt Ratings & Corporate Bond Yields - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Mergent Rating	Numerical Rating	Bloomberg Yields
BOARDWALK PIPELINE PRITNRS-LP	BWP	BBB-	12	Baa3	12	5.00
CENTERPOINT ENERGY INC	CNP	A-	9	Baa1	10	4.11
DOMINION ENERGY INC	D	BBB+	10	Baa2	11	4.30
ENABLE MIDSTREAM PARTS LP	ENBL	BBB-	12	Baa3	12	5.00
ENBRIDGE ENERGY MGMT LLC	EEQ					
ENBRIDGE ENERGY PRITNRS -LP	EEO	BBB	11	Baa3	12	4.55
ENBRIDGE INC	ENB	BBB+	10	Baa3	12	4.30
KINDER MORGAN INC	KMI	BBB-	12	Baa3	12	5.00
MDU RESOURCES GROUP INC	MDU	BBB+	10			
NATIONAL FUEL GAS CO	NFG	BBB	11	Baa3	12	4.55
ONEOK INC	OKE	BBB	11	Baa3	12	4.55
WILLIAMS COS INC	WMB	BB+	13	Ba2	14	5.60
WORLD FUEL SERVICES CORP	INT					
	Average	BBB	11	Baa3	12	4.55
	Median	BBB	11	Baa3	12	4.55

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

**Pipeline Screened Comparables Group  
Long-Term Debt Ratings & Corporate Bond Yields - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Mergent Rating	Numerical Rating	Bloomberg Yields
BUCKEYE PARTNERS LP	BPL	BBB-	12	Baa3	12	5.00
COMMERCIAL METALS	CMC	BB+	13	Ba2	14	5.60
ENERGY TRANSFER PARTNERS -LP	ETP	BBB-	12	Baa3	12	5.00
GATX CORP	GATX	BBB	11	Baa2	11	4.55
ONEOK INC	OKE	BBB	11	Baa3	12	4.55
QRVO INC	QRVO	BB+	13	Ba1	13	5.60
WESTERN GAS PARTNERS LP	WES	BBB-	12	Ba1	13	5.00
	Average	BBB-	12	Baa3	12	5.00
	Median	BBB-	12	Baa3	12	5.00

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

The following tables indicates the long-term debt ratings and yields to maturity for the Standard & Poor's, Mergent (Moody's ratings), and Bloomberg bond databases at January 1, 2018.

<b>Standard &amp; Poor's and Moody's Long Term Bond Yields (%)</b>					
<b>S&amp;P</b>	<b>Avg YTM</b>	<b>Med YTM</b>	<b>Moody's</b>	<b>Avg YTM</b>	<b>Med YTM</b>
<b>AAA</b>	3.44	3.45	<b>Aaa</b>	3.49	3.46
<b>AA+</b>	3.58	3.61	<b>Aa1</b>	3.65	3.61
<b>AA</b>	3.62	3.57	<b>Aa2</b>	3.66	3.62
<b>AA-</b>	3.71	3.65	<b>Aa3</b>	3.63	3.62
<b>A+</b>	3.77	3.70	<b>A1</b>	3.73	3.67
<b>A</b>	3.76	3.73	<b>A2</b>	3.79	3.75
<b>A-</b>	3.95	3.92	<b>A3</b>	4.01	3.97
<b>BBB+</b>	4.35	4.24	<b>Baa1</b>	4.30	4.18
<b>BBB</b>	4.52	4.46	<b>Baa2</b>	4.38	4.26
<b>BBB-</b>	5.41	5.34	<b>Baa3</b>	4.86	4.77
<b>BB+</b>	5.00	5.37	<b>Ba1</b>	5.11	5.12

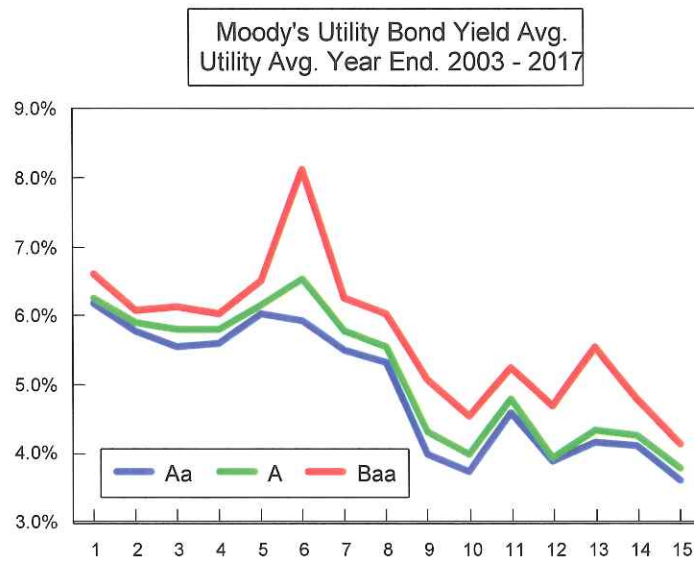
Source: Mergent Bond Record Database, Jan. 2018.

### Bloomberg 2017 Year-end Bond Yields

<b>Rating</b>	<b>December 2017</b>			<b>Average</b>
	<b>20Y</b>	<b>25Y</b>	<b>30Y</b>	
AA	3.61	3.60	3.57	3.59
AA-	3.81	3.79	3.79	3.80
A+	3.76	3.82	3.86	3.81
A	3.77	3.80	3.77	3.78
A-	4.04	4.06	4.24	4.11
BBB+	4.18	4.28	4.45	4.30
BBB	4.56	4.55	4.55	4.55
BBB-	5.01	4.97	5.01	5.00
BB+	5.81	5.40	N/A	5.60
BB	5.99	6.00	6.00	6.00
BB-	6.16	7.05	7.05	6.75
B+	7.56	8.59	8.74	8.30
B	9.85	11.55	N/A	10.70
B-	9.82	N/A	N/A	9.82

Source: Bloomberg Database - Dec. 31, 2017.

## Mergent Utility Bond Yields



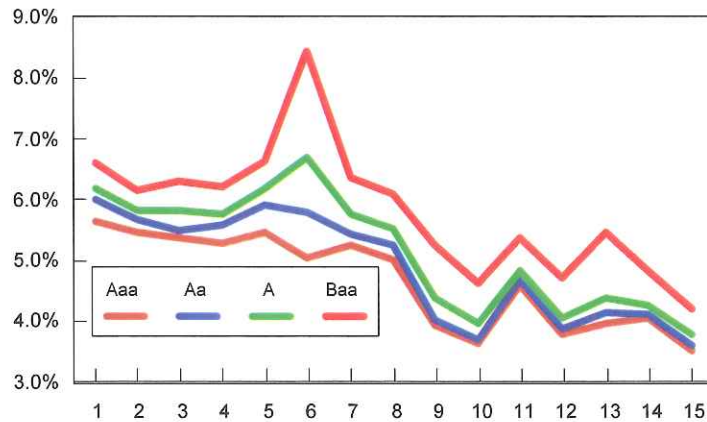
### Public Utility Bond Yields - Year End Data (2003 - 2017)

Year End Date	Aa	A	Baa
2003	6.18%	6.27%	6.61%
2004	5.78%	5.92%	6.10%
2005	5.55%	5.80%	6.14%
2006	5.62%	5.81%	6.05%
2007	6.03%	6.16%	6.51%
2008	5.93%	6.54%	8.13%
2009	5.52%	5.79%	6.26%
2010	5.32%	5.56%	6.04%
2011	4.00%	4.33%	5.07%
2012	3.75%	4.00%	4.56%
2013	4.59%	4.81%	5.25%
2014	3.90%	3.95%	4.70%
2015	4.16%	4.35%	5.55%
2016	4.11%	4.27%	4.79%
2017	3.62%	3.79%	4.14%

Source: Mergent's Bond Record, January 2004 - 2018

## Mergent Corporate Bond Yields

**Moody's Corporate Bond Yield Avg.  
Corp. Avg. Year End. 2003 - 2017**



Corp. Bond Yields - Year End Data (2003 - 2017)				
Year End Date	Aaa	Aa	A	Baa
2003	5.65%	6.02%	6.19%	6.60%
2004	5.47%	5.69%	5.82%	6.15%
2005	5.38%	5.51%	5.84%	6.33%
2006	5.29%	5.58%	5.78%	6.22%
2007	5.49%	5.91%	6.19%	6.65%
2008	5.06%	5.81%	6.70%	8.45%
2009	5.26%	5.44%	5.77%	6.37%
2010	5.02%	5.26%	5.52%	6.10%
2011	3.93%	4.03%	4.40%	5.25%
2012	3.65%	3.70%	3.98%	4.63%
2013	4.62%	4.68%	4.85%	5.38%
2014	3.79%	3.89%	4.05%	4.74%
2015	3.97%	4.16%	4.38%	5.46%
2016	4.06%	4.12%	4.28%	4.83%
2017	3.51%	3.61%	3.79%	4.22%

Source: Mergent's Bond Record, January 2004 - 2018

The average yields for all corporate bonds rated **BBB-/Baa3** by Standard & Poor's and Moody's, respectively, was **5.41%** and **4.86%**, respectively, as of January 1, 2018. The average yields for Bloomberg **BBB-** corporate bonds ranging from 20 to 30 years to maturity was **5.00%** at December 31, 2017. From the information discussed and displayed above we estimated the appropriate cost of debt capital rated **BBB-** to be **5.00%** at January 1, 2018 for the typical interstate natural gas pipeline company. This estimate recognizes that the typical interstate natural gas pipeline's typical bond rating is approximately **BBB-**, one rating above junk bond status, at the beginning of January 2018.

## **Cost of Equity**

We have estimated the cost of equity capital by employing several methods. The market cost of equity is generally considered to be the most difficult part of computing the cost of capital because it relies on interpretation of projections by market analysts as well as the projections of the equity models used by the appraiser. The market cost of equity capital is equal to the rate of return *expected* by investors at their perceived level of risk for a company's equity. There are several methods used to estimate the cost of equity capital. The most common methods are the Gordon growth model sometimes referred to as the discounted cash flow method (or DCF method), the risk premium method (RP), and the capital asset pricing model (CAPM).

All estimates of the cost of equity rates fall into one of two classes. They are either (1) add-ons to an interest rate, or (2) ratios of return to investment. Add-on estimates of the cost of equity capital include RP and the CAPM. The DCF method is a ratio of return to investment.

As discussed beginning on page 18, we analyzed data from several guideline groups of companies which considered as a whole should provide a reasonable estimate of the cost of equity capital for the typical interstate natural gas pipeline company.

After computing the cost of equity by the DCF, RP, and CAPM methods, the data was analyzed and reconciled to obtain the cost of equity capital before flotation costs of **12.50%**. On the following page is a summary of the cost of equity calculations by each of the methods employed. The summary page is followed by an explanation of each method and the indicators found therein.



## Summary of Cost of Equity Calculations

### DCF Indicators - January 1, 2018

Company Groups	Value Line Data		S&P (IBES) Data	
	Average	Median	Average	Median
Natural Gas Pipeline Industry (Large)	22.02	20.65	19.09	14.30
Natural Gas Div. & Oil/Gas Dist. (Large)	24.25	22.20	34.05	20.83
Natural Gas Diversified Industry (Large)	24.64	25.93	52.41	42.19
Interstate Natural Gas Pipeline Forum (Pipelines)	22.68	21.53	18.57	12.15
S&P Screened Comparables Group	20.00	20.50	31.79	20.95
S&P 500 Companies with "BBB-" Rated Debt	13.33	12.03	18.68	13.77
<b>Averages</b>	<b>21.15</b>	<b>20.47</b>	<b>29.10</b>	<b>20.70</b>

The discounted cash flow method for above industry groups were calculated as follows:

Using *Value Line* data and *Value Line* earnings growth estimates and S&P's *Compustat* data with *Institutional Brokers Estimate System* (IBES) earnings growth.

### Risk Premium Indicators - January 1, 2018

#### General Risk Premium Indicators

Indicators	Rates		Indicator
	Rf	Rp	
30-Year Treasury Bonds (ex post)	2.64	7.10	9.74
30-Year Treasury Bonds (ex ante)	2.64	9.91	12.55

#### Risk Premium Indicators by Groups

Indicators	Median S&P Rating		Bloomberg	Risk Prem.
	Rating	Number	Yields	Indicator
Natural Gas Pipeline Industry (Large)	BBB-	12	5.00	10.85
Natural Gas Div. & Oil/Gas Dist. (Large)	BBB-	12	5.00	10.85
Natural Gas Diversified Industry (Large)	BBB-	12	5.00	10.85
Interstate Natural Gas Pipeline Forum (Pipes)	BBB	11	4.55	10.40
S&P Screened Comparables Group	BBB-	12	5.00	10.85
<b>Average</b>	<b>BBB</b>	<b>12</b>	<b>4.91</b>	<b>10.76</b>

\* Base Rate: Average YTM Bloomberg.

Risk Premium: Simulated *SBI* Methodology (see p. 102).

### Capital Asset Pricing Model (CAPM) - January 1, 2018

Item	Rates			CAPM Indicator
	Rf	Rp	Beta	
<b>CAPM Indicator *</b>				
Long-Term Gov't Bonds (ex post)	2.64	7.10	1.25	11.52
Long-Term Gov't Bonds (ex ante)	2.64	9.91	1.25	15.03

CAPM Formula:  $Ke = Rf + B(Rp)$

\* CAPM Indicator is based upon a *Value Line* beta of 1.25 & Federal Reserve data 1/2/18.



## DCF Method

The discounted cash flow method of estimating the cost of equity is based on the formula shown in Figure 2. Our computations using the DCF method are based upon information from the *Standard and Poor's Compustat* database, *Institutional Brokers Estimate System* (IBES), and the *Value Line Investment Survey* database containing approximately 5,981 companies. We began our analysis by screening the *Standard and Poor's* database of approximately 9,095 companies for companies with risk equal to the risk of the typical interstate natural gas pipeline. As a measure of financial risk the average *Standard and Poor's* rating on the

long-term debt of companies comprising the large natural gas pipeline industry was **BBB-**. (Several of these companies have double-B rated debt.) Our first screening process was to find all companies having a *S&P* senior debt rating of BBB to BB+ (the mid-rated triple-B debt to the highest level double-B debt). This screening will give us a list of companies that have long-term debt which is believed to be equal in risk to the typical interstate natural gas pipeline. This measure is indicative of financial risk for the companies.

Next we screened the surviving group of companies by the return on net plant investment (before taxes). This is a measure of business risk and measures the ability of a company to compete in the market and maintain its rate of return before income taxes. From this calculation we screened out all companies varying more than seventy-five percent from the median return of the interstate natural gas pipelines industry.

Next we screened the surviving group of companies by their *S&P* adjusted betas. Beta is a measurement of the sensitivity of a company's stock price to the overall fluctuation in the *Standard & Poor's 500 (S&P 500)* Index Price. For example, a beta of 1.5 indicates that a company's stock price tends to rise (or fall) 1.5%, with a 1% rise (or fall) in the index price. The median *S&P* adjusted beta of the interstate natural gas pipeline shown on the following page was approximately 1.05 presently, while the average of the *Value Line* median betas of all the pipeline groups was 1.31, as shown on page 62. Thus we excluded all companies with *S&P* adjusted betas less than 1.00 and greater than 1.20. In our judgment, this range is a reasonable range of betas to use for comparison purposes in determining comparables of approximate risk to the natural gas pipelines. A table of risk screening data follows.

$$K_e = \frac{D_1}{P_0} + g$$

where

$K_e$  = Cost of equity

$D_1$  = Expected Dividend in year 1

$P_0$  = Current price of stock

$g$  = Growth in dividends

Figure 2

**Pipeline Risk Screening Data - January 1, 2018**  
**Natural Gas Pipeline Industry (Large)**

<b>Company Name</b>	<b>Ticker</b>	<b>S&amp;P Debt Rating Letter</b>	<b>S&amp;P Debt Rating Number</b>	<b>S&amp;P Adj. Beta</b>	<b>Return on Net Invest.</b>
BOARDWALK PIPELINE	BWP	BBB-	12	0.85	5.81
CENTERPOINT ENERGY INC	CNP	A-	9	0.76	7.79
DCP MIDSTREAM LP	DCP	BB	14	1.75	5.44
ENABLE MIDSTREAM	ENBL	BBB-	12	1.55	3.80
ENERGY TRANSFER EQUITY	ETE	BB-	15	1.60	5.39
ENLINK MIDSTREAM	ENLK	BBB-	12	1.72	3.51
ENTERPRISE PRODS	EPD	BBB+	10	0.94	9.69
EQT CORP	EQT	BBB	11	0.87	(2.18)
KINDER MORGAN INC	KMI	BBB-	12	0.75	10.23
NATIONAL FUEL GAS CO	NFG	BBB	11	0.99	11.83
ONEOK INC	OKE	BBB	11	1.15	10.15
SPECTRA ENERGY	SEP	BBB+	10	0.78	8.13
TRANSCANADA CORP	TRP	A-	9	0.82	8.44
WESTERN GAS PARTNERS	WES	BBB-	12	1.10	12.43
WILLIAMS COS INC	WMB	BB+	13	1.26	6.28
WILLIAMS PARTNERS LP	WPZ	BBB	11	1.17	6.73
<b>Median</b>		<b>BBB-</b>	<b>12</b>	<b>1.05</b>	<b>7.26</b>

Source: S&P Compustat, January 2018.

Surviving the screening process are seven (7) companies, which in general should be approximately of equal or slightly less risk when compared to the interstate natural gas pipeline industry. These companies are shown in the following table.

Buckeye Partners LP	ONEOK Inc.
Commercial Metals	Qorvo Inc.
Energy Transfer Partners	Western Gas Partners
GATX Corp.	

In addition to performing a DCF analysis for the companies listed above of approximately equal or slightly less risk to the interstate natural gas pipelines, we performed additional DCF analyses on five (5) other groups of companies as described on page 20.

We used financial data from two independent sources, *Standard and Poor's Compustat* database of approximately 9,095 companies, and the *Value Line Investment Survey* full database of approximately 5,981 companies. The two independent sources of data gave us two sets of growth estimates for the six groups of companies. The growth estimates considered were provided by *Value Line* and the *Institutional Brokers Estimate System (IBES)* through the

*Standard and Poor's Compustat* database. From these analysts' projections we calculated DCF indicators on all groupings and calculated a simple average and median indicator. We gave the most weight to the median indicator in each grouping. The median indicator is not affected by extreme values and outliers and thus is a very good indicator of central tendency of a representative sample of companies. We placed the most confidence in the estimates provided by the IBES projections, because these estimates were provided by a large group of financial analysts who monitor these companies.<sup>42</sup> It is our opinion, based on this documented data, that the appropriate cost of equity for the interstate natural gas pipeline industry by the DCF method is **14.50%** as of January 1, 2018. The result of all of the DCF analysis and research can be found below and on the following pages.

### DCF Indicators - January 1, 2018

Company Groups	Value Line Data		S&P (IBES) Data	
	Average	Median	Average	Median
Natural Gas Pipeline Industry (Large)	22.02	20.65	19.09	14.30
Natural Gas Div. & Nat. Gas Utility (Large)	24.25	22.20	34.05	20.83
Natural Gas Diversified Industry (Large)	24.64	25.93	52.41	42.19
Interstate Natural Gas Pipeline Forum (Pipelines)	22.68	21.53	18.57	12.15
S&P Screened Comparables Group	20.00	20.50	31.79	20.95
S&P 500 Companies with "BBB-" Rated Debt	13.33	12.03	18.68	13.77
<b>Averages</b>	21.15	20.47	29.10	20.70

The discounted cash flow method for above industry groups were calculated using Value Line data and Value Line earnings growth estimates and S&P's Compustat data with Institutional Brokers Estimate System (IBES) earnings growth.

---

<sup>42</sup> The Institutional Brokers Estimate System (IBES) is a database provided through *Standard & Poor's Compustat* of earnings expectations obtained from more than 3,500 security analysts from over 300 contributing firms.



**Natural Gas Pipeline Industry (Large)  
DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Boardwalk Pipeline	BWP	3.02	12.50	15.52
CenterPoint Energy	CNP	3.96	6.00	9.96
DCP Midstream LP	DCP	7.95	5.50	13.45
Enable Midstream Part.	ENBL	8.53	13.00	21.53
Energy Transfer Equity	ETE	6.72	12.50	19.22
EnLink Midstream Part.	ENLK	9.16		
Enterprise Products	EPD	6.22	12.50	18.72
EQT Corp.	EQT	0.20	22.00	22.20
Kinder Morgan Inc.	KMI	2.63	24.00	26.63
National Fuel Gas	NFG	2.93		
ONEOK Inc.	OKE	5.30	18.50	23.80
Spectra Energy Part.	SEP	6.87	5.50	12.37
TransCanada Corp.	TRP	5.04	55.00	60.04
Western Gas Part.	WES	7.15	13.50	20.65
Williams Cos.	WMB	3.68	18.50	22.18
Williams Partners L.P.	WPZ	5.81		
	Average	5.32	16.85	22.02
	Median	5.56	13.00	20.65

Source: Value Line, January 2018.

**Natural Gas Pipeline Industry (Large)  
Capital Structure (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
BOARDWALK PIPELINE PRTNRS-LP	BWP	3.33	7.40	10.73
CENTERPOINT ENERGY INC	CNP	4.09	8.27	12.36
DCP MIDSTREAM LP	DCP	8.26	(3.77)	
ENABLE MIDSTREAM PARTNERS LP	ENBL	9.63	7.65	17.28
ENERGY TRANSFER EQUITY LP	ETE			
ENLINK MIDSTREAM PARTNERS LP	ENLK			
ENTERPRISE PRODS PRTNRS -LP	EPD	6.73	5.60	12.33
EQT CORP	EQT	0.24	15.00	15.24
KINDER MORGAN INC	KMI	4.20	51.67	55.87
NATIONAL FUEL GAS CO	NFG			
ONEOK INC	OKE	6.38	14.45	20.83
SPECTRA ENERGY PARTNERS LP	SEP	7.76	5.60	13.36
TRANSCANADA CORP	TRP	4.39	7.45	11.84
WESTERN GAS PARTNERS LP	WES	8.48	12.59	21.07
WILLIAMS COS INC	WMB			
WILLIAMS PARTNERS LP	WPZ			
	Average	5.77	11.99	19.09
	Median	6.38	7.65	14.30

Source: S&P Compustat, January 2018.

**Natural Gas Diversified & Oil/Gas Dist. - Large  
DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Antero Resources	AR		16.00	
Cabot Oil & Gas 'A'	COG	0.83		
Chesapeake Energy	CHK			
Cimarex Energy	XEC	0.24	31.00	31.24
Concho Resources	CXO		24.50	
Devon Energy	DVN	0.55	14.50	15.05
Enbridge Inc.	ENB.TO	5.25	3.50	8.75
EOG Resources	EOG	0.65	29.00	29.65
EQT Corp.	EQT	0.20	22.00	22.20
Kinder Morgan Inc.	KMI	2.63	24.00	26.63
MDU Resources	MDU	2.97	11.50	14.47
National Fuel Gas	NFG	2.93		
Newfield Exploration	NFX		18.00	
ONEOK Inc.	OKE	5.30	18.50	23.80
Pembina Pipeline	PPL.TO	4.69	15.00	19.69
QEP Resources	QEP			
Southwestern Energy	SWN		8.00	
Targa Resources	TRGP	7.22	28.00	35.22
TransCanada Corp.	TRP	5.04	55.00	60.04
Williams Cos.	WMB	3.68	18.50	22.18
World Fuel Services	INT	0.83	5.50	6.33
	Average	2.87	20.15	24.25
	Median	2.93	18.50	22.20

Source: Value Line, January 2018.

**Natural Gas Diversified & Oil/Gas Dist. - Large  
DCF Indicator (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
ANTERO RESOURCES CORP	AR		21.84	
CABOT OIL & GAS CORP	COG	0.99	41.20	42.19
CHESAPEAKE ENERGY CORP	CHK			
CIMAREX ENERGY CO	XEC	0.52	99.28	99.80
CONCHO RESOURCES INC	CXO		80.03	
DEVON ENERGY CORP	DVN			
ENBRIDGE INC	ENB	5.23	6.71	11.94
EOG RESOURCES INC	EOG			
EQT CORP	EQT	0.24	15.00	15.24
KINDER MORGAN INC	KMI	4.20	51.67	55.87
MDU RESOURCES GROUP INC	MDU			
NATIONAL FUEL GAS CO	NFG			
NEWFIELD EXPLORATION CO	NFX		31.60	
ONEOK INC	OKE	6.38	14.45	20.83
PEMBINA PIPELINE CORP	PBA	6.26	31.83	38.09
QEP RESOURCES INC	QEP			
SOUTHWESTERN ENERGY CO	SWN			
TARGA RESOURCES CORP	TRGP			
TRANSCANADA CORP	TRP	4.39	7.45	11.84
WILLIAMS COS INC	WMB			
WORLD FUEL SERVICES CORP	INT	0.94	9.73	10.66
	Average	3.24	34.23	34.05
	Median	4.20	26.72	20.83

Source: S&P Compustat, January 2018.



**Natural Gas Diversified Industry (Large)  
DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Antero Resources	AR		16.00	
Cabot Oil & Gas 'A'	COG	0.83		
Chesapeake Energy	CHK			
Cimarex Energy	XEC	0.24	31.00	31.24
Concho Resources	CXO		24.50	
Devon Energy	DVN	0.55	14.50	15.05
EOG Resources	EOG	0.65	29.00	29.65
EQT Corp.	EQT	0.20	22.00	22.20
MDU Resources	MDU	2.97	11.50	14.47
National Fuel Gas	NFG	2.93		
Newfield Exploration	NFX		18.00	
QEP Resources	QEP			
Southwestern Energy	SWN		8.00	
Targa Resources	TRGP	7.22	28.00	35.22
	Average	1.95	20.25	24.64
	Median	0.74	20.00	25.93

Source: Value Line, January 2018.

**Natural Gas Diversified Industry (Large)  
DCF Indicator (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
ANTERO RESOURCES CORP	AR		21.84	
CABOT OIL & GAS CORP	COG	0.99	41.20	42.19
CHESAPEAKE ENERGY CORP	CHK			
CIMAREX ENERGY CO	XEC	0.52	99.28	99.80
CONCHO RESOURCES INC	CXO		80.03	
DEVON ENERGY CORP	DVN			
EOG RESOURCES INC	EOG			
EQT CORP	EQT	0.24	15.00	15.24
MDU RESOURCES GROUP INC	MDU			
NATIONAL FUEL GAS CO	NFG			
NEWFIELD EXPLORATION CO	NFX		31.60	
QEP RESOURCES INC	QEP			
SOUTHWESTERN ENERGY CO	SWN			
TARGA RESOURCES CORP	TRGP			
	Average	0.58	48.16	52.41
	Median	0.52	36.40	42.19

Source: S&P Compustat, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)  
DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Boardwalk Pipeline	BWP	3.02	12.50	15.52
CenterPoint Energy	CNP	3.96	6.00	9.96
Dominion Energy	D	4.32	6.50	10.82
Enable Midstream Part.	ENBL	8.53	13.00	21.53
Enbridge Energy Mgmt LLC	EEQ			
Enbridge Energy Part.	EEP	9.27	26.50	35.77
Enbridge Inc.	ENB.TO	5.25	3.50	8.75
Kinder Morgan Inc.	KMI	2.63	24.00	26.63
MDU Resources	MDU	2.97	11.50	14.47
National Fuel Gas	NFG	2.93		
ONEOK Inc.	OKE	5.30	18.50	23.80
TransCanada Corp.	TRP	5.04	55.00	60.04
Williams Cos.	WMB	3.68	18.50	22.18
	Average	4.74	17.77	22.68
	Median	4.14	13.00	21.53

Source: Value Line, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)  
DCF Indicator (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
BOARDWALK PIPELINE PRTNRS-LP	BWP	3.33	7.40	10.73
CENTERPOINT ENERGY INC	CNP	4.09	8.27	12.36
DOMINION ENERGY INC	D	3.94	3.80	7.74
ENABLE MIDSTREAM PARTNERS LP	ENBL	9.63	7.65	17.28
ENBRIDGE ENERGY MGMT LLC	EEQ			
ENBRIDGE ENERGY PRTNRS -LP	EEP			
ENBRIDGE INC	ENB	5.23	6.71	11.94
KINDER MORGAN INC	KMI	4.20	51.67	55.87
MDU RESOURCES GROUP INC	MDU			
NATIONAL FUEL GAS CO	NFG			
ONEOK INC	OKE	6.38	14.45	20.83
TRANSCANADA CORP	TRP	4.39	7.45	11.84
WILLIAMS COS INC	WMB			
	Average	5.15	13.43	18.57
	Median	4.30	7.55	12.15

Source: S&P Compustat, January 2018.

**Pipeline Screened Comparables Group**  
**DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Buckeye Partners L.P.	BPL	9.57	6.50	16.07
Commercial Metals	CMC	1.96	17.00	18.96
Energy Transfer Part.	ETP	12.00	8.50	20.50
GATX Corp.	GATX	2.64		
ONEOK Inc.	OKE	5.30	18.50	23.80
Qorvo Inc.	QRVO		26.50	
Western Gas Part.	WES	7.15	13.50	20.65
	Average	6.44	15.08	20.00
	Median	6.23	15.25	20.50

Source: Value Line, January 2018.

**Pipeline Screened Comparables Group**  
**DCF Indicator (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
BUCKEYE PARTNERS LP	BPL	10.25	0.60	10.85
COMMERCIAL METALS	CMC	3.03	34.61	37.64
ENERGY TRANSFER PARTNERS -LP	ETP	20.41	61.80	82.21
GATX CORP	GATX	3.11	15.00	18.11
ONEOK INC	OKE	6.38	14.45	20.83
QORVO INC	QRVO		14.10	
WESTERN GAS PARTNERS LP	WES	8.48	12.59	21.07
	Average	8.61	21.88	31.79
	Median	7.43	14.45	20.95

Source: S&P Compustat, January 2018.

**S&P 500 Companies with "BBB-" Rated Debt  
DCF Indicator (VL Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
Advance Auto Parts	AAP	0.21	9.50	9.71
Amer. Tower 'A'	AMT	2.09	10.50	12.59
Andeavor	ANDV	2.03	6.50	8.53
Apartment Investment	AIV	3.36		
Arconic Inc.	ARNC	0.81		
Best Buy Co.	BBY	2.20	9.00	11.20
Cimarex Energy	XEC	0.24	31.00	31.24
Constellation Brands	STZ	0.96	13.50	14.46
Crown Castle Int'l	CCI	4.01	8.50	12.51
Delta Air Lines	DAL	2.19	10.50	12.69
Discover Fin'l Svcs.	DFS	1.78	5.00	6.78
Expedia Inc.	EXPE	0.95	19.00	19.95
Flowserve Corp.	FLS	1.75		
FMC Corp.	FMC	0.75	13.50	14.25
Harris Corp.	HRS	1.60	10.50	12.10
Hess Corp.	HES	1.97		
Horton D.R.	DHI	0.96	11.00	11.96
Huntington Ingalls	HII	1.23	7.00	8.23
Kansas City South'n	KSU	1.34	9.50	10.84
Kinder Morgan Inc.	KMI	2.63	24.00	26.63
Kohl's Corp.	KSS	4.29	7.00	11.29
Kraft Heinz Co.	KHC	3.24		
Molson Coors Brewing	TAP	2.13	14.00	16.13
Mosaic Company	MOS	0.37	3.00	3.37
Motorola Solutions	MSI	2.29	10.50	12.79
Newell Brands	NWL	2.87	24.50	27.37
Synchrony Financial	SYF	1.52	8.00	9.52
Tapestry Inc.	TPR	2.98	8.00	10.98
Total System Svcs.	TSS	0.65	11.00	11.65
Viacom Inc. 'B'	VIAB	2.70	2.00	4.70
Zions Bancorp.	ZION	1.65	13.50	15.15
	Average	1.86	11.54	13.33
	Median	1.78	10.50	12.03

Source: Value Line, January 2018.



**S&P 500 Companies with "BBB-" Rated Debt**  
**DCF Indicator (S&P Data) - January 1, 2018**

Company Name	Ticker	% Cur Yld	EPS Gth	DCF
ADVANCE AUTO PARTS INC	AAP	0.27	10.20	10.47
AMERICAN TOWER CORP	AMT	2.51	27.74	30.24
ANDEAVOR	ANDV	2.58	25.05	27.63
APARTMENT INVST & MGMT CO	AIV	3.53	7.10	10.63
ARCONIC INC	ARNC	1.07	21.46	22.53
BEST BUY CO INC	BBY	2.35	18.10	20.45
CIMAREX ENERGY CO	XEC	0.52	99.28	99.80
CONSTELLATION BRANDS -CL A	STZ	1.06	16.57	17.63
CROWN CASTLE INTL CORP	CCI	4.35	15.01	19.36
D R HORTON INC	DHI	1.12	14.05	15.16
DELTA AIR LINES INC	DAL	2.42	10.90	13.32
DISCOVER FINANCIAL SVCS	DFS	1.97	8.00	9.97
EXPEDIA INC	EXPE	1.18	17.50	18.68
FLOWSERVE CORP	FLS	1.93	7.00	8.93
FMC CORP	FMC	0.81	16.60	17.41
HARRIS CORP	HRS	2.07	28.32	30.39
HESS CORP	HES	2.21	5.00	7.21
HUNTINGTON INGALLS IND INC	HII	1.24	1.86	3.10
KANSAS CITY SOUTHERN	KSU	1.55	13.15	14.70
KINDER MORGAN INC	KMI	4.20	51.67	55.87
KOHL'S CORP	KSS	4.30	6.05	10.35
KRAFT HEINZ CO	KHC	3.47	8.00	11.47
MOLSON COORS BREWING CO	TAP	2.15	7.70	9.85
MOSAIC CO	MOS	0.42	6.84	7.25
MOTOROLA SOLUTIONS INC	MSI	2.45	6.41	8.85
NEWELL BRANDS INC	NWL	3.14	5.55	8.69
SYNCHRONY FINANCIAL	SYF	1.80	15.56	17.36
TAPESTRY INC	TPR	3.37	10.40	13.77
TOTAL SYSTEM SERVICES INC	TSS	0.74	12.91	13.65
VIACOM INC	VIAB	2.75	6.10	8.85
ZIONS BANCORPORATION	ZION	1.44	14.16	15.60
	Average	2.10	16.59	18.68
	Median	2.07	12.91	13.77

Source: S&P Compustat, January 2018.

## Risk Premium Method

The risk premium method is a standard method of estimating the cost of equity ( $K_e$ ) based on the formula in Figure 3. This method sums two elements of risk — a risk free rate, which is the price of time (the reward for deferring consumption and for not exposing funds to risk), and a risk premium, which is the additional reward for assuming risk. The nominal risk free rate includes the real risk free rate and an inflation premium. The risk premium includes an interest rate risk, business risk, financial risk, and liquidity risk. All of these elements are included when calculating equity cost by the risk premium method.

Our risk premium calculations included computations for two categories of risk premium indicators — general indicators and indicators for specific groups. These groups are the Natural Gas Pipeline Industry (large companies – with over \$1 billion in annual sales); the *Value Line* Natural Gas Diversified Industry combined with the *Value Line Natural Gas Utilities* (large companies – with over \$1 billion in annual sales); the large *Natural Gas Diversified Industry*; the Interstate Natural Gas Pipeline Forum Group (with subsidiaries) that are heavily involved with pipelines, and the S&P Screened Comparables Group as described on page 39. Our ex post risk premiums were derived from a simulated *SBBI* methodology as shown on pages 102 and 103. This risk premium was cross-checked for reasonableness by information from *Value Line*.<sup>43</sup> Our *ex ante* risk premium indicator was derived from the expected cost of equity for the companies

$$K_e = R_f + R_p$$

where

$K_e$  = Cost of equity

$R_f$  = Risk free rate

$R_p$  = Risk premium

Figure 3

---

<sup>43</sup> In an effort to check the long-term risk premium of 7.10%, we performed our own calculations to confirm the reasonableness of this figure. The risk premium figure is supported by our own calculations of risk premium by using the CAPM formula in Figure A. From *Value Line* we know the expected median return on their S&P 500 database is 10.86% and that the 5-year beta is 1.05 for this database (see statistics for database, *Value Line*, January 2018). Further, we know the long-term treasury bond rate was 2.64% at January 1, 2018. Therefore, we can substitute all the known elements into the CAPM formula and solve for RP as shown in Figure B. The result of this calculation is a risk premium indicator of 7.83%, which well supports the long-term government bond risk premium of 7.10%.

$$K_e = R_f + \beta(R_p)$$

Figure A

Solve for  $R_p$

$$R_p = \frac{K_e - R_f}{\beta}$$
$$R_p = \frac{0.1086 - 0.0264}{1.05}$$
$$R_p = 0.0783$$

Figure B



making up the *S&P 500* (which are expected to pay dividends). We developed the weighted average cost of capital (weighted by market value) for the *S&P 500*, which was 12.55%. (*The ex ante risk premium of 9.91%, while high by historical standards, is partially the result of very low yields – among the lowest in over 50 years – on long term Treasury bonds.*) The market-weighted average is appropriate because the monthly fundamental beta is estimated based upon the sensitivity of a company's stock price to the overall fluctuation in the *S&P 500* index price (with the *S&P 500* being the surrogate for the market in general). The market-weighted average gives most weight to the highest market value stocks and is a very good indicator of the central tendency of the overall market cost of capital. Our relevant current 'safe rates' for the general indicators were derived from the Federal Reserve at January 2, 2018. The 'safe rates' (or base rates) used for each company within the company groupings were the Bloomberg long-term yields for the bond rating for each company in *Standard & Poor's Compustat* database (January, 2018). The average yield to maturity for each company's bond rating was added to the corporate bond risk premium of 5.85% (as calculated on page 103) to obtain an individual estimate for each company in the group. Thus, the risk premium indicators for the individual groups are specific for each company within the group and, thus, as individualized as possible for each company.

The general Risk Premium (or equity build-up method) indicators, using the calculated risk premium, indicates a cost of equity capital of 9.74% (ex post) and 12.55% (ex ante). The range for all calculations of risk premium indicators using the indicators by specific company groups are between 10.40% and 10.85%. A reasonable view of these results would indicate a correlated risk premium indicator for the specific company groups to be approximately 10.75%.

The long-term bond risk premium indicators are well supported by the estimates derived from the specific indicators from the yields to maturity of all of the groups of interstate natural gas pipeline industry long-term bonds. We believe the appropriate cost of equity for the typical interstate natural gas pipeline by the risk premium method as of January 1, 2018, was **10.75%**. This conclusion gives weight and consideration to all indicators. A summary of the cost of equity indicators by the risk premium method (or equity build-up method) follows and the supporting data follows afterward.

## Summary of Risk Premium Indicators - January 1, 2018

### General Risk Premium Indicators

Indicators	Rates		Indicator
	Rf	Rp	
30-year Treasury Bonds (ex post)	2.64	7.10	9.74
30-year Treasury Bonds (ex ante)	2.64	9.91	12.55

### Risk Premium Indicators by Groups

Indicators	Median S&P Rating		Bloomberg Yields	Risk Prem Indicator
	Rating	Number		
Natural Gas Pipeline Industry (Large)	BBB-	12	5.00	10.85
Natural Gas Diversified & Natural Gas Utility (Large)	BBB-	12	5.00	10.85
Natural Gas Diversified Industry (Large)	BBB-	12	5.00	10.85
Interstate Natural Gas Pipeline Forum (Pipelines)	BBB	11	4.55	10.40
Pipeline Screened Comparables Group	BBB-	12	5.00	10.85
<b>Average</b>	BBB-	12	4.91	10.76

\* Base Rate: Average YTM Bloomberg database, Dec. 31, 2017.

Risk Premium Simulated *SBI* Methodology (see p.102 ).

**Natural Gas Pipeline Industry (Large)**  
**Risk Premium Indicator - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Bloomberg Yields	Risk Prem Indicator
BOARDWALK PIPELINE PRTNRS-LP	BWP	BBB-	12	5.00	10.85
CENTERPOINT ENERGY INC	CNP	A-	9	4.11	9.96
DCP MIDSTREAM LP	DCP	BB	14	6.00	11.85
ENABLE MIDSTREAM PARTNERS LP	ENBL	BBB-	12	5.00	10.85
ENERGY TRANSFER EQUITY LP	ETE	BB-	15	6.75	12.60
ENLINK MIDSTREAM PARTNERS LP	ENLK	BBB-	12	5.00	10.85
ENTERPRISE PRODS PRTNRS -LP	EPD	BBB+	10	4.30	10.15
EQT CORP	EQT	BBB	11	4.55	10.40
KINDER MORGAN INC	KMI	BBB-	12	5.00	10.85
NATIONAL FUEL GAS CO	NFG	BBB	11	4.55	10.40
ONEOK INC	OKE	BBB	11	4.55	10.40
SPECTRA ENERGY PARTNERS LP	SEP	BBB+	10	4.30	10.15
TRANSCANADA CORP	TRP	A-	9	4.11	9.96
WESTERN GAS PARTNERS LP	WES	BBB-	12	5.00	10.85
WILLIAMS COS INC	WMB	BB+	13	5.60	11.45
WILLIAMS PARTNERS LP	WPZ	BBB	11	4.55	10.40
	Average	BBB-	12	5.00	10.85
	Median	BBB-	12	5.00	10.85

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

**Natural Gas Diversified & Oil/Gas Dist. - Large**  
**Risk Premium Indicator - January 1, 2018**

Company Name	Ticker	S&P Rating	Numerical Rating	Bloomberg Yields	Risk Prem Indicator
ANTERO RESOURCES CORP	AR	BB	14	6.00	11.85
CABOT OIL & GAS CORP	COG				
CHESAPEAKE ENERGY CORP	CHK	B-	18	9.82	15.67
CIMAREX ENERGY CO	XEC	BBB-	12	5.00	10.85
CONCHO RESOURCES INC	CXO	BBB-	12	5.00	10.85
DEVON ENERGY CORP	DVN	BBB	11	4.55	10.40
ENBRIDGE INC	ENB	BBB+	10	4.30	10.15
EOG RESOURCES INC	EOG	BBB+	10	4.30	10.15
EQT CORP	EQT	BBB	11	4.55	10.40
KINDER MORGAN INC	KMI	BBB-	12	5.00	10.85
MDU RESOURCES GROUP INC	MDU	BBB+	10	4.30	10.15
NATIONAL FUEL GAS CO	NFG	BBB	11	4.55	10.40
NEWFIELD EXPLORATION CO	NFX	BB+	13	5.60	11.45
ONEOK INC	OKE	BBB	11	4.55	10.40
PEMBINA PIPELINE CORP	PBA	BBB	11	4.55	10.40
QEP RESOURCES INC	QEP	BB+	13	5.60	11.45
SOUTHWESTERN ENERGY CO	SWN	BB-	15	6.75	12.60
TARGA RESOURCES CORP	TRGP	BB-	15	6.75	12.60
TRANSCANADA CORP	TRP	A-	9	4.11	9.96
WILLIAMS COS INC	WMB	BB+	13	5.60	11.45
WORLD FUEL SERVICES CORP	INT				
	Average	BBB-	12	5.00	10.85
	Median	BBB-	12	5.00	10.85

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

## Natural Gas Diversified Industry (Large)

Risk Premium Indicator - January 1, 2018

Company Name	Ticker	S&P Rating	Numerical Rating	Bloomberg Yields	Risk Prem Indicator
ANTERO RESOURCES CORP	AR	BB	14	6.00	11.85
CABOT OIL & GAS CORP	COG				5.85
CHESAPEAKE ENERGY CORP	CHK	B-	18	9.82	15.67
CIMAREX ENERGY CO	XEC	BBB-	12	5.00	10.85
CONCHO RESOURCES INC	CXO	BBB-	12	5.00	10.85
DEVON ENERGY CORP	DVN	BBB	11	4.55	10.40
EOG RESOURCES INC	EOG	BBB+	10	4.30	10.15
EQT CORP	EQT	BBB	11	4.55	10.40
MDU RESOURCES GROUP INC	MDU	BBB+	10	4.30	10.15
NATIONAL FUEL GAS CO	NFG	BBB	11	4.55	10.40
NEWFIELD EXPLORATION CO	NFX	BB+	13	5.60	11.45
QEP RESOURCES INC	QEP	BB+	13	5.60	11.45
SOUTHWESTERN ENERGY CO	SWN	BB-	15	6.75	12.60
TARGA RESOURCES CORP	TRGP	BB-	15	6.75	12.60
	Average	BB+	13	5.60	11.45
	Median	BBB-	12	5.00	10.85

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)**  
**Risk Premium Indicator - January 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>S&amp;P Rating</b>	<b>Numerical Rating</b>	<b>Bloomberg Yields</b>	<b>Risk Prem Indicator</b>
BOARDWALK PIPELINE PRTNRS-LP	BWP	BBB-	12	5.00	10.85
CENTERPOINT ENERGY INC	CNP	A-	9	4.11	9.96
DOMINION ENERGY INC	D	BBB+	10	4.30	10.15
ENABLE MIDSTREAM PARTNERS LP	ENBL	BBB-	12	5.00	10.85
ENBRIDGE ENERGY MGMT LLC	EEQ				
ENBRIDGE ENERGY PRTNRS -LP	EEO	BBB	11	4.55	10.40
ENBRIDGE INC	ENB	BBB+	10	4.30	10.15
KINDER MORGAN INC	KMI	BBB-	12	5.00	10.85
MDU RESOURCES GROUP INC	MDU	BBB+	10	4.30	10.15
NATIONAL FUEL GAS CO	NFG	BBB	11	4.55	10.40
ONEOK INC	OKE	BBB	11	4.55	10.40
TRANSCANADA CORP	TRP	A-	9	4.11	9.96
WILLIAMS COS INC	WMB	BB+	13	5.60	11.45
	Average	BBB	11	4.55	10.40
	Median	BBB	11	4.55	10.40

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

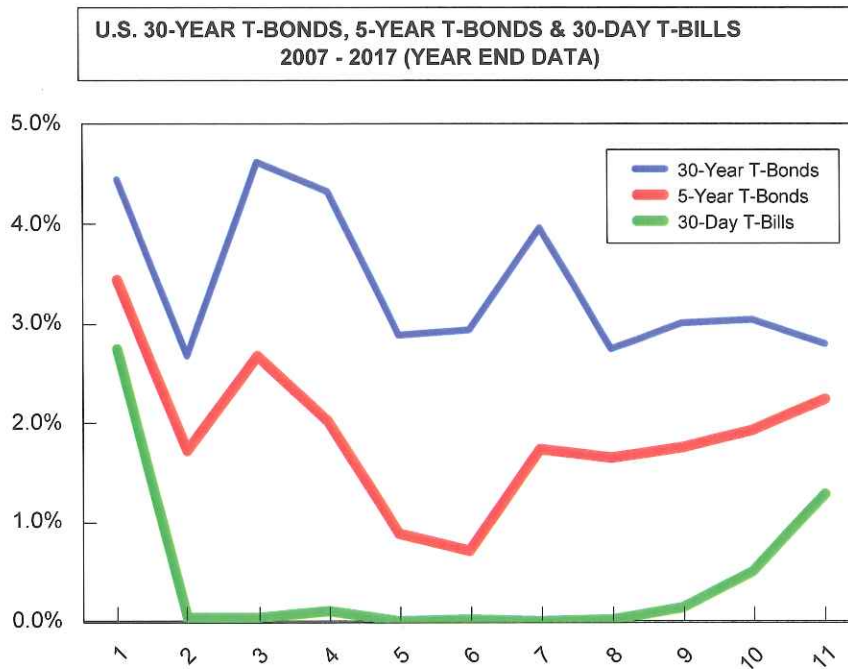


**Pipeline Screened Comparables Group**  
**Risk Premium Indicator - January 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>S&amp;P Rating</b>	<b>Numerical Rating</b>	<b>Bloomberg Yields</b>	<b>Risk Prem Indicator</b>
BUCKEYE PARTNERS LP	BPL	BBB-	12	5.00	10.85
COMMERCIAL METALS	CMC	BB+	13	5.60	11.45
ENERGY TRANSFER PARTNERS -LP	ETP	BBB-	12	5.00	10.85
GATX CORP	GATX	BBB	11	4.55	10.40
ONEOK INC	OKE	BBB	11	4.55	10.40
QORVO INC	QRVO	BB+	13	5.60	11.45
WESTERN GAS PARTNERS LP	WES	BBB-	12	5.00	10.85
	Average	BBB-	12	5.00	10.85
	Median	BBB-	12	5.00	10.85

Source: S&P Compustat, Mergent, & Bloomberg, January 2018.

## US 30-Year T-Bonds, 5-Year T-Bonds, and 30-Day T-Bills



**U.S. 30-YEAR TREASURY BONDS  
U.S. 5-YEAR TREASURY BONDS  
U.S. 30-DAY TREASURY BILLS**

Year End Date	30-Year T-Bonds	5-Year T-Bonds	30-DAY T-Bills
2007	4.45%	3.45%	2.76%
2008	2.69%	1.72%	0.04%
2009	4.63%	2.69%	0.04%
2010	4.34%	2.02%	0.11%
2011	2.89%	0.89%	0.01%
2012	2.95%	0.72%	0.02%
2013	3.96%	1.75%	0.01%
2014	2.75%	1.65%	0.03%
2015	3.01%	1.76%	0.14%
2016	3.04%	1.94%	0.52%
2017	2.81%	2.25%	1.29%

Source: Federal Reserve, Jan.2, 2018.

## Capital Asset Pricing Model

The capital asset pricing model (CAPM) is a generally accepted method of estimating the cost of equity ( $K_e$ ) based on the formula shown in Figure 4. It is the preferred method of estimating the cost of equity by some analysts. The CAPM method is much like the risk premium method, however the risk premium is adjusted by beta before it is added to the appropriate risk level. The two elements of risk are a risk free rate, which is the price of time (the reward for postponing consumption and for not exposing funds to risk), and a risk premium, which is the additional compensation for assuming risk. The nominal risk free rate includes the real risk free rate and an inflation premium. The risk premium includes an interest rate risk, business risk, financial risk, and liquidity risk. All of these elements are accounted for when we calculate the cost of equity using the CAPM method.

Our *ex post* CAPM calculations were based upon the long-term risk premium using the data provided by Morningstar and Duff & Phelps, and simulated for 2018 on page 102. The indicated cost of equity by this method was 11.52% at January 1, 2018. Our *ex ante* CAPM calculations were based upon the expected risk premium of 9.91% derived from the market-weighted average of the cost of equity capital less the current long-term Treasury bond rate. The indicated cost of equity by this method was 15.03% at January 1, 2018.

Our 'safe rates' for the CAPM calculations were derived as described in the risk premium method discussed earlier. Our beta estimate of 1.25 was based on observing the average and median *Value Line* betas from each of the groups. The average and median betas are shown in Figure 5. The calculated forward-looking (*ex ante*) CAPM indicator was found by deriving an expected risk premium from the S&P 500 companies. The *ex ante* CAPM indicator is a good check on the reliability of the standard CAPM because it is forward looking. All prospective investment in interstate natural

$$K_e = R_f + \beta R_p$$

where

$K_e$  = Cost of equity  
 $R_f$  = Risk free rate  
 $\beta$  = Beta  
 $R_p$  = Risk premium

Figure 4

Group of Companies	Avg.	Med.
<b>Value Line Betas</b>		
VL Nat Gas Pipelines (Large)	1.36	1.35
VL Nat Gas Div. & Oil/Gas Dist. (Large)	1.43	1.40
VL NG Diversified Large)	1.49	1.43
Nat Gas PL Forum (pipes)	1.20	1.15
S&P Screened Comps.	1.39	1.40
S&P 500 BBB- rated debt	1.14	1.10

Figure 5 - *Value Line* Betas

gas pipeline companies is based on an expectation of future benefits. This is consistent with the fundamental principle underlying the income approach, which is the principle of anticipation. Further, this *ex ante* method is discussed in the *Cost of Capital* as follows:

The *ex ante* risk premium is a forward looking premium. The Gordon Growth Model is applied to determine the resulting risk premium. The premium is determined by first estimating the cost of equity for the proxy market. The proxy market is a market large enough to remove the effects of non-diversification. Typically, the S&P 500 or the NYSE is used as this proxy...

The first step in deriving the *ex ante* risk premium is to use a single-stage discounted cash flow analysis (otherwise known as the Gordon Growth Model) to calculate the cost of equity for the market proxy, (i.e., the S&P 500). The cost of equity is calculated by using the most recent I/B/E/S consensus long-term growth rates for each firm in the S&P 500 and adding it to the dividend growth yield. I/B/E/S is a service that polls analysts about their growth estimates for individual stocks. The dividend yield for the S&P 500 should be an estimate for Year 1's dividend ( $D_1$ ).  $D_1$  can be estimated by multiplying the S&P 500's current weighted average dividend yield ( $D_0$ ) by 1 plus its weighted average long-term earnings growth rate. By adding the weighted average long-term growth rate to the dividend yield at the end of Year 1, the cost of equity is estimated. If for example, the long-term growth rate is equal to 10% and the current dividend yield is 4%, then the cost of equity is  $(4\% \times 1.1) + 10\%$ , or 14.40 %. This can also be described in the following formula:

$$K_{e500} = DY \times (1 + g) + g$$

Where:      DY      =      dividend yield  
                   G        =      long-term growth  
                    $K_{e500}$  =      cost of equity for the S&P 500

The second step is to calculate the risk premium of the S&P 500 ( $RP_{500}$ ). For the CAPM, the *ex ante* risk premium is calculated by subtracting the risk-free rate ( $R_f$ ), from the cost of equity for the S&P 500. For the build up method, the *ex ante* risk premium is calculated by subtracting the weighted average bond yield for the S&P 500 from the cost of equity for the S&P 500.<sup>44</sup>

$$RP_{500} = K_{e500} - R_f$$

---

<sup>44</sup> Pratt, Shannon P. *Cost of Capital, Estimation and Applications*, (NY: John Wiley & Sons, Inc. 1998) 178.

In order to perform the *ex ante* CAPM indicator we derived the expected cost of equity for the companies making up the *S&P 500* (which are expected to pay dividends). We developed the weighted average cost of capital (weighted by market value) for the *S&P 500*, which was 12.55%. We then subtracted the current long-term Treasury bond rate of 2.64% to obtain the expected equity risk premium of 9.91%. The market-weighted average is appropriate because the monthly fundamental beta is estimated based upon the sensitivity of a company's stock price to the overall fluctuation in the *S&P 500* index price (with the *S&P 500* being the surrogate for the market in general). The market-weighted average gives most weight to the highest market value stocks and is a very good indicator of the central tendency of the overall market cost of capital.

Based upon the analysis presented and considering all the relevant facts, we believe the appropriate cost of equity capital indicated by the CAPM method is **12.40%** at January 1, 2018. This conclusion gives weight and consideration to both indicators. A summary of the CAPM indicators and the supporting data begins below and on the following page.

### Summary of CAPM Indicators - January 1, 2018

Item	Rates			CAPM Indicator
	Rf	Rp	Beta	
<b>CAPM Indicator *</b>				
Long-Term Gov't Bonds (ex post)	2.64	7.10	1.25	11.52
Long-Term Gov't Bonds (ex ante)	2.64	9.91	1.25	15.03

CAPM Formula:  $Ke = Rf + B(Rp)$

\* CAPM Indicator is based upon a *Value Line* beta of 1.25 & Federal Reserve data January 2, 2018.

On the following tables are the *Value Line* betas for the various groups of pipeline and comparable companies. Shown after the betas for the various groups are the calculations for the *ex ante* CAPM with supporting data from *Standard & Poor's Compustat* at January 1, 2018.

### Summary of Industry Betas

Value Line Data - Medians	Beta
Natural Gas Pipeline Industry (Large)	1.35
Natural Gas Div. Ind. & Oil/Gas Dist. (Large)	1.40
Natural Gas Diversified (Large)	1.43
Interstate Natural Gas Pipeline Forum (Pipelines)	1.15
S&P Screened Comparables Group	1.40
S&P 500 Companies with BBB- Rated Debt	1.10
<b>Average</b>	<b>1.31</b>

### Natural Gas Pipeline Industry (Large) Beta (Value Line) - January 1, 2018

Company Name	Ticker	Beta
Boardwalk Pipeline	BWP	1.00
CenterPoint Energy	CNP	0.90
DCP Midstream LP	DCP	1.60
Enable Midstream Part.	ENBL	1.30
Energy Transfer Equity	ETE	2.05
EnLink Midstream Part.	ENLK	1.75
Enterprise Products	EPD	1.30
EQT Corp.	EQT	1.00
Kinder Morgan Inc.	KMI	1.45
National Fuel Gas	NFG	1.05
ONEOK Inc.	OKE	1.55
Spectra Energy Part.	SEP	0.90
TransCanada Corp.	TRP	1.10
Western Gas Part.	WES	1.40
Williams Cos.	WMB	1.85
Williams Partners L.P.	WPZ	1.55
	<b>Average</b>	<b>1.36</b>
	<b>Median</b>	<b>1.35</b>

Source: Value Line, January 2018.



**Natural Gas Diversified & Oil/Gas Dist. - Large  
Beta (Value Line) - January 1, 2018**

Company Name	Ticker	Beta
Antero Resources	AR	1.30
Cabot Oil & Gas 'A'	COG	1.05
Chesapeake Energy	CHK	2.15
Cimarex Energy	XEC	1.40
Concho Resources	CXO	1.60
Devon Energy	DVN	1.80
Enbridge Inc.	ENB.TO	1.00
EOG Resources	EOG	1.45
EQT Corp.	EQT	1.00
Kinder Morgan Inc.	KMI	1.45
MDU Resources	MDU	1.15
National Fuel Gas	NFG	1.05
Newfield Exploration	NFX	1.90
ONEOK Inc.	OKE	1.55
Pembina Pipeline	PPL.TO	1.10
QEP Resources	QEP	1.75
Southwestern Energy	SWN	1.35
Targa Resources	TRGP	1.95
TransCanada Corp.	TRP	1.10
Williams Cos.	WMB	1.85
World Fuel Services	INT	1.15
	Average	1.43
	Median	1.40

Source: Value Line, January 2018.

**Natural Gas Diversified Industry (Large)**  
**Beta (Value Line) - January 1, 2018**

Company Name	Ticker	Beta
Antero Resources	AR	1.30
Cabot Oil & Gas 'A'	COG	1.05
Chesapeake Energy	CHK	2.15
Cimarex Energy	XEC	1.40
Concho Resources	CXO	1.60
Devon Energy	DVN	1.80
EOG Resources	EOG	1.45
EQT Corp.	EQT	1.00
MDU Resources	MDU	1.15
National Fuel Gas	NFG	1.05
Newfield Exploration	NFX	1.90
QEP Resources	QEP	1.75
Southwestern Energy	SWN	1.35
Targa Resources	TRGP	1.95
	Average	1.49
	Median	1.43

Source: Value Line, January 2018.

**Interstate Natural Gas Pipeline Forum (Pipelines)  
Beta (Value Line) - January 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>Beta</b>
Boardwalk Pipeline	BWP	1.00
CenterPoint Energy	CNP	0.90
Dominion Energy	D	0.65
Enable Midstream Part.	ENBL	1.30
Enbridge Energy Mgmt LLC	EEQ	1.35
Enbridge Energy Part.	EPP	1.30
Enbridge Inc.	ENB.TO	1.00
Kinder Morgan Inc.	KMI	1.45
MDU Resources	MDU	1.15
National Fuel Gas	NFG	1.05
ONEOK Inc.	OKE	1.55
TransCanada Corp.	TRP	1.10
Williams Cos.	WMB	1.85
	Average	1.20
	Median	1.15

Source: Value Line, January 2018.

**Pipeline Screened Comparables Group  
Beta (Value Line) - January 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>Beta</b>
Buckeye Partners L.P.	BPL	1.20
Commercial Metals	CMC	1.45
Energy Transfer Part.	ETP	1.55
GATX Corp.	GATX	1.25
ONEOK Inc.	OKE	1.55
Qorvo Inc.	QRVO	1.30
Western Gas Part.	WES	1.40
	Average	1.39
	Median	1.40

Source: Value Line, January 2018.

**S&P 500 Companies with "BBB-" Rated Debt  
Beta (Value Line) - January 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>Beta</b>
Advance Auto Parts	AAP	1.05
Amer. Tower 'A'	AMT	0.95
Andeavor	ANDV	1.20
Apartment Investment	AIV	0.85
Arconic Inc.	ARNC	
Best Buy Co.	BBY	1.10
Cimarex Energy	XEC	1.40
Constellation Brands	STZ	0.80
Crown Castle Int'l	CCI	0.85
Delta Air Lines	DAL	1.30
Discover Fin'l Svcs.	DFS	1.10
Expedia Inc.	EXPE	1.20
Flowserve Corp.	FLS	1.35
FMC Corp.	FMC	1.25
Harris Corp.	HRS	1.05
Hess Corp.	HES	1.65
Horton D.R.	DHI	1.35
Huntington Ingalls	HII	1.10
Kansas City South'n	KSU	1.15
Kinder Morgan Inc.	KMI	1.45
Kohl's Corp.	KSS	1.05
Kraft Heinz Co.	KHC	0.90
Molson Coors Brewing	TAP	0.95
Mosaic Company	MOS	1.35
Motorola Solutions	MSI	0.95
Newell Brands	NWL	1.10
Synchrony Financial	SYF	1.10
Tapestry Inc.	TPR	1.05
Total System Svcs.	TSS	1.00
Viacom Inc. 'B'	VIAB	1.20
Zions Bancorp.	ZION	1.25
	<b>Average</b>	<b>1.14</b>
	<b>Median</b>	<b>1.10</b>

Source: Value Line, January 2018.

**Cost of Equity Indication Using Expected Risk Premium**  
**Weighted Average Cost of Equity for S&P 500 = Market Required Cost of Equity**

**CAPM Calculations:**

S&P 500 Expected Equity Cost (Wt. Avg)	12.55	<b>LT Gov't.</b>		<b>Cost of</b>	
Current Yield on L-T Gov't. Bonds	<u>2.64</u>	<b>Bond Yield</b>		<b>Equity by</b>	
Expected Equity Risk Premium	9.91			<b>CAPM</b>	
Beta	<u>1.25</u>				
Adjusted Risk Premium	12.39 +	2.64	=	15.03	<i>Ex Ante</i>

Note: Forward-looking CAPM (Ex Ante) uses the weighted average expected return on the S&P 500 as the expected market return. The current US Government bond yield is deducted from the weighted average expected return to obtain the expected risk premium. The current beta is applied to the expected risk premium and the result is added to the current US Government bond yield to obtain the indicated cost of equity by the CAPM method.

(Calculations for expected market return for S&P 500 can be found on the following pages.)

Source: *Value Line* (January 2018).

## Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
3M Company	MMM	1.96	9.50	11.46	142,820.83
Abbott Labs.	ABT	1.90	8.50	10.40	102,382.15
AbbVie Inc.	ABBV	2.85	12.50	15.35	158,798.28
Accenture Plc	ACN	1.70	9.00	10.70	100,971.24
Activision Blizzard	ATVI	0.52	9.00	9.52	50,376.08
Acuity Brands	AYI	0.28	14.50	14.78	7,815.52
Advance Auto Parts	AAP	0.21	9.50	9.71	8,231.50
Aetna Inc.	AET	1.09	9.00	10.09	60,214.36
Affiliated Managers	AMG	0.40	7.00	7.40	11,149.47
Aflac Inc.	AFL	2.04	4.00	6.04	35,433.00
Agilent Technologies	A	0.87	7.00	7.87	22,556.10
Air Products & Chem.	APD	2.27	9.00	11.27	36,754.09
Alaska Air Group	ALK	1.62	5.50	7.12	8,976.40
Albemarle Corp.	ALB	0.98	9.50	10.48	15,187.54
Allegion plc	ALLE	0.78	10.00	10.78	7,719.91
Allergan plc	AGN	1.63	9.00	10.63	56,728.26
Alliance Data Sys.	ADS	0.78	11.50	12.28	14,560.49
Alliant Energy	LNT	3.05	6.00	9.05	9,604.21
Allstate Corp.	ALL	1.46	7.50	8.96	36,500.40
Altria Group	MO	3.76	10.00	13.76	134,265.45
Amer. Airlines	AAL	0.75	1.00	1.75	25,022.40
Amer. Elec. Power	AEP	3.53	4.00	7.53	35,127.36
Amer. Express	AXP	1.38	6.00	7.38	87,230.65
Amer. Int'l Group	AIG	2.11	27.00	29.11	54,157.52
Amer. Tower 'A'	AMT	2.09	10.50	12.59	60,956.94
Amer. Water Works	AWK	2.03	8.50	10.53	15,607.72
Ameren Corp.	AEE	3.22	6.00	9.22	14,087.78
Ameriprise Fin'l	AMP	1.95	12.00	13.95	25,514.13
AmerisourceBergen	ABC	1.61	9.50	11.11	21,224.59
AMETEK Inc.	AME	0.48	7.00	7.48	17,167.37
Amgen	AMGN	2.94	8.50	11.44	131,223.95
Amphenol Corp.	APH	0.85	9.50	10.35	27,685.09
Analog Devices	ADI	1.97	16.00	17.97	33,851.84
Andeavor	ANDV	2.03	6.50	8.53	18,093.86
Anthem Inc.	ANTM	1.21	12.00	13.21	59,671.63
Aon plc	AON	1.06	9.50	10.56	34,254.27
Apache Corp.	APA	2.13	20.00	22.13	17,492.67
Apple Inc.	AAPL	1.57	14.50	16.07	893,753.19
Applied Materials	AMAT	0.88	24.00	24.88	59,610.72
Aptiv PLC	APTIV	1.39	7.50	8.89	24,438.58
Archer Daniels Midl'd	ADM	3.16	3.50	6.66	22,410.31
Assurant Inc.	AIZ	2.23	4.00	6.23	5,363.46
AT&T Inc.	T	5.26	5.50	10.76	234,829.53
Automatic Data Proc.	ADP	2.12	10.00	12.12	52,365.36
Avery Dennison	AVY	1.64	10.00	11.64	10,446.41
Ball Corp.	BLL	1.04	15.00	16.04	13,511.25
Bank of America	BAC	1.72	17.00	18.72	314,979.13
Bank of New York Mellon	BK	1.75	8.50	10.25	56,382.65



**Value Line Data for S&P 500 - Jan. 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>Yield %</b>	<b>Growth Rate %</b>	<b>Equity Cost %</b>	<b>Market Value</b>
Baxter Int'l Inc.	BAX	0.93	4.00	4.93	37,731.62
BB&T Corp.	BBT	2.70	5.50	8.20	40,629.43
Becton Dickinson	BDX	1.44	9.00	10.44	50,382.89
Best Buy Co.	BBY	2.20	9.00	11.20	20,628.24
BlackRock Inc.	BLK	1.91	10.50	12.41	84,997.97
Block (H&R)	HRB	3.60	8.00	11.60	5,500.58
Boeing	BA	2.30	11.00	13.30	185,268.41
BorgWarner	BWA	1.26	8.50	9.76	11,663.56
Bristol-Myers Squibb	BMJ	2.59	14.50	17.09	101,328.09
Broadcom Ltd.	AVGO	2.59	44.00	46.59	110,964.45
Brown-Forman 'B'	BF/B	1.15	10.00	11.15	26,364.08
C.H. Robinson	CHRW	2.05	6.00	8.05	12,697.49
CA Inc.	CA	3.07	6.00	9.07	14,012.59
Campbell Soup	CPB	2.97	4.00	6.97	15,384.49
Capital One Fin'l	COF	1.57	4.00	5.57	48,829.54
Cardinal Health	CAH	3.03	12.00	15.03	20,544.30
Carnival Corp.	CCL	2.69	12.50	15.19	47,622.05
Caterpillar Inc.	CAT	1.95	10.00	11.95	98,776.90
CBOE Holdings	CBOE	0.87	16.50	17.37	14,696.21
CBS Corp. 'B'	CBS	1.24	13.50	14.74	22,704.00
CenterPoint Energy	CNP	3.96	6.00	9.96	12,086.08
CF Industries	CF	2.98	8.50	11.48	9,964.74
Chevron Corp.	CVX	3.41	15.00	18.41	244,126.55
Chubb Ltd.	CB	1.97	8.00	9.97	66,620.74
Church & Dwight	CHD	1.52	7.50	9.02	12,595.62
Cigna Corp.	CI	0.01	12.00	12.01	51,336.43
Cimarex Energy	XEC	0.24	31.00	31.24	12,216.27
Cincinnati Financial	CINF	2.71	6.50	9.21	12,081.88
Cintas Corp.	CTAS	1.00	12.50	13.50	17,190.54
Cisco Systems	CSCO	2.97	7.50	10.47	197,742.94
Citigroup Inc.	C	1.69	11.00	12.69	197,057.47
Citizens Fin'l Group	CFG	1.83	10.50	12.33	22,008.19
Clorox Co.	CLX	2.30	7.00	9.30	18,879.63
CME Group	CME	1.77	8.50	10.27	51,454.38
CMS Energy Corp.	CMS	3.07	6.50	9.57	13,049.34
Coca-Cola	KO	3.34	4.50	7.84	196,052.00
Cognizant Technology	CTSH	0.82	12.50	13.32	43,288.30
Colgate-Palmolive	CL	2.12	11.00	13.12	66,323.27
Comcast Corp.	CMCSA	1.54	11.00	12.54	189,194.28
Comerica Inc.	CMA	1.37	13.50	14.87	15,466.56
Conagra Brands	CAG	2.24	3.00	5.24	15,326.84
ConocoPhillips	COP	1.89	59.00	60.89	68,515.25
Consol. Edison	ED	3.47	2.50	5.97	25,695.90
Constellation Brands	STZ	0.96	13.50	14.46	42,408.91
Cooper Cos.	COO	0.02	16.50	16.52	11,350.85
Corning Inc.	GLW	1.83	11.50	13.33	29,346.13
Costco Wholesale	COST	1.05	10.00	11.05	82,777.59
Coty Inc.	COTY	2.49	8.50	10.99	15,227.81

## Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
Crown Castle Int'l	CCI	4.01	8.50	12.51	44,019.89
CSX Corp.	CSX	1.40	11.50	12.90	52,497.29
Cummins Inc.	CMI	2.37	8.00	10.37	30,341.19
CVS Health	CVS	2.66	9.00	11.66	78,781.01
Danaher Corp.	DHR	0.59	9.00	9.59	66,246.38
Darden Restaurants	DRI	2.55	11.00	13.55	12,216.42
Deere & Co.	DE	1.50	8.00	9.50	51,764.16
Delta Air Lines	DAL	2.19	10.50	12.69	38,985.36
Dentsply Sirona	XRAY	0.52	8.50	9.02	15,681.68
Devon Energy	DVN	0.55	14.50	15.05	22,706.25
Discover Fin'l Svcs.	DFS	1.78	5.00	6.78	28,393.96
Disney (Walt)	DIS	1.49	8.50	9.99	176,032.00
Dollar General	DG	1.09	9.50	10.59	25,567.75
Dominion Energy	D	4.32	6.50	10.82	50,244.88
Dover Corp.	DOV	1.82	8.00	9.82	15,959.23
Dr Pepper Snapple	DPS	2.48	7.50	9.98	17,283.63
DTE Energy	DTE	3.37	6.00	9.37	19,191.14
Duke Energy	DUK	4.42	4.50	8.92	57,540.00
Duke Realty Corp.	DRE	3.08	33.50	36.58	
DXC Technology	DXC	0.72	18.00	18.72	28,625.48
Eastman Chemical	EMN	2.32	10.00	12.32	14,006.22
Eaton Corp. plc	ETN	2.97	7.00	9.97	36,142.42
Ecolab Inc.	ECL	1.20	8.50	9.70	39,494.54
Edison Int'l	EIX	3.88	4.00	7.88	20,917.07
Emerson Electric	EMR	2.71	12.00	14.71	46,330.16
EOG Resources	EOG	0.65	29.00	29.65	65,210.73
EQT Corp.	EQT	0.20	22.00	22.20	10,180.43
Equifax Inc.	EFX	1.28	8.00	9.28	14,638.80
Equinix Inc.	EQIX	1.78	23.00	24.78	35,846.82
Everest Re Group Ltd.	RE	2.42	3.50	5.92	8,983.63
Eversource Energy	ES	3.27	6.50	9.77	19,726.15
Exelon Corp.	EXC	3.48	7.00	10.48	37,088.89
Expedia Inc.	EXPE	0.95	19.00	19.95	19,520.23
Expeditors Int'l	EXPD	1.29	8.00	9.29	11,626.56
Exxon Mobil Corp.	XOM	3.59	10.50	14.09	369,212.19
Fastenal Co.	FAST	2.33	5.50	7.83	15,941.13
FedEx Corp.	FDX	0.75	11.00	11.75	71,971.34
Fidelity Nat'l Info.	FIS	1.22	7.50	8.72	31,878.09
Fifth Third Bancorp	FITB	2.12	4.50	6.62	21,658.05
FirstEnergy Corp.	FE	4.74	12.00	16.74	13,640.79
FLIR Systems	FLIR	1.51	7.50	9.01	6,875.02
Fluor Corp.	FLR	1.57	2.00	3.57	7,523.93
FMC Corp.	FMC	0.75	13.50	14.25	13,180.50
Foot Locker	FL	2.67	6.50	9.17	6,262.79
Ford Motor	F	4.62	2.50	7.12	52,235.77
Fortune Brands Home	FBHS	1.14	12.00	13.14	10,843.15
Franklin Resources	BEN	2.12	5.00	7.12	24,505.60
Gallagher (Arthur J.)	AJG	2.46	15.50	17.96	11,489.84

## Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
Gap (The) Inc.	GPS	2.81	0.50	3.31	12,564.70
Garmin Ltd.	GRMN	3.45	5.50	8.95	11,313.75
Gen'l Dynamics	GD	1.63	5.50	7.13	61,119.94
Gen'l Electric	GE	2.59	8.50	11.09	158,525.72
Gen'l Mills	GIS	3.33	3.50	6.83	34,210.87
Gen'l Motors	GM	3.44	5.50	8.94	61,908.00
Genuine Parts	GPC	2.77	7.50	10.27	14,365.14
Global Payments	GPN	0.03	12.00	12.03	16,539.93
Goldman Sachs	GS	1.16	9.50	10.66	95,460.66
Goodyear Tire	GT	1.75	10.00	11.75	8,149.98
Grainger (W.W.)	GWW	2.16	4.50	6.66	13,576.20
Halliburton Co.	HAL	1.39	21.50	22.89	45,596.88
Hanesbrands Inc.	HBI	3.01	9.00	12.01	7,874.76
Harley-Davidson	HOG	2.86	8.00	10.86	8,673.92
Harris Corp.	HRS	1.60	10.50	12.10	17,428.33
Hartford Fin'l Svcs.	HIG	1.80	12.50	14.30	19,586.04
Hasbro Inc.	HAS	2.51	10.50	13.01	11,604.79
Helmerich & Payne	HP	4.21	4.50	8.71	7,445.47
Hershey Co.	HSY	2.33	6.50	8.83	24,028.91
Hewlett Packard Ent.	HPE	1.99	3.50	5.49	23,640.29
Hilton Worldwide Hldgs.	HLT	0.74	7.00	7.74	25,975.27
Home Depot	HD	2.18	11.00	13.18	224,302.72
Honeywell Int'l	HON	1.92	8.50	10.42	117,884.49
Hormel Foods	HRL	2.05	10.50	12.55	19,239.88
Horton D.R.	DHI	0.96	11.00	11.96	19,825.51
HP Inc.	HPQ	2.60	4.50	7.10	36,026.83
Humana Inc.	HUM	0.61	10.50	11.11	36,936.45
Hunt (J.B.)	JBHT	0.81	9.00	9.81	12,954.03
Huntington Bancshs.	HBAN	3.03	10.00	13.03	16,160.14
Illinois Tool Works	ITW	1.87	10.50	12.37	57,409.48
Ingersoll-Rand	IR	1.99	11.00	12.99	22,650.21
Int'l Flavors & Frag.	IFF	1.84	7.50	9.34	12,306.99
Int'l Paper	IP	3.08	18.50	21.58	25,653.48
Intel Corp.	INTC	2.45	7.50	9.95	209,383.20
Intercontinental Exch.	ICE	1.10	12.00	13.10	42,848.32
Interpublic Group	IPG	3.57	10.00	13.57	8,127.79
Intuit Inc.	INTU	0.96	14.50	15.46	41,983.08
Invesco Ltd.	IVZ	3.15	5.50	8.65	14,997.56
Iron Mountain	IRM	6.36	11.00	17.36	9,885.31
Jacobs Engineering	JEC	0.88	8.00	8.88	8,173.35
Johnson & Johnson	JNJ	2.47	9.50	11.97	380,972.09
JPMorgan Chase	JPM	2.09	6.50	8.59	376,465.28
Juniper Networks	JNPR	1.38	7.00	8.38	10,855.82
Kansas City South'n	KSU	1.34	9.50	10.84	11,400.23
Kellogg	K	3.17	7.00	10.17	23,863.65
KeyCorp	KEY	2.21	11.00	13.21	21,882.91
Kimberly-Clark	KMB	3.27	10.50	13.77	42,010.34
Kinder Morgan Inc.	KMI	2.63	24.00	26.63	42,079.45



### Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
KLA-Tencor	KLAC	2.19	16.00	18.19	17,262.95
Kohl's Corp.	KSS	4.29	7.00	11.29	9,559.20
Kroger Co.	KR	1.92	3.50	5.42	24,641.57
L Brands	LB	4.70	0.50	5.20	13,716.48
L3 Technologies	LLL	1.51	10.00	11.51	15,869.73
Lam Research	LRCX	1.03	20.00	21.03	32,085.05
Lauder (Estee)	EL	1.16	13.50	14.66	48,265.46
Leggett & Platt	LEG	3.01	7.50	10.51	6,369.40
Lennar Corp.	LEN	0.23	10.50	10.73	16,133.12
Leucadia National	LUK	1.49	31.00	32.49	9,706.18
Lilly (Eli)	LLY	2.63	11.00	13.63	94,837.30
Lincoln Nat'l Corp.	LNC	1.72	8.00	9.72	17,330.88
Lockheed Martin	LMT	2.50	10.00	12.50	94,094.63
Loews Corp.	L	0.49	15.00	15.49	17,026.70
Lowe's Cos.	LOW	1.87	13.50	15.37	77,873.01
LyondellBasell Inds.	LYB	3.19	4.00	7.19	45,011.60
M&T Bank Corp.	MTB	1.73	8.00	9.73	26,300.77
Macy's Inc.	M	6.16	2.00	8.16	7,443.59
Marathon Petroleum	MPC	2.44	6.50	8.94	34,556.22
Marriott Int'l	MAR	0.97	15.00	15.97	49,706.97
Marsh & McLennan	MMC	1.82	10.00	11.82	41,909.76
Martin Marietta	MLM	0.77	17.50	18.27	14,473.29
Masco Corp.	MAS	0.99	14.00	14.99	13,914.70
MasterCard Inc.	MA	0.64	13.00	13.64	168,826.20
McCormick & Co.	MKC	2.03	9.00	11.03	13,521.61
McDonald's Corp.	MCD	2.32	9.50	11.82	138,657.00
McKesson Corp.	MCK	0.87	11.00	11.87	33,178.64
Medtronic plc	MDT	2.23	6.00	8.23	115,745.66
Merck & Co.	MRK	3.36	5.50	8.86	154,478.11
MetLife Inc.	MET	3.34	5.50	8.84	54,801.84
MGM Resorts Int'l	MGM	1.30	41.50	42.80	18,717.85
Microchip Technology	MCHP	1.58	14.50	16.08	21,658.91
Microsoft Corp.	MSFT	1.92	8.50	10.42	681,521.56
Molson Coors Brewing	TAP	2.13	14.00	16.13	18,054.83
Mondelez Int'l	MDLZ	2.10	10.00	12.10	64,316.25
Monsanto Co.	MON	1.83	6.00	7.83	52,313.48
Moody's Corp.	MCO	1.00	9.50	10.50	29,630.93
Morgan Stanley	MS	1.88	10.50	12.38	95,861.65
Mosaic Company	MOS	0.37	3.00	3.37	9,229.10
Motorola Solutions	MSI	2.29	10.50	12.79	15,036.84
Nasdaq Inc.	NDAQ	1.93	9.50	11.43	13,320.94
National Oilwell Varco	NOV	0.52	3.00	3.52	14,711.85
Navient Corp.	NAVI	4.59	6.00	10.59	3,600.63
NetApp Inc.	NTAP	1.38	16.00	17.38	15,926.55
Newell Brands	NWL	2.87	24.50	27.37	15,722.41
Newmont Mining	NEM	0.78	9.00	9.78	20,458.77
NextEra Energy	NEE	2.85	7.00	9.85	71,952.09
Nielsen Hldgs. plc	NLSN	3.80	2.50	6.30	12,879.04

## Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
NIKE Inc. 'B'	NKE	1.26	14.00	15.26	105,314.49
NiSource Inc.	NI	2.79	5.50	8.29	8,417.28
Nordstrom Inc.	JWN	3.07	2.00	5.07	8,041.78
Norfolk Southern	NSC	1.65	8.00	9.65	43,657.75
Northern Trust Corp.	NTRS	1.65	9.50	11.15	23,310.65
Northrop Grumman	NOC	1.29	8.00	9.29	53,661.29
Nucor Corp.	NUE	2.26	20.50	22.76	21,694.65
NVIDIA Corp.	NVDA	0.28	23.50	23.78	134,532.00
Occidental Petroleum	OXY	4.13	25.00	29.13	57,538.77
Omnicom Group	OMC	3.23	7.50	10.73	16,692.90
ONEOK Inc.	OKE	5.30	18.50	23.80	21,595.98
Oracle Corp.	ORCL	1.57	8.00	9.57	202,924.14
PACCAR Inc.	PCAR	2.40	6.50	8.90	26,313.29
Packaging Corp.	PKG	1.96	8.50	10.46	12,232.35
Parker-Hannifin	PH	1.30	13.00	14.30	27,384.60
Patterson Cos.	PDCO	2.93	13.00	15.93	3,582.45
Paychex Inc.	PAYX	2.98	8.50	11.48	24,526.18
Pentair plc	PNR	1.93	12.00	13.93	13,182.13
People's United Fin'l	PBCT	3.71	13.50	17.21	6,537.06
PepsiCo Inc.	PEP	2.76	7.50	10.26	167,899.77
PerkinElmer Inc.	PKI	0.36	8.00	8.36	8,460.59
Perrigo Co. plc	PRGO	0.76	0.50	1.26	12,690.30
Pfizer Inc.	PFE	3.69	12.00	15.69	217,267.78
Philip Morris Int'l	PM	4.13	7.50	11.63	161,749.72
Phillips 66	PSX	2.94	5.00	7.94	51,717.88
Pinnacle West Capital	PNW	3.36	5.50	8.86	9,273.11
Pioneer Natural Res.	PXD	0.04	37.50	37.54	30,379.56
PNC Financial Serv.	PNC	2.07	5.50	7.57	69,043.80
PPG Inds.	PPG	1.53	10.50	12.03	30,211.39
PPL Corp.	PPL	5.33	1.50	6.83	21,607.38
Praxair Inc.	PX	2.10	8.00	10.10	46,183.86
Price (T. Rowe) Group	TROW	2.22	8.00	10.22	26,614.47
Principal Fin'l Group	PFG	2.74	4.50	7.24	20,832.58
Procter & Gamble	PG	3.02	10.00	13.02	232,689.80
Progressive Corp.	PGR	1.73	8.00	9.73	32,395.12
Prudential Fin'l	PRU	2.57	5.50	8.07	49,952.85
Public Serv. Enterprise	PEG	3.61	1.00	4.61	25,154.05
PulteGroup Inc.	PHM	1.18	17.00	18.18	10,123.16
PVH Corp.	PVH	0.10	7.50	7.60	11,002.40
Qualcomm Inc.	QCOM	3.63	5.00	8.63	97,681.98
Quest Diagnostics	DGX	1.81	9.50	11.31	13,557.84
Ralph Lauren	RL	1.93	1.50	3.43	8,533.25
Range Resources	RRC	0.46	23.50	23.96	4,180.87
Raymond James Fin'l	RJF	1.10	12.50	13.60	13,189.88
Raytheon Co.	RTN	1.67	8.00	9.67	55,592.04
Regions Financial	RF	2.22	9.50	11.72	20,350.45
Republic Services	RSG	2.06	8.50	10.56	22,864.22
ResMed Inc.	RMD	1.61	10.00	11.61	12,546.26



**Value Line Data for S&P 500 - Jan. 1, 2018**

<b>Company Name</b>	<b>Ticker</b>	<b>Yield %</b>	<b>Growth Rate %</b>	<b>Equity Cost %</b>	<b>Market Value</b>
Robert Half Int'l	RHI	1.85	5.50	7.35	7,115.95
Rockwell Automation	ROK	1.67	6.00	7.67	25,938.08
Rockwell Collins	COL	0.96	14.00	14.96	22,299.38
Roper Tech.	ROP	0.62	9.00	9.62	27,447.35
Ross Stores	ROST	0.85	9.00	9.85	31,037.90
Royal Caribbean	RCL	1.96	12.50	14.46	25,922.34
S&P Global	SPGI	1.01	11.50	12.51	45,180.90
SCANA Corp.	SCG	5.28	3.50	8.78	6,509.36
Schlumberger Ltd.	SLB	2.73	17.50	20.23	103,617.60
Schwab (Charles)	SCHW	0.67	14.00	14.67	70,003.17
Scripps Networks	SNI	1.39	6.50	7.89	11,212.62
Seagate Technology	STX	5.91	4.50	10.41	13,306.01
Sealed Air	SEE	1.29	12.00	13.29	8,954.76
Sempra Energy	SRE	3.24	7.50	10.74	27,228.48
Sherwin-Williams	SHW	0.84	14.50	15.34	39,649.94
Signet Jewelers Ltd.	SIG	2.36	2.00	4.36	3,469.38
Skyworks Solutions	SWKS	1.27	14.00	15.27	18,538.88
Smith (A.O.)	AOS	0.90	11.50	12.40	10,881.45
Smucker (J.M.)	SJM	2.51	6.00	8.51	14,391.98
Snap-on Inc.	SNA	1.86	9.00	10.86	10,345.06
Southern Co.	SO	5.09	3.50	8.59	47,371.24
Southwest Airlines	LUV	0.77	10.50	11.27	37,976.83
Stanley Black & Decker	SWK	1.48	9.50	10.98	26,477.76
Starbucks Corp.	SBUX	2.12	15.00	17.12	85,744.47
State Street Corp.	STT	1.73	7.50	9.23	36,954.30
Stryker Corp.	SYK	1.18	15.00	16.18	61,059.24
SunTrust Banks	STI	2.42	7.00	9.42	31,582.67
Symantec Corp.	SYMC	1.03	10.50	11.53	18,322.55
Synchrony Financial	SYF	1.52	8.00	9.52	30,724.25
Sysco Corp.	SYU	2.36	10.50	12.86	32,123.95
Tapestry Inc.	TPR	2.98	8.00	10.98	12,871.42
Target Corp.	TGT	3.76	4.50	8.26	36,540.08
TE Connectivity	TEL	1.64	9.50	11.14	35,301.70
Texas Instruments	TXN	2.29	10.50	12.79	108,144.18
Textron Inc.	TXT	0.13	13.00	13.13	15,369.39
Thermo Fisher Sci.	TMO	0.30	10.50	10.80	81,289.70
Tiffany & Co.	TIF	1.96	8.00	9.96	13,280.21
Time Warner	TWX	1.73	9.50	11.23	72,493.73
TJX Companies	TJX	1.65	10.50	12.15	47,833.72
Torchmark Corp.	TMK	0.66	7.50	8.16	10,535.74
Total System Svcs.	TSS	0.65	11.00	11.65	14,936.90
Tractor Supply	TSCO	1.50	9.00	10.50	9,973.85
Travelers Cos.	TRV	2.17	1.00	3.17	35,977.87
Twenty-First Century Fox	FOXA	0.97	11.50	12.47	67,135.69
Tyson Foods 'A'	TSN	1.49	10.50	11.99	30,069.28
U.S. Bancorp	USB	2.21	4.50	6.71	92,338.89
Union Pacific	UNP	1.95	8.00	9.95	110,134.59
United Parcel Serv.	UPS	2.72	10.00	12.72	111,344.54

### Value Line Data for S&P 500 - Jan. 1, 2018

Company Name	Ticker	Yield %	Growth Rate %	Equity Cost %	Market Value
United Technologies	UTX	2.14	8.00	10.14	106,066.08
UnitedHealth Group	UNH	1.33	13.50	14.83	217,792.44
Universal Health Sv. 'B'	UHS	0.35	9.00	9.35	10,454.56
Unum Group	UNM	1.65	12.00	13.65	12,670.00
V.F. Corp.	VFC	2.43	8.50	10.93	30,518.75
Valero Energy	VLO	3.08	5.00	8.08	41,265.25
Verizon Communic.	VZ	4.48	2.00	6.48	213,721.91
Viacom Inc. 'B'	VIAB	2.70	2.00	4.70	11,742.03
Visa Inc.	V	0.72	11.50	12.22	249,420.59
Vulcan Materials	VMC	0.75	19.00	19.75	17,717.72
Wal-Mart Stores	WMT	2.06	5.50	7.56	301,578.47
Walgreens Boots	WBA	2.23	11.00	13.23	73,144.44
Waste Management	WM	1.93	8.50	10.43	38,231.84
WEC Energy Group	WEC	3.38	6.00	9.38	20,648.14
Wells Fargo	WFC	2.55	5.00	7.55	305,725.13
Western Digital	WDC	2.43	13.00	15.43	24,024.80
Western Union	WU	3.59	5.50	9.09	9,870.36
WestRock Co.	WRK	2.56	10.00	12.56	17,244.92
Weyerhaeuser Co.	WY	3.62	14.50	18.12	26,733.31
Whirlpool Corp.	WHR	2.60	8.00	10.60	12,171.60
Williams Cos.	WMB	3.68	18.50	22.18	26,911.08
Wyndham Worldwide	WYN	2.18	7.50	9.68	11,526.16
Wynn Resorts	WYNN	1.22	14.00	15.22	16,681.68
Xcel Energy Inc.	XEL	3.18	4.50	7.68	23,935.95
Xerox Corp.	XRX	3.36	4.00	7.36	7,703.77
Xilinx Inc.	XLNX	1.98	8.00	9.98	18,731.13
XL Group Ltd.	XL	2.49	13.00	15.49	
Xylem Inc.	XYL	1.03	14.00	15.03	12,478.61
Yum! Brands	YUM	1.60	6.50	8.10	28,130.22
Zimmer Biomet Hldgs.	ZBH	0.86	11.00	11.86	25,546.93
Zions Bancorp.	ZION	1.65	13.50	15.15	10,109.42
Zoetis Inc.	ZTS	0.68	13.00	13.68	36,216.65

Market Weighted Average = **12.55**

Source: Value Line, January 2018.

## Flotation Cost Adjustment

Flotation costs are the costs associated with financing the investment – issuing debt and equity. They are made up of several types of costs including underwriter's fees, legal expenses, cost of preparing the prospectus, etc. In the appraisal process it is appropriate to include the interest rate and any other charges necessary to obtain the financing for the investment. In other words, the cost of financing an investment includes not only the interest rate but also flotation costs (the cost of issuing securities – both debt and equity). The Appraisal Institute's *The Appraisal of Real Estate* and the International Association of Assessing Officers' *Property Assessment Valuation* state the following regarding the cost of financing:

The cost of financing includes the interest rate and any points, discounts, equity participations, or other charges that the lender requires to increase the effective yield on the loan.<sup>45</sup>

The investor considers risk, return, management, liquidity, and other factors in deciding an acceptable discount rate. The discount rate is the annual percentage rate reflecting the competitive rate of return on an investment. The discount rate, also known as the *overall yield rate* [ $Y_{od}$ ], is the weighted average cost of capital for a particular investment and includes the costs associated with issuing debt and equity.<sup>46</sup>

Flotation costs can be accounted for either by amortizing the cost (reducing the cash flow to discount), or by including them in the cost of capital. Many studies have been made regarding the amount of flotation costs for debt and equity capital.

In general, the adjustment for flotation costs is a refinement of the basic unadjusted cost. In other words, usually the adjusted and unadjusted costs will not be very different. However, this doesn't imply that you shouldn't make the adjustment. The information needed to make the adjustment is readily available, and the adjustment itself doesn't require much effort or computer processing time. To paraphrase the film maker, Spike Lee, you should do the right thing (*especially if the right thing is relatively easy to do*).<sup>47</sup>

---

<sup>45</sup> *The Appraisal of Real Estate*, 14<sup>th</sup> ed., (Chicago: Appraisal Institute, 2013) 109.

<sup>46</sup> *Property Assessment Valuation*, 3<sup>rd</sup> ed., (Kansas City: International Association of Assessing Officers, 2010), 305.

<sup>47</sup> Ehrhardt, Michael C., *The Search for Value: Measuring the Company's Cost of Capital*, (Harvard Business School Press: Boston, MA, 1994), 134.

Flotation costs occur when new issues of stock or debt are sold to the public. The firm usually incurs several kinds of flotation or transaction costs, which reduces the actual proceeds received by the firm. Some of these are direct out-of-pocket outlays, such as fees paid to underwriters, legal expenses, and prospectus preparation costs. Because of this reduction in proceeds, the firm's required returns on these proceeds equate to a higher return to compensate for the additional costs. Flotation costs can be accounted for either by amortizing the cost, thus reducing the cash flow to discount, or by incorporating the cost into the cost of capital. Because flotation costs are not typically applied to operating cash flow, one must incorporate them into the cost of capital.<sup>48</sup>

An adjustment for flotation cost must be made even if the issuing company has no plans to ever issue any additional securities. The following illustration is quoted by Roger A. Morin, PhD, *Regulatory Finance: Utilities' Cost of Capital*, (Arlington, VA: Public Utilities Reports, Inc., 1994), p. 170.] and fully addresses this issue.

Brigham, Aberwald, and Gapenski (1985) performed an excellent analysis regarding the need for a flotation cost adjustment. The following illustration adapted from Brigham, Aberwald, and Gapenski (1985) shows that: (1) even if no further stock issues are contemplated, the flotation adjustment is still permanently required to keep shareholders whole, and (2) flotation costs are only recovered if the rate of return is applied to total equity, including retained earnings, in all future years, even if no future financing is contemplated....It is noteworthy that the adjustment is always required each and every year, whether or not new stock issues are sold in the future, and that the allowed return on equity must be earned on total equity, including retained earnings, for investors to earn the cost of equity.<sup>49</sup>

Companies generally hire an investment banker to assist them when they issue common stock, preferred stock, or bonds. In return for a fee, the investment banker helps the company with the terms, price, and sale of the issue. The banker's fees are often referred to as **flotation costs**. The total cost of capital should include not only the required return paid to investors but also the flotation fees paid to the investment banker for marketing the issue.<sup>50</sup> [This identical quote

---

<sup>48</sup> Pratt, Shannon P., *Cost of Capital, Estimation and Applications*, (NY: John Wiley & Sons, Inc. 1998) 176.

<sup>49</sup> Roger A. Morin, PhD, *Regulatory Finance: Utilities' Cost of Capital*, (Arlington, VA: Public Utilities Reports, Inc., 1994), 170-171. (emphasis added)

<sup>50</sup> Brigham, Eugene F. and Michael C. Ehrhardt, *Financial Management: Theory and Practice*, 10<sup>th</sup> ed. (Thomson Learning, Inc.: Stamford, CT, 2002), 452.

is also found in *Fundamentals of Financial Management*, 9<sup>th</sup> ed. (Dryden Press) by Eugene F. Brigham and Joel F. Houston, Chapter 10.]

Additionally, Dr. Roger Ibbotson refers to flotation cost in his book, *Stocks, Bonds, Bills and Inflation*, when he discusses the cost of capital. He states the following:

Although the cost of capital estimation techniques set forth later in this book are applicable to rate setting, certain adjustments may be necessary. One such adjustment is for flotation costs (amounts that must be paid to underwriters by the issuer to attract and retain capital).<sup>51</sup>

All of these studies reach the conclusion that a flotation cost adjustment must be made when estimating the cost of capital. Alternatively, some finance textbooks suggest that it is better to adjust the net present value of the assets downward.

**Issue costs.** If accepting the project forces the firm to issue securities, then the present value of issue costs should be subtracted from base-case NPV.<sup>52</sup>

In either case (whether the cost of capital is adjusted upward or the net present value of the assets is adjusted downward) the end result is exactly the same – the market value of the assets subject to appraisal is lower as a result of flotation costs.

Even if one accounted for flotation costs as a negative cash flow [as Brealey, Myers and Marcus suggest – see *Fundamentals of Corporate Finance* (2004) 4<sup>th</sup> ed. Pg. 335-336] rather than an adjustment to the WACC, we should get exactly the same correct valuation. The following will illustrate that it makes no difference mathematically whether we (1) account for flotation costs in the WACC or (2) account for flotation costs as a negative cash flow. Please note the example that follows where we compare the appraisal by either adjusting the WACC for flotation costs or simply deducting the flotation costs from the expected cash flow to get the net cash flow. In both cases \$950 is available to purchase assets because \$50 was the flotation cost from issuing \$1,000 worth of securities. Note that market value in both cases is exactly the same — \$950. Clearly it makes no difference whether one adjusts the WACC or does all the necessary math to find the net present value after treating flotation costs as a negative cash flow at the beginning of the first year. The following flotation cost measurement example is taken from the

---

<sup>51</sup> *Stocks, Bonds, Bills and Inflation: 2012 Yearbook, Valuation Edition* (Chicago: Morningstar, Inc., 2012), 25.

<sup>52</sup> Brealey, Richard & Stewart C. Myers, *Principles of Corporate Finance*, 7<sup>th</sup> ed. (New York: McGraw-Hill, 2002), 552.



### Flotation Cost Measurement

WACC Adjustment Method		Cash Flow Adjustment Method			
Securities Issued	\$1,000	Securities Issued	\$1,000		
Cost of Capital	10%	Flotation Cost =	\$50		
Required Return	\$100	Assets Purchased	\$950		
Flotation Cost =	5.00%	Disc. Rate = Unadjusted WACC =	10.00%		
Flotation Cost =	50	<b>First Year's Cash Flow:</b>			
Assets Purchased	<b>950</b>	<b>Pres. Value Factor</b>		<b>NCF</b>	
Cost of Capital	10.00%	Beg. of Year	(\$50)	1.10	(\$55)
1 - FC =	0.95	First Year's Income =		100	
Adj'd. Cost of Cap.	10.5263%	First Year's Net Cash Flow =		45	
<b>Market Value:</b>		End of Year	NCF	Pres. Value Factor (divisor)	Pres. Value
Required Return	100	1	45	1.10	40.91
Adj'd Cost of Cap.	10.5263%	2	100	1.21	82.64
		3	100	1.33	75.13
		4	100	1.46	68.30
		5	100	1.61	62.09
		6	100	1.77	56.45
		7	100	1.95	51.32
		8	100	2.14	46.65
		9	100	2.36	42.41
		10	100	2.59	38.55
		skip to			
		339	100	107,676,335,910,201.00	0.00
		340	100	118,443,969,501,221.00	0.00
		341	100	130,288,366,451,343.00	0.00
		342	100	143,317,203,096,477.00	0.00
		343	100	157,648,923,406,125.00	0.00
		344	100	173,413,815,746,737.00	0.00
		345	100	190,755,197,321,411.00	0.00
		346	100	209,830,717,053,552.00	0.00
		347	100	230,813,788,758,908.00	0.00
		348	100	253,895,167,634,798.00	0.00
		349	100	279,284,684,398,278.00	0.00
		350	100	307,213,152,838,106.00	0.00
					<b>\$950.00</b>

As one can see from the above mathematical example the same \$950 value results in either case. Actually, it is wrong to presuppose that one knows how much flotation cost to deduct in a

<sup>53</sup> Tegarden, Thomas K., "The Appraisal of Public Utilities: Adjustment to the WACC for Flotation Costs," *Journal of Property Tax Management & Administration*, (Chicago: IAAO), Vol. 5, Issue 1, 2008, 71-74.

valuation problem because in order to know exactly how much flotation cost will be, one has to already know what the value in order to know how much debt and equity will have to be issued. Thus, the appraiser must be biased or clairvoyant or both. **In solving a valuation problem, the WACC adjustment method is best.** If one already knew the amount of debt and equity securities to be issued, one would have to already know the purchase price and thus, the valuation. It's a 'Catch 22.' If one already knew the value, why do an appraisal at all?

The flotation costs associated with debt for large issues conservatively are approximately 1%. For relatively large issues of equity, the flotation costs range from a low of 2% to as much as 6%. From information derived from *Public Utility Finance Tracker* we determined the average flotation cost associated with the issuance of long-term debt and common stock of natural gas and natural gas transmission companies. We found the average issuance cost of long-term debt to be 1.00% and the average issuance cost of common equity to be 4.25%. We selected 1.00% and 4.25% to be representative of the typical flotation cost associated with the issuance of long-term debt and common stock securities, respectively.

On the following pages are the schedules detailing the long-term debt and common stock flotation costs.

**Debt Issuance Cost**  
**Natural Gas/Transmission Utilities (1997 - 2017)**

Company	Type of Utility	Issue Date	Amount Offered (\$000)	Price to Public (\$/100)	Net Proceeds	Issue Cost
Michigan Con Gas Company	Gas	14-May-97	15,000	100.000	96.868	3.23%
Michigan Con Gas Company	Gas	15-May-97	30,000	100.000	99.247	0.76%
Michigan Con Gas Company	Gas	15-May-97	40,000	100.000	99.361	0.64%
Seagull Energy Corp.	Gas	25-Sep-97	150,000	99.544	98.544	1.02%
SONAT Inc.	Gas	25-Sep-97	100,000	99.748	99.097	0.66%
Southern Natural Gas Co.	Gas	25-Sep-97	100,000	99.891	99.239	0.66%
Laclede Gas	Gas	16-Oct-97	25,000	98.682	98.352	0.34%
Kn Energy Inc.	Gas	22-Oct-97	150,000	100.000	99.374	0.63%
Northern Illinois Gas Co.	Gas	23-Oct-97	50,000	99.500	98.996	0.51%
Enron Oil & Gas Co.	Gas	25-Nov-97	100,000	99.709	99.058	0.66%
Consolidated Natural Gas Co.	Gas	09-Dec-97	300,000	99.190	98.314	0.89%
SONAT	Gas	27-Jan-98	100,000	99.531	98.879	0.66%
SONAT	Gas	29-Jan-98	100,000	99.787	98.912	0.89%
KN Energy, Inc.	Gas	04-Mar-98	500,000	99.784	98.908	0.89%
KN Energy, Inc.	Gas	04-Mar-98	150,000	99.496	98.370	1.14%
Coastal Corp.	Gas	02-Jun-98	200,000	99.882	99.231	0.66%
Coastal Corp.	Gas	02-Jun-98	200,000	99.661	98.785	0.89%
Wisconsin Gas Co.	Gas	19-Jan-99	50,000	99.252	98.602	0.66%
No. Illinois Gas Co.	Gas	02-Feb-99	50,000	100.000	99.350	0.65%
Providence Gas Co.	Gas	04-Feb-99	15,000	100.000	96.850	3.25%
Cascade Natural Gas Corp.	Gas	15-Mar-99	15,000	100.000	99.250	0.76%
Laclede Gas Co.	Gas	28-May-99	25,000	100.000	99.502	0.50%
Mich. Consolidated Gas Co.	Gas	04-Jun-99	55,000	100.000	96.850	3.25%
Williams Co.	Gas	21-Jul-99	700,000	99.075	98.200	0.89%
Williams Communication Grp.	Gas	30-Sep-99	1,500,000	99.249	96.749	2.58%
Indiana Gas Co.	Gas	04-Oct-99	30,000	100.000	99.375	0.63%
Northwest Natural Gas	Gas	09-Dec-99	20,000	100.000	99.250	0.76%
SEMCO Energy	Gas	12-Apr-00	30,000	100.000	97.250	2.83%
New Jersey Gas Co.	Gas	29-Jun-00	10,000	100.000	99.250	0.76%
New Jersey Gas Co.	Gas	05-Jul-00	10,000	100.000	96.850	3.25%
New Jersey Gas Co.	Gas	01-Jul-00	15,000	100.000	97.600	2.46%
Northwest Natural Gas	Gas	29-Aug-00	20,000	100.000	99.250	0.76%
Northwest Natural Gas	Gas	06-Sep-00	20,000	100.000	99.250	0.76%
Northwest Natural Gas	Gas	06-Sep-00	10,000	100.000	99.250	0.76%
Northwest Natural Gas	Gas	27-Nov-00	25,000	100.000	99.375	0.63%
AgI Capital Corp	Gas	23-Feb-01	300,000	99.578	98.928	0.66%
Oneok, Inc	Gas	03-Apr-01	400,000	99.912	99.262	0.65%
Atmos Energy Corp	Gas	15-May-01	350,000	99.940	99.290	0.65%
Semco Energy	Gas	18-Jun-01	60,000	100.000	97.500	2.56%
Questar Gas Co.	Gas	03-Oct-01	60,000	100.000	99.375	0.63%
Northwest Natural Gas	Gas	26-Mar-02	40,000	100.000	99.375	0.63%
Northwest Natural Gas	Gas	24-Sep-02	30,000	100.000	99.250	0.76%
JGI Utilities Inc.	Gas	25-Sep-02	20,000	100.000	99.375	0.63%
California Gas Co.	Gas	02-Oct-02	250,000	99.897	99.247	0.65%
AGL Capital Corp.	Gas	07-Jan-03	225,000	99.927	99.277	0.65%
Atmos Energy Corp	Gas	13-Jan-03	250,000	99.915	99.250	0.67%



**Debt Issuance Cost**  
**Natural Gas/Transmission Utilities (1997 - 2017)**

Company	Type of Utility	Issue Date	Amount Offered (\$000)	Price to Public (\$/100)	Net Proceeds	Issue Cost
Sepra Energy	Gas	01-Feb-03	400,000	99.658	99.008	0.66%
Michigan Consolidated Gas Co	Gas	12-Feb-03	200,000	99.637	98.762	0.89%
Northwest Natural Gas	Gas	25-Feb-03	10,000	100.000	99.250	0.76%
Nisource Finance Corp	Gas	01-Mar-03	345,000	100.000	99.354	0.65%
Keyspan Corporation	Gas	01-Apr-03	150,000	99.763	98.888	0.88%
AGL Capital Corp.	Gas	15-Apr-03	225,000	99.927	99.277	0.65%
The Cincinnati Gas & Electric Co.	Gas	12-Jun-03	200,000	99.764	98.889	0.88%
The Cincinnati Gas & Electric Co.	Gas	12-Jun-03	200,000	99.396	98.521	0.89%
Baltimore Gas And Electric Company	Gas	17-Jun-03	200,000	99.295	98.420	0.89%
Nisource Finance Corp	Gas	16-Jul-03	500,000	99.862	99.212	0.66%
Vectren Coproation	Gas	24-Jul-03	100,000	99.746	99.096	0.66%
Vectren Coproation	Gas	24-Jul-03	100,000	99.177	98.477	0.71%
UGI Utilities	Gas	14-Aug-03	20,000	100.000	99.250	0.76%
UGI Utilities	Gas	14-Aug-03	25,000	100.000	99.370	0.63%
Energy East Corporation	Gas	08-Sep-03	200,000	99.830	98.950	0.89%
Madison Gas & Electric Co	Gas	09-Sep-03	20,000	100.000	99.250	0.76%
Energen Corporation	Gas	30-Oct-03	50,000	99.557	98.907	0.66%
Northwest Natural Gas	Gas	21-Nov-03	40,000	100.000	99.250	0.76%
Piedmont Natural Gas Co Inc	Gas	16-Dec-03	100,000	99.859	98.984	0.88%
Piedmont Natural Gas Co Inc	Gas	16-Dec-03	100,000	100.000	99.350	0.65%
AGL Resources	Gas	14-Dec-04	200,000	99.870	99.220	0.66%
Aquila	Gas	18-Aug-04	300,000	25.000	25.000	0.00%
Atmos Energy	Gas	18-Oct-04	500,000	99.993	99.343	0.65%
Atmos Energy	Gas	18-Oct-04	200,000	99.392	98.517	0.89%
Laclede Gas Co.	Gas	21-Apr-04	50,000	99.585	98.835	0.76%
Laclede Gas Co.	Gas	21-Apr-04	100,000	99.434	98.559	0.89%
Michigan Consolidated Gas	Gas	27-Sep-04	120,000	99.594	98.844	0.76%
Consolidated Natural Gas Co	Gas	15-Nov-04	400,000	99.686	99.036	0.66%
Alabama Gas Corp	Gas	11-Jan-05	40,000	100.000	96.860	3.24%
Alabama Gas Corp	Gas	11-Jan-05	40,000	100.000	99.350	0.65%
Alabama Gas Corp	Gas	14-Nov-05	80,000	100.000	99.400	0.60%
Cascade Natural Gas	Gas	20-Jan-05	30,000	100.000	96.850	3.25%
Cascade Natural Gas	Gas	29-Aug-05	15,000	100.000	99.300	0.70%
Northwest Natural Gas Co.	Gas	02-Jun-05	40,000	100.000	99.375	0.63%
Northwest Natural Gas Co.	Gas	21-Jun-05	10,000	100.000	99.250	0.76%
Vectren Utility Holdings, Inc	Gas	16-Nov-05	75,000	99.799	99.149	0.66%
Vectren Utility Holdings, Inc	Gas	16-Nov-05	75,000	99.779	98.904	0.88%
Laclede Gas Co.	Gas	06-Jun-06	55,000	99.852	98.977	0.88%
Piedmont Natural Gas Co., Inc	Gas	15-Jun-06	200,000	100.000	96.850	3.15%
AGI Capital Resources	Gas	27-Jun-06	175,000	99.856	99.206	0.65%
Southern Union Co.	Gas	18-Oct-06	600,000	99.644	98.344	1.30%
Northwest Natural Gas Co.	Gas	15-Dec-06	25,000	100.000	99.375	0.63%
Alabama Gas Corp	Gas	10-Jan-07	45,000	100.000	99.125	0.88%
Atmos Energy Corp	Gas	11-Jun-07	250,000	99.729	99.079	0.66%
Vectren Utility Holdings, Inc	Gas	05-Mar-08	125,000	100.000	96.850	3.25%
Vectren Utility Holdings, Inc	Gas	24-Mar-08	100,000	99.930	99.062	0.88%

**Debt Issuance Cost**  
**Natural Gas/Transmission Utilities (1997 - 2017)**

Company	Type of Utility	Issue Date	Amount Offered (\$000)	Price to Public (\$/100)	Net Proceeds	Issue Cost
Vectren Utility Holdings, Inc	Gas	24-Mar-08	50,000	99.400	99.290	0.11%
Laclede Gas Co	Gas	18-Sep-08	80,000	100.000	96.850	3.25%
Washington Gas Light	Gas	05-Dec-08	50,000	100.000	99.375	0.63%
AGI Capital Corp	Gas	05-Aug-09	300,000	99.783	99.133	0.66%
Atmos Energy	Gas	23-Mar-09	450,000	99.813	99.163	0.66%
National Fuel Gas Co	Gas	01-Apr-09	250,000	99.762	99.112	0.66%
Northwest Natural Gas Co.	Gas	20-Mar-09	75,000	100.000	99.375	0.63%
Sempra Energy	Gas	05-Oct-09	750,000	99.159	98.284	0.89%
Central Hudson Gas &Elec Corp	Gas	02-Dec-10	44,150	100.000	99.375	0.63%
Central Hudson Gas &Elec Corp	Gas	02-Dec-10	30,000	100.000	92.467	8.15%
Southwest Gas Corporation	Gas	07-Dec-10	125,000	99.818	99.168	0.66%
Washington Gas Light Co.	Gas	30-Nov-10	75,000	100.000	99.979	0.02%
AGL Capital Corp.	Gas	16-Mar-11	500,000	99.833	98.958	0.88%
Atmos Energy Co	Gas	07-Jun-11	400,000	99.678	98.803	0.89%
Northwest Natural Gas Co	Gas	19-Aug-11	500,000	100.000	99.375	0.63%
AGL Capital Corp.	Gas	15-Sep-11	200,000	113.434	112.559	0.78%
AGL Capital Corp.	Gas	15-Sep-11	300,000	98.483	97.833	0.66%
National Fuel Gas Co	Gas	28-Nov-11	500,000	99.867	99.217	0.66%
San Diego Gas & Elec	Gas	19-Mar-12	250,000	99.481	98.606	0.89%
Pacific Gas & Elec	Gas	11-Apr-12	400,000	99.491	98.616	0.89%
Pacific Gas & Electric Co	Gas	13-Aug-12	350,000	99.911	99.035	0.88%
Pacific Gas & Electric Co	Gas	13-Aug-12	400,000	99.709	99.059	0.66%
Baltimore Gas & Electric Co.	Gas	14-Aug-12	250,000	99.620	99.314	0.31%
Sempra Energy	Gas	19-Sep-12	500,000	99.965	99.315	0.65%
AGI Capital	Gas	13-May-13	500,000	99.618	98.743	0.89%
Atmos Energy	Gas	08-Jan-13	500,000	99.812	98.937	0.88%
Integrus Energy Group	Gas	12-Aug-13	400,000	25.000	24.213	3.25%
NiSource	Gas	09-Apr-13	750,000	99.575	98.700	0.89%
NiSource Finance	Gas	03-Oct-13	500,000	99.341	98.466	0.89%
Northwest Natural Gas Co	Gas	14-Aug-13	50,000	100.000	99.375	0.63%
Piedmont Natural Gas Co	Gas	29-Jul-13	300,000	99.952	99.077	0.88%
Sempra Energy	Gas	09-Nov-13	500,000	99.665	99.015	0.66%
Laclede Group Inc	Gas	12-Aug-14	250,000	99.908	99.030	0.88%
Piedmont Natural Gas Co	Gas	15-Sep-14	250,000	99.826	99.076	0.75%
Atmos Energy	Gas	06-Oct-14	500,000	99.812	98.937	0.88%
WGL Holdings Inc	Gas	22-Oct-14	125,000	99.226	98.351	0.88%
WGL Holdings Inc	Gas	11-Dec-14	125,000	92.612	91.737	0.88%
WGL Holdings Inc	Gas	13-Nov-15	250,000	99.910	99.260	0.65%
WGL Holdings Inc	Gas	22-Jun-15	450,000	99.686	99.036	0.65%
WGL Holdings Inc	Gas	09-Sep-15	150,000	99.935	99.285	0.65%
WGL Holdings Inc	Gas	12-Nov-15	350,000	99.728	99.078	0.65%
AGI Capital Corp	Gas	13-May-16	350,000	99.598	98.948	0.66%
Peidmont Natural Gas Co., Inc.	Gas	25-Jul-16	300,000	99.878	99.003	0.88%
Southwest Gas Corp	Gas	26-Sep-16	300,000	99.698	98.823	0.89%
Washington Gas Light Co.	Gas	16-Sep-16	250,000	100.000	99.250	0.76%



**Debt Issuance Cost  
Natural Gas/Transmission Utilities (1997 - 2017)**

Company	Type of Utility	Issue Date	Amount Offered (\$000)	Price to Public (\$/100)	Net Proceeds	Issue Cost
Atmos Energy Corp	Gas	05-Jun-17	500,000	99.725	99.075	0.66%
Atmos Energy Corp	Gas	05-Jun-17	250,000	103.907	103.032	0.85%
Baltimore Gas And Electric Co	Gas	21-Aug-17	300,000	99.199	98.324	0.89%
National Fuel Gas Co	Gas	18-Sep-17	300,000	99.317	98.667	0.66%
Nisource Finance Corp	Gas	05-Sep-17	750,000	99.892	99.017	0.88%
Nisource Finance Corp	Gas	11-May-17	1,000,000	99.918	99.043	0.88%
Nisource Finance Corp	Gas	11-May-17	1,000,000	99.984	99.334	0.65%
Northwest Gas Co.	Gas	06-Sep-17	15,000	100.000	99.250	0.76%
Northwest Gas Co.	Gas	06-Sep-17	25,000	100.000	99.400	0.60%
Oklahoma Gas Electric Co	Gas	08-Aug-17	300,000	99.682	98.800	0.89%
PECO Energy Co	Gas	11-Sep-17	325,000	99.623	98.748	0.89%
San Diego Gas And Electric Co	Gas	05-Jun-17	400,000	99.554	98.679	0.89%
Southern Company Gas	Gas	04-May-17	450,000	99.765	98.890	0.88%
					Average	1.00%
					Selected	1.00%

Source: Public Utility Finance Tracker, February 1998 - 2018.



**Common Stock Issuance Cost  
Natural Gas/Transmission Utilities (1990 - 2017)**

Company	Type of Company	Issue Date	Number of Shares (000)	Price to Public	Net Proceeds	Issue Cost
Consolidated Natural Gas	Gas	08-Jan-90	3,500	45.50	44.24	2.85%
Washington Energy	Gas	17-Jan-90	1,750	20.13	19.26	4.52%
Colonial Gas	Gas	15-May-90	600	21.50	20.27	6.07%
Atlanta Gas Light	Gas	05-Dec-90	1,000	31.38	30.00	4.60%
Washington Energy	Gas	04-Feb-91	2,650	19.00	18.21	4.34%
Piedmont Natural Gas	Gas	03-Apr-91	1,250	28.50	27.36	4.17%
Panhandle Eastern	Gas	18-Jul-91	13,800	10.75	10.27	4.67%
Bay State Gas Co.	Gas	13-Mar-92	1,550	23.25	22.28	4.35%
El Paso Natural Gas Co.	Gas	12-May-92	5,000	19.00	17.77	6.92%
New Jersey Resources Co.	Gas	15-Sep-92	1,500	22.25	21.27	4.61%
Washington Energy Co.	Gas	29-Sep-92	2,750	21.00	20.19	4.01%
Equitable Resources	Gas	22-Sep-93	2,400	38.50	37.25	3.36%
Brooklyn Union Gas	Gas	29-Sep-93	1,700	25.75	24.77	3.96%
S.E. Michigan Gas Enterprises	Gas	19-Jan-94	650	20.50	19.62	4.49%
Connecticut Energy Corp.	Gas	03-Mar-94	900	20.13	19.22	4.71%
Mobile Gas Service Corp.	Gas	14-Sep-94	400	22.00	20.30	8.37%
Northwest Natural Gas	Gas	15-Feb-95	1,000	29.75	28.59	4.06%
MCN Corp.	Gas	14-Mar-95	5,000	17.88	17.21	3.86%
Piedmont Natural Gas	Gas	20-Mar-95	1,500	20.00	19.14	4.49%
Laclede Gas	Gas	15-May-95	1,550	19.00	18.12	4.86%
United Cities	Gas	08-Jun-95	1,200	14.50	13.88	4.47%
Atlanta Gas Light	Gas	12-Jun-95	1,300	33.63	32.51	3.43%
WICOR, INC.	Gas	05-Dec-95	1,100	31.88	30.63	4.06%
Connecticut Natural Gas	Gas	05-Jun-96	640	23.25	22.19	4.78%
Delta Natural Gas	Gas	15-Jul-96	350	16.00	15.07	6.17%
Tejas Gas	Gas	22-Jul-96	3,075	35.00	33.42	4.73%
KN Energy	Gas	31-Jul-96	3,100	32.25	31.01	4.00%
Cascade Natural Gas	Gas	13-Aug-96	1,350	15.25	14.45	5.54%
Energen	Gas	17-Jan-97	1,500	29.50	28.39	3.91%
KCS Energy	Gas	29-Jan-97	3,000	39.00	36.91	5.66%
Energen	Gas	18-Sep-97	1,200	35.50	34.16	3.92%
COHO Energy, Inc.	Gas	29-Sep-97	8,585	10.50	9.87	6.38%
Fall River Gas Co.	Gas	30-Oct-97	340	13.25	12.06	9.87%
Connecticut Energy Corp.	Gas	12-Nov-97	900	24.25	23.17	4.66%
Roanoke Gas Co.	Gas	22-Feb-98	166	20.00	18.67	7.12%
KN Energy	Gas	04-Mar-98	11,000	52.00	49.90	4.21%
Enron Corp.	Gas	05-May-98	15,000	50.00	48.47	3.16%
Laclede Gas Co.	Gas	05-May-99	1,100	50.00	49.34	1.35%
SEMCO	Gas	12-Jun-00	9,000	10.00	9.60	4.17%
WGL Holdings Co.	Gas	26-Jun-01	1,790	26.73	25.80	3.47%
Utilicorp	Gas	25-Jan-02	11,000	23.00	22.28	3.25%
Calpine Corporation	Gas	24-Apr-02	66,000	11.50	11.13	3.30%
MDU Resources Group	Gas	19-Nov-02	2,100	24.00	23.30	3.00%
MDU Resources Group	Gas	29-Nov-02	2,100	24.00	23.16	3.63%
Agl Resources, Inc	Gas	11-Feb-03	5,600	22.00	21.21	3.70%
Atmos Energy Corp.	Gas	18-Jun-03	4,000	25.31	24.25	4.38%

**Common Stock Issuance Cost  
Natural Gas/Transmission Utilities (1990 - 2017)**

Company	Type of Company	Issue Date	Number of Shares (000)	Price to Public	Net Proceeds	Issue Cost
Sempra Energy	Gas	23-Oct-03	15,000	28.00	27.15	3.12%
Southern Union Co.	Gas	10-Jun-03	3,000	16.15	16.15	0.00%
Southern Union Co.	Gas	05-Jun-03	9,500	16.00	15.38	4.06%
Southern Union Co.	Gas	15-Jun-03	2,500	50.00	48.17	3.80%
Vectren Corporation	Gas	07-Aug-03	6,500	22.81	22.00	3.70%
AGL Resources	Gas	19-Nov-04	9,600	31.010	30.038	3.23%
Ameren	Gas	30-Jun-04	10,000	42.000	40.700	3.19%
Aquila(M)	Gas	18-Aug-04	40,000	2.550	2.451	4.04%
Atmos Energy Co.	Gas	21-Oct-04	14,000	24.750	23.760	4.17%
Northwest Natural Gas Co.	Gas	30-Mar-04	1,200	31.000	29.844	3.87%
Piedmont Natural Gas Co. Inc	Gas	20-Jan-04	4,250	42.500	41.010	3.63%
Southern Union Co.	Gas	26-Jul-04	11,000	18.750	18.003	4.15%
The Laclede Group Inc	Gas	06-May-04	1,500	26.800	25.862	3.63%
JGI Corp.	Gas	18-Mar-04	7,500	32.100	30.696	4.58%
Semco Energy	Gas	09-Aug-05	27,176	6.320	6.067	4.17%
Southern Union Co.	Gas	07-Feb-05	342,999	23.000	22.300	3.14%
Chesapeake Utility Corp	Gas	15-Nov-06	600	30.100	28.975	3.88%
Vectron Corp	Gas	22-Feb-07	4,600	28.33	27.34	3.62%
Clean Energy	Gas	25-Jun-09	8,200	8.30	7.80	6.38%
EQT	Gas	10-Mar-11	12,500	44.00	42.24	4.17%
Gas Natural Inc	Gas	30-Nov-13	1,134,000	10.00	9.42	6.16%
Gas Natural Inc	Gas	11-Jul-13	1,500	10.00	9.42	6.16%
Laclede Group	Gas	22-May-13	8,700	4.50	4.33	3.98%
Piedmont Natural Gas Co.	Gas	29-Jan-13	4,000	32.00	30.88	3.63%
Atmos Energy	Gas	11-Feb-14	800	44.00	42.46	3.63%
The Laclede Group Inc	Gas	05-Jun-14	9,000	46.25	44.54	3.84%
Chesapeake Utilities Corp	Gas	22-Sep-16	835	62.26	62.24	3.74%
South Jersey Industries, Inc	Gas	12-May-16	7,000	26.25	26.24	3.50%
Spectra Energy Corp	Gas	04-Apr-16	1,400	30.00	30.00	0.90%
Spire Inc	Gas	12-May-16	1,900	63.05	63.03	3.25%
Average						4.25%
Selected						4.25%

Source: Public Utility Finance Tracker, February 1991 - 2018.



Incorporating the flotation costs found on the previous pages into our cost of capital study is computed and the result is shown in the table below.

<b>Cost of Capital Including Flotation Costs</b>			
<b>Capital</b>	<b>Portion</b>	<b>Cost</b>	<b>Product</b>
Debt	30.00%	5.04%	1.51%
Equity	70.00%	13.05%	9.14%
Totals	100.00%		10.65%

Including flotation cost in the cost of capital requires an adjustment to compensate for the expense is issuing of debt and equity. This is in accordance with virtually all finance texts, as well as the practices of state and federal regulatory commissions, and the adjustment is necessary to properly match income and rate in the capitalization process for property tax appraisals. Including flotation cost adds approximately 0.40% (40 basis points) to the overall cost of capital. The cost of capital to purchase the operating assets for the typical interstate natural gas pipeline after accounting for flotation costs was **10.65%** at January 1, 2018.

## **Other Issues Regarding the Cost of Capital**

### **Geometric Mean vs. Arithmetic Mean**

Occasionally appraisers make the mistake of using the geometric mean rather than the arithmetic mean in measuring the equity risk premium. The geometric mean is backward-looking, measuring the change in wealth over more than one period. On the other hand, the arithmetic mean better represents a typical performance over single periods and serves as the correct rate for forecasting, discounting, and estimating the cost of capital. Dr. Roger Ibbotson has written regarding this issue as follows:

The equity risk premium data presented in this book are arithmetic average risk premia as opposed to geometric average risk premia. The arithmetic average equity risk premium can be demonstrated to be most appropriate when discounting future cash flows. For use as the expected equity risk premium in either the CAPM or the building block approach, the arithmetic mean or the simple difference of the arithmetic means of stock market returns and riskless rates is the relevant number. This is because both the CAPM and the building block approach are additive models, in which the cost of capital is the sum of its parts. The geometric average is more appropriate for reporting past performance,

since it represents the compound average return.<sup>54</sup>

Additionally, Dr. Roger Morin addressed the issue of the arithmetic versus geometric means in estimating the cost of capital.

In statistical parlance, the arithmetic average is the unbiased measure of the expected value of repeated observations of a random variable, not the geometric mean. This appendix formally illustrates that only arithmetic averages can be used as estimates of cost of capital, and that the geometric mean is not an appropriate measure of cost of capital.<sup>55</sup>

Brealey, Myers and Allen also addressed this issue:

If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return (geometric averages).<sup>56</sup>

## **Income Return**

The income return is the appropriate return for use in calculating the equity risk premium. This issue is discussed in SBBI as follows:

Another point to keep in mind when calculating the equity risk premium is that the income return on the appropriate-horizon Treasury security, rather than the total return, is used in the calculation. The total return is comprised of three return components: the income return, the capital appreciation return, and the reinvestment return. The income return is defined as the portion of the total return that results from a periodic cash flow or, in this case, the bond coupon payment. The capital appreciation return results from the price change of a bond over a specific period. Bond prices generally change in reaction to unexpected fluctuations in yields. Reinvestment return is the return on a given month's investment income when reinvested into the same asset class in the subsequent months of the year. The income return is thus used in the estimation of the equity

---

<sup>54</sup> *Stocks, Bonds, Bills and Inflation: 2012 Valuation Edition Yearbook*, (Chicago: Morningstar, Inc., 2012), 56.

<sup>55</sup> Morin, Roger A., *New Regulatory Finance* (Vienna, VA: Public Utilities Reports, Inc., 2006), 133.

<sup>56</sup> Richard A. Brealey, Stewart C. Myers, and Paul Allen, *Principles of Corporate Finance*, 8<sup>th</sup> ed., (Irwin McGraw-Hill, 2006), 156-157.

risk premium because it represents the truly riskless portion of the return.<sup>57</sup>

## Equity Risk Premium Puzzle

In 1985, Mehra and Prescott published a paper that discussed the equity risk premium from a utility theory perspective. The point that Mehra and Prescott make is that under existing economic theory, economists cannot justify the magnitude of the equity risk premium. The utility theory model employed was incapable of obtaining values consistent with those observed in the market.

This is an interesting point and may be worthy of further study, but it does not do anything to prove that the equity risk premium is too high. It may, on the other hand, indicate that theoretical economic models require further refinement to adequately explain market behavior.<sup>58</sup>

There is no historical data to suggest a systematic decline in the market risk premium in estimating the cost of equity.

Are there any historical data to suggest a systematic decline in the market risk premium? Exhibit 10.5 plots five-year rolling averages of the market equity risk premium from 1930 to 1995. The volatility of the market risk premium has decreased, but what about the average market risk premium? A regression of the rolling five-year market risk premium versus time indicates that there is no statistically significant change in the risk premium between 1926 and 1995. The slope of the regression is not significantly different from zero.<sup>59</sup>

## Survivorship Bias

Some have suggested that a negative adjustment should be made to the cost of equity for survivorship bias. They argue that the United States has been the most successful stock market of the twentieth century and therefore equity costs do not consider the low returns that failing companies might indicate. If that is the case, is it possible that the equity risk premium statistics based only on U.S. data may overstate the returns of equities as a whole because they only focus on one successful market? According to Dr. Roger Ibbotson this is not the case.

---

<sup>57</sup> *Stocks, Bonds, Bills and Inflation: 2012 Yearbook, Valuation Edition* (Chicago: Morningstar, Inc., 2012), 55.

<sup>58</sup> *Stocks, Bonds, Bills and Inflation: 2012 Yearbook, Valuation Edition* (Chicago: Morningstar, Inc., 2012), 62.

<sup>59</sup> Copeland, Tom, Tim Koller & Jack Murrin, *Valuation: Measuring and Managing the Value of Companies*, 3<sup>rd</sup> ed. (New York: John Wiley & Sons, 2000), 217.

While the survivorship bias evidence may be compelling on a worldwide basis, one can question its relevance to a purely U.S. analysis. If the entity being valued is a U.S. company, then the relevant data set should be the performance of equities in the U.S. market.<sup>60</sup>

Other studies have reached similar conclusions – that survivorship bias is of no significance in measuring the cost of equity in U. S. equity markets.

The U.S. equity premium plays an important role in many areas of finance research and practice. Therefore, the concerns raised by Brown, Goetzmann, and Ross (BGR) that the equity premium might contain serious survival bias should be studied with great care: If proven true, this hypothesis would have widespread impact.

Based on a general survival model developed in this paper, we show that the fundamental difficulty facing the survival argument is that to have high survival bias, the probability of market survival over the long run has to be extremely small, which seems to be inconsistent with existing historical evidence. Therefore, we argue that contrary to what BGR suggest, the survival bias in the U.S. equity premium is unlikely to be significant and the resultant concerns about the survival problem in the current literature are probably overstated.<sup>61</sup>

Thus, we believe that there is no significant survivorship bias affecting our estimate of the cost of capital for the Interstate Natural Gas Pipeline industry at January 1, 2018, and no adjustment is necessary.

---

<sup>60</sup> *Stocks, Bonds, Bills and Inflation: 2012 Yearbook, Valuation Edition* (Chicago: Morningstar, Inc., 2012), 62.

<sup>61</sup> Li, Haitao, and Yuewu Xu, “Survival Bias and the Equity Premium Puzzle,” *The Journal of Finance*, Vol. LVII, Issue 5, October 2002, 1991. (emphasis added)



## Supplement to the Cost of Capital Study

The income approach is based on the principle of anticipation primarily and involves converting dollars of expected future income into present value. The execution of the income approach involves the selection of the appropriate capitalization method, estimation of the expected income, and estimation of a proper capitalization rate which matches the income to be capitalized. The basic income formula is shown in the box to the right.

$$\text{Value} = \frac{\text{Income}}{\text{Rate}}$$

Income-producing property is typically purchased for investment purposes, and the projected net income stream is the critical factor affecting its market value. An investor purchasing income-producing property is in effect trading a sum of present dollars for the right to a stream of future dollars. There is a relationship between the two, and the connecting link is the process of capitalization. Because future dollars are worth less than present dollars, the anticipated future dollars are discounted to a present worth on some basis that reflects the risk and the waiting time involved.

The historical development of the income approach reflects a movement away from an initial emphasis on physical components of value toward a greater emphasis on investment components. The initial division of capitalization was between the concept of value as income divided by a rate (straight capitalization) and as income multiplied by a factor (annuity capitalization). Contemporary income appraisal theory revolves around two categories of capitalization methods — *direct* capitalization and *yield* capitalization.

## Impact of New Tax Law on Valuation

The new Tax Cuts and Jobs Act (TCJA) of 2017 was signed into law on December 20, 2017 by President Donald Trump. The TCJA takes effect on January 1, 2018 and provides for a number of changes in corporate taxes. The most visible and immediate impact is a reduction in corporate federal income tax rates from 35% to 21%. The impact on regulated companies should be minimal from a valuation standpoint. For example, regulated utilities are unlikely to see any long-term benefit. Any reduction in tax costs will be passed on directly to customers as savings, as the regulated model is typically based on cost of service. Any cost reductions resulting from tax reform will result in lower revenues granted from regulators. In fact, the Center for Financial Research and Analysis (CFRA) has stated, “CFRA does not expect regulated gas utilities to see any long-term benefit from U.S. Tax Reform. Any reduction in tax costs will be passed on directly to customers as savings, as the regulated model is typically based on cost of service.”

Actually that statement is good for regulated companies in general because all regulatory commissions (state and federal) in their oversight capacity in setting the rates of return and net

operating income for their regulated companies do essentially the same thing. The regulatory commissions start their regulatory process at the bottom of the income statement and work their way up to the top – just the opposite of what the typical accountant or appraiser would do in estimating net operating income for a generic property.

Regulators set the allowed rate of return using a “standard WACC” (weighted average cost of capital). This WACC is after the correct amount of income tax is computed, taking into consideration the fact that interest expense is a tax-deductible item of expense. Most financial texts compute an after-tax WACC (AT WACC) as if interest expense is not a tax deductible item (or as if the total investment was financed entirely by equity). Some appraisers and financial texts will even compute a pre-tax WACC (PT WACC). In any event, whatever cost of capital is used (as long as it is matched with the proper level of income) should not have any impact on an appraisal. Please see the following illustration which shows all three ‘WACCs’ mentioned above.

Income Tax Rate = 35%

Capital	Portion	Cost	WACC	Tax. Ben.	AT WACC	Divisor	PT WACC
Debt	50%	6.00%	3.00%	65.00%	1.95%		
Equity	50%	10.00%	5.00%		5.00%		
<b>Total</b>	<b>100%</b>		<b>8.00%</b>		<b>6.95%</b>	<b>65.00%</b>	<b>10.69%</b>

Now compare the information above for the company with the new 21% tax rate.

Income Tax Rate = 21%

Capital	Portion	Cost	WACC	Tax. Ben.	AT WACC	Divisor	PT WACC
Debt	50%	6.00%	3.00%	79.00%	2.37%		
Equity	50%	10.00%	5.00%		5.00%		
<b>Total</b>	<b>100%</b>		<b>8.00%</b>		<b>7.37%</b>	<b>79.00%</b>	<b>9.33%</b>

Notice how the standard WACC does not change with the change in the tax law. That is because the standard WACC computed by the regulatory commissions is after the correct amount of income tax is computed and deducted (whatever the tax rate is). That illustrates the cost of service model used by all regulatory commissions. In other words, income taxes are a cost of service expense that is passed on to the consumer no matter what the tax rate or tax expense is.

For unregulated companies the theory would be similar. Regulatory commissions are set up to be a surrogate for market competition and thus the impacts should be similar. For unregulated companies competition should theoretically cause unregulated companies to pass along any tax savings to consumers (same as for regulated companies). In order for unregulated companies to remain competitive with their peers they must offer their goods and services for the

lowest prices possible to allow them to earn their cost of capital. There may be some short-term advantages that accrue to companies because of the new corporate tax rate, however over the long term these advantages will be either regulated or competed away. We must remember that we are appraising these companies (regulated and unregulated) using a perpetuity model. That model assumes that we are appraising only the operating properties that exist on the appraisal date and we are projecting a level income based on the assumption that depreciation expense will be offset with an equal amount of capital expenditures. This is well documented in the railroad public utility appraisal arena and is further discussed by Dr. Gary C. Cornia, David Crapo, and Dr. Larry Walters as quoted below:

This approach is well suited to public utility valuation. It capitalizes a stable, level annual income by assuming that annual depreciation charges will be reinvested annually. This produces a level rate base and, thus, a level income. This net operating income (*NOI*) is then simply divided by the market capitalization rate (*r*). The same mathematical formula ( $V = NOI/r$ ) is also appropriate if the intent is to only value the assets in existence on the lien date. In such a situation, it is assumed that depreciation is equal to the amount of replacement capital expenditures necessary to maintain the existing assets into perpetuity. Thus, the cash flow (*CF*) to be capitalized is deemed to be equal to *NOI*. This formula can also be expressed as  $V = CF/r - g$  where the growth (*g*) is equal to 0 percent when it is expected that the cash flows will remain constant into perpetuity.<sup>62</sup>

Ultimately, the appraiser recognizing that the appraisal procedure of capitalizing net operating income into perpetuity and that net operating income for regulated utilities (and to a large extent for unregulated companies over the long term due to competition) is not likely to be significantly impacted by a change in tax rates (or any other operating expenses). Companies must still earn their cost of capital to remain in business over the long term, regardless of whether they are regulated by a regulatory commission or simply by market competition, their net operating income and thus value are not likely to be significantly impacted by the change in federal income tax rates.

Rating agencies (Moody's, Fitch, and Standard & Poor's) have noted that regulated companies may face a ratings downgrade due to accumulated deferred income taxes (ADIT)

---

<sup>62</sup> Cornia, Gary C., David J. Carpo, and Lawrence C. Walters. 2013. "The Unit Approach to the Taxation of Railroad and Public Utility Property". *Infrastructure and Land Policies*, eds. Ingram, Gregory K. and Karin L. Brandt. Cambridge, MA: Lincoln Institute of Land Policy. This paper was presented at the Lincoln Institute's annual Land Policy Conference in 2012, along with numerous other papers examining the links between infrastructure and land policy. It is included as Chapter 5 in the book "Infrastructure and Land Policies."

having to be paid back to customers. ADIT has been collected based on a 35% income tax rate and is to be paid based on a 21% rate. The excess ADIT will be returned to customers and may create cash flow or interest coverage problems, potentially causing debt ratings downgrades.

## Rates of Return

The typical investor's objective in any investment is to ultimately receive more than the amount invested. The investor thus wants a complete return *of* all capital invested and, in addition, a fair return *on* the capital invested. Thus, the investor expects to completely recoup his investment and be fairly compensated for the use of his capital. The return *of* capital is usually referred to as the recapture of the initial capital investment. The return *on* capital is usually referred to as the compensation an investor receives for the use of his capital until the capital is recaptured.

All rates of return can be classified as either 1) *income rates* or 2) *yield rates*. An example of an income rate is the *overall capitalization rate ( $R_o$ )*. An example of a yield rate is the property's *overall yield rate*, which is synonymous with the *discount rate* and the *cost of capital*. Under certain conditions, the income and yield rates for a property are equal even though they are not conceptually equal.

## Categories of Capitalization

There are two categories (sometimes called methods) of capitalization which can be used in the income approach — *direct* and *yield* capitalization. Each category is based on sound appraisal theory and each is theoretically different in application. Direct capitalization is accomplished by the use of an *overall capitalization rate ( $R_o$ )*. The overall capitalization rate is actually the percent that a single year's income (usually the first year's income) represents as compared to market value. Yield capitalization is accomplished through the use of an *overall yield rate ( $Y_o$ )*. The overall yield rate is conceptually the weighted average of the interest rate for long-term debt and the equity yield rate and is also known as the *weighted average cost of capital (WACC)* or *discount rate*. Unlike the overall capitalization rate, the overall yield rate is not necessarily the percent of market value that the first year's income represents. However, under certain circumstances the overall capitalization rate and the overall yield rate are identical.

## Direct Capitalization

Direct capitalization is a method of converting one year's income into value in one direct step, usually by dividing the income estimate by the appropriate income rate. It is the present worth of the future earnings that gives a proper indication of value by the income approach. Typically the income capitalized is the estimated net utility operating income expected in the

following year. Net utility operating income for public utilities is defined as the income representing the amount available to pay the debt costs and equity costs for the property. Public utility regulatory commissions (both state and federal) recognize that net utility operating income is the level of income necessary to pay the cost of capital annually.

Regulatory commissions develop the cost of debt capital and cost of equity capital for the INGPI company in each rate case. The cost of debt capital and the cost of equity capital is weighted by the respective percentages of the amount of debt and equity in the overall capital structure for the utility. The resulting **weighted average cost of capital** is multiplied by the authorized rate base to obtain the authorized net utility operating income for regulatory purposes, which is the targeted amount that the regulatory commissions intend for the utility to earn each year to pay its cost of capital. Net utility operating income is reported on the utility's income statement and it is the amount available to pay to debt and equity holders. Thus, net utility operating income is the level of income set by regulatory commissions to fully cover the cost of capital of a public utility.

A note of caution about the use of direct capitalization is given here. There are six accepted techniques which can be used correctly to derive the overall capitalization rate used in direct capitalization. They are as stated below.

When supported by appropriate market data, accepted techniques include 1) derivation from comparable sales, 2) derivation from effective gross income multipliers and net income ratios, 3) band of investment—mortgage and equity components, 4) band of investment—land and building components, 5) the debt coverage formula, and 6) yield capitalization techniques such as the general yield and change formula, ( $R_O = \text{yield} - \text{change in income and value}$ ) and the Ellwood method.<sup>63</sup>

Generally accepted appraisal literature indicates that it is improper under any circumstances to use sales of stock as comparable sales for deriving an overall capitalization rate or even an equity capitalization rate. In fact, there is an abundance of caution in appraisal literature about the use of sales that are not comparable to the property being appraised (such as deriving earnings-price ratios from stock transactions). For example, the following quotation addresses this issue:

**Fundamental Investment Difference between Investment Securities and Real Estate/Tangible Personal Property.** Table 29-2 summarizes some of the intrinsic differences between capital market securities (whether debt or equity instruments) and real estate and

---

<sup>63</sup> *The Appraisal of Real Estate*, 13<sup>th</sup> ed., (Chicago: Appraisal Institute, 2008), 501.



tangible personal property (either individual assets or going concern assemblages of assets) as investment alternatives.

**Table 29-2**  
**Investment Differences between Securities and Real Estate/Personal Property**

<b>Securities (Debt or Equity Instruments)</b>	<b>Real Estate/Personal Property (Individually or as a Mass Assemblage)</b>
1. Liquid, marketable investments	1. Illiquid investments
2. Noncontrolling interest in income production and distribution	2. Controlling interest in income production and distribution
3. Small, absolute dollar investment required	3. Large, absolute dollar investment required
4. Small percentage of overall wealth committed to this investment	4. Large percentage of overall wealth committed to this investment
5. Diversified portfolio of investments	5. Nondiversified portfolio of investments
6. Short-term investment time horizon	6. Long-term investment time horizon
7. Does not require re-investment to maintain investment base	7. Requires “replenishment” investment to maintain investment base
8. Investments expected to appreciate over time	8. Investments expected to depreciate over time
9. Income typically subject to only individual tax (from investor’s perspective)	9. Income typically subject to both corporate and individual tax (from investor’s perspective)
10. Portfolios can be created in limitless combinations of risky securities and risk-free securities	10. Portfolio limited to the particular combination of real estate and personal property that operate the subject business

As the table indicates, there are fundamental investment risk and return differences between (1) marketable, minority interests in debt and equity securities and (2) nonmarketable, controlling interests in operating real estate and tangible personal property. Due to these differences, and for other reasons, it is unlikely that an economic model that correlates nondiversified risk and expected return for one type of investment will effectively serve the same function for such a different type of investment.<sup>64</sup>

Thus, it is clear from appraisal literature that it is absolutely wrong to use earnings-price

---

<sup>64</sup> Pratt, Reilly, & Schweih, *Valuing A Business*, 3<sup>rd</sup> edition, (Chicago: Irwin Professional Publishing, 1996), 708.

ratios derived from stock sales as the equity capitalization rate or the equity yield rate in the appraisal of tangible assets or mass assemblages of assets as a going concern. Further, it is improper to use earnings-price ratios to match with the net utility operating income authorized by the FERC. The FERC does not utilize earnings-price ratios in the determination of the cost of equity for any company or in setting the authorized net operating amount. Finally, for the FERC to set the cost of equity capital based on earnings-price ratios would violate the mandates of the US Supreme court in their *Hope Natural Gas* and *Bluefield Water Works* decisions, which require the regulatory commissions to allow the regulated utilities to earn their cost of capital (commensurate with the return earned by companies of comparable risk).

Appraisal texts tell us explicitly that an appraiser **may not** derive equity capitalization rates from the stock market, however the same appraisal texts emphatically state that appraisers can derive equity yield rates from stocks and bonds of commensurate risk in the market. The use of earnings-price ratios as a substitute for the equity capitalization rate in deriving equity value, is simply not permissible. For example, IAAO's primary textbook addresses this issue as stated below.

The equity yield rate ( $Y_E$ ) is different from the equity capitalization rate ( $R_E$ ). The equity capitalization rate is simply the ratio between the first year's income and the equity value or equity investment. The equity yield rate is the rate of return on equity capital. It is similar in concept to the property's overall yield rate ( $Y_O$ ). The equity yield rate can be estimated by extraction from recent comparable sales (similar to derivation of the overall yield rate in the previous example), survey and opinion of market participants, and comparison with the equity yield rates ( $Y_E$ ) achieved in alternative investments of comparable risk such as stocks and bonds. While the equity yield rate ( $Y_E$ ) can be developed from alternative investments of comparable risks such as stocks and bonds, the equity capitalization rate ( $R_E$ ) used in direct capitalization cannot be developed correctly from the earnings-to-price ratios of common stocks. Earnings-to-price ratios of common stocks can only be used in the appraisal of similar common stock, not for the appraisal of real personal property.<sup>65</sup>

Additionally, many of the interstate natural gas pipeline companies are subsidiaries of publicly traded holding companies. The use of a parent company traded stock earnings-price ratio as comparison to an untraded subsidiary company would further exacerbate an incorrect equity value.

---

<sup>65</sup> *Property Assessment Valuation*, 3<sup>rd</sup> ed., (Kansas City: International Association of Assessing Officers, 2010), 362.

## Yield Capitalization

Yield capitalization is a method of converting a series of income flows (called cash flows) or a singular representative level cash flow into present value by discounting the expected future benefits at an appropriate discount rate (synonymous with the property's **overall yield rate** or **cost of capital**).

To perform yield capitalization, an appraiser 1) selects an appropriate projection period; 2) forecasts all future cash flows or cash flow patterns (including the reversion); 3) chooses an appropriate yield rate; and 4) converts future benefits into present value by discounting each annual future benefit or by developing an overall rate that reflects the income pattern, value change, and yield rate using one of the various yield capitalization formulas. The application of capitalization rates that reflect an appropriate yield rate, the use of present value factors, and discounted cash flow analysis are all yield capitalization procedures.<sup>66</sup>

Thus, the appraiser performs yield capitalization by either 1) discounting each individual cash flow to its present value for the duration of the income, or 2) capitalizing the appropriate income at an overall capitalization rate, which represents the income pattern, value change, and yield rate.

Upon projecting the amount, timing, and duration of the cash flows to the property being appraised, the appraiser must identify the pattern that the cash flow is expected to follow during the holding period. Those patterns are either variable, level, increasing, or decreasing annuities. For a level annuity where a property is expected to generate a level net utility operating income for a finite period of time and then be resold at the original purchase price, the property can be valued with capitalization in perpetuity by dividing the periodic income by the appropriate discount rate. In this model the discount rate and the overall capitalization rate are the same.<sup>67</sup>

When the net income consists of a fixed amount that represents the return of capital (depreciation expense) plus a declining amount representing the return on the capital remaining in the investment, classic straight-line capitalization can be used to value the property.<sup>68</sup> In this model, as with the level perpetuity, the discount rate and the overall capitalization rate are equal when properly applied to a utility's net cash flow.

If the cash flow pattern is expected to be in the form of a variable annuity each individual income flow will be discounted into an indication of present worth at the appropriate discount

---

<sup>66</sup> *The Appraisal of Real Estate*, 13<sup>th</sup> ed., (Chicago: Appraisal Institute, 2008), 519-520.

<sup>67</sup> *Ibid.*, 560.

<sup>68</sup> *Ibid.*, 560.

rate for the holding period. Further, the appraiser discounts any remaining value in the investment at the end of the holding period and adds the total present worth of the variable cash flows to the present worth of the future value at the end of the holding period. The total represents the present worth of the total property.

The application of the DCF model for a variable annuity can be accomplished using the following formula.

$$Value = \frac{I_1}{(1+r)^1} + \frac{I_2}{(1+r)^2} + \frac{I_3}{(1+r)^3} + \dots + \frac{I_n}{(1+r)^n}$$

In this formula, *I* equals income or cash flow in periods 1 through n, and *r* equals the discount rate. Where income has the characteristics of a perpetuity or of a classic straight line capitalization model, the universal capitalization formula,  $Value = Income \div Rate$ , can be used. In this case the overall capitalization rate will equal the discount rate.

To derive *equity yield rates* from market information, yield capitalization permits some things that would not be proper when using direct capitalization. For example, generally accepted appraisal texts record how it is permissible to use stocks and bonds for determination of equity yield rates in alternative investments when appraising real estate.

An investor may compare the expected equity yield on a real property investment with the yields on alternative investments with commensurate risk (e.g., stocks and bonds) and with a lender's yield on mortgages secured by similar real property.<sup>69</sup>

The Appraisal Institute goes on to state:

To estimate equity yield rates, appraisers must research the market. This research can take many forms and may include one or more of the following analyses...Comparison with the equity yield rates achieved in alternative investments of comparable risk such as stocks and bonds.<sup>70</sup>

An important difference between yield capitalization and direct capitalization is that in yield capitalization when deriving the equity yield rate, i.e., the cost of capital, it is entirely appropriate to use sales of stock (the capital asset pricing model, DCF or Gordon growth model,

---

<sup>69</sup> *The Appraisal of Real Estate*, 13<sup>th</sup> ed., 635; 12<sup>th</sup> ed., 119; 11<sup>th</sup> ed., 554-555; and 10<sup>th</sup> ed., 506-507.

<sup>70</sup> *The Appraisal of Real Estate*, 13<sup>th</sup> ed., 635-636; 12<sup>th</sup> ed., 119; 11<sup>th</sup> ed., 554-555; and 10<sup>th</sup> ed., 506-507.

or risk premium models) to derive the equity yield rate. However, as discussed above, when using direct capitalization, it is absolutely inappropriate to use sales of stock (earnings-price ratios) to derive equity capitalization rates. The reason is simple; equity cap rates are intended to be ratios between income and value while equity yield rates are not. Thus, it is critical that the sales used in deriving those ratios be virtually identical to the property being appraised. Stocks, quite simply, are not comparable to tangible assets as discussed in the quotation on page 96. Because stock sales used to derive equity yield rates are used to indicate relative risk between investments, it is entirely appropriate to use stock sales to derive equity yield rates.

### **Estimation of Income to Capitalize**

The income level capitalized in the income approach is usually called *cash flow*. In fact, as mentioned previously on page 14, Dr. William Kinnard, MAI explains that all of the annual “income” figures used in appraising income-producing properties are *cash flows* rather than accrual accounting incomes. Cash flow can be defined in a number of ways, however for appraisal purposes it generally consists of income necessary to satisfy the cost of capital plus depreciation expense. Commercial and general appraisers recognize this level of income as simply *net operating income*. Utility appraisers know that the definition of “net utility operating income” for public utilities and commercial properties is different in one important aspect. For public utilities the level of income reported as “net utility operating income” is only that income available to pay the utility's cost of capital, while for commercial properties “net operating income” includes not only the level of income available for debt and equity, but also the income to recapture a portion of the wasting asset (*otherwise known as depreciation expense*).

In general commercial appraisals cash flow is typically defined as simply net operating income (as defined for general commercial appraisal purposes), which is the income available for debt and equity and the depreciation expense. For an illustration of this type of analysis, refer to *The Appraisal of Real Estate*, 14<sup>th</sup> edition, page 546-547.

For public utility appraisal, cash flow is often defined as net utility operating income (defined as the income available to pay the cost of capital) plus depreciation expense and the current portion of deferred income taxes. This definition of cash flow is sometimes referred to as *gross cash flow* because there is no deduction for capital expenditures to keep the utility operating. Thus this cash flow model will have a limited life duration. In other words, gross cash flows cannot continue indefinitely without significant new investment to keep the utility operations ongoing.

Another variation of this same general definition of cash flow for a public utility is called *net cash flow*, which is the gross cash flow less capital expenditures. Some refer to this as gross revenue less all cash disbursements except interest expense. For the appraisal of public utilities where it is assumed that the amount of capital reinvestment is equal to the depreciation expense,



*net cash flow* can be defined simply as utility net utility operating income. For the appraisal of a public utility as a going concern, net cash flow is usually the best level of income to work with.<sup>71</sup> This issue was addressed and discussed by Dr. Gary C. Cornia, David Crapo, and Dr. Larry Walters as previously quoted on page 93.

As discussed earlier, the purpose of this cost of capital study is to provide the cost of capital, which can be used to capitalize the net cash flow for the typical interstate natural gas pipeline company for the purpose of estimating market value of the operating assets.

---

<sup>71</sup> Tegarden, Thomas K., "Income Approach Techniques in Central Assessment Appraisals," *Journal of Property Tax Assessment & Administration*, (Kansas City: IAAO), Vol. 10, Issue 3, 2013, 13-14.

**Computation of 2018 Equity Risk Premium**  
**Adapted from *SBI* and Duff & Phelps Information**

Computed By Tom Tegarden, MAI, CAE

2017 ERP = 6.94% (Average of 1926 - 2016 data)<sup>72</sup>

$$0.0694 = \frac{\sum_{t=1926}^{2017} (R_{M^t} - R_{F^t})}{(2017 - 1926)} = \frac{\sum}{91}$$

$$R_M^{2017} - R_F^{2017} = 0.2183 - 0.0278 = 0.1905$$

$$2018 \text{ ERP} = \frac{\sum_{t=1926}^{2018} (R_{M^t} - R_{F^t})}{92} = \frac{(\sum + 0.1905)}{92}$$

$$\text{Since } 0.0694 = \frac{\sum}{91} \rightarrow \sum = 91 \times 0.0694 = 6.3154$$

$$2018 \text{ ERP} = \frac{(6.3154 + 0.1905)}{92} = 0.0707 \text{ or } 7.1\%$$

---

<sup>72</sup> Based on the *SBI* & Duff & Phelps study 1926 - 2017. Total annual return S&P 500. [ycharts.com/indicators/ Standard & Poor's 500 total annual return](http://ycharts.com/indicators/Standard%20and%20Poor's%20500%20total%20annual%20return). (Original study by Dr. Hal Heaton, Brigham Young Univ.)  
Tegarden & Associates, Inc. 2018 INGPI Cost of Capital - Page 102

**Computation of 2018 Equity Risk Premium (for LT Corp Bonds)**  
**Adapted from *SBI* Information**

2017 ERP = 5.81% (Average of 1926 - 2016 data)<sup>73</sup>

$$0.058 = \frac{\sum_{t=1926}^{2015} (R_{M^t} - R_{F^t})}{(2017 - 1926)} = \frac{\sum}{91}$$

$$R_M^{2017} - R_F^{2017} = 0.2183 - 0.1209 = 0.0974$$

$$2018 \text{ ERP for LT Corp Bonds} = \frac{\sum_{t=1926}^{2017} (R_{M^t} - R_{F^t})}{92} = \frac{(\sum + 0.0974)}{92}$$

$$\text{Since } 0.0581 = \frac{\sum}{91} \rightarrow \sum = 91 \times 0.0581 = 5.287$$

$$2018 \text{ ERP for LT Corp Bonds} = \sum_{1926}^{2076} + \left( R_f^{2017} + R_f^{2017} \right)$$

$$2018 \text{ ERP for LT Corp Bonds} = \frac{(5.2871 + 0.0974)}{92} = 0.0585 \text{ or } 5.85\%$$

---

<sup>73</sup> Based on the *SBI* study 1926 - 2013 (LT Corp Bonds). Total annual return long-term Corporate Bonds BloomBarc Benchmark Vanguard ETF website.

## Duff & Phelps Risk Premium Calculations - 2018

**Exhibit 2.3: Summary Statistics of Annual Total Returns, Income Returns, and Capital Appreciation Returns of Basic U.S. Asset Classes 1926–2017**

1926–2017	Geometric Mean Returns (%)	Arithmetic Mean Returns (%)	Standard Deviation of Returns (%)
<b>Large Company Stocks</b>			
Total Return	10.2	12.1	19.6
Income Return	4.0	4.0	1.6
Capital Appreciation Return	6.0	7.8	19.1
<b>Small Company Stocks</b>			
Total Return	12.1	16.5	31.7
<b>Mid-cap Stocks (Decile 3-5)</b>			
Total Return	11.2	13.4	24.3
Income Return	3.7	3.8	1.8
Capital Appreciation Return	7.2	9.9	23.6
<b>Low-cap Stocks (Decile 6-8)</b>			
Total Return	11.6	15.3	28.5
Income Return	3.4	3.4	2.0
Capital Appreciation Return	8.0	11.7	27.9
<b>Micro-cap Stocks (Decile 9-10)</b>			
Total Return	12.7	18.0	39.6
Income Return	2.8	2.6	1.7
Capital Appreciation Return	9.7	15.4	37.8
<b>Long-term Corporate Bonds</b>			
Total Return	6.1	6.4	8.2
<b>Long-term Government Bonds</b>			
Total Return	5.5	6.0	9.8
Income Return	5.0	5.5	7.6
Capital Appreciation Return	0.4	0.8	8.9
<b>Intermediate-term Government Bonds</b>			
Total Return	5.1	5.2	6.6
Income Return	4.4	4.4	2.9
Capital Appreciation Return	0.6	0.7	4.4
<b>US Treasury Bills</b>			
Total Return	3.4	3.4	3.1
<b>Inflation</b>			
	2.9	3.0	4.0

**Source of underlying data in both Exhibit 2.3 and 2.4:** (i) Stocks, bonds, bills, and inflation (BBB<sup>®</sup>) return series from the Morningstar Direct database. Series used: Large Company Stocks (IA SBB US Large Stock TR USD EX), The "SBB US Large Stock" return series is essentially the S&P 500 index; Small Company Stocks (IA SBB US Small Stock TR USD), Long-term Corp. Bonds (IA SBB US LT Corp TR USD), Long-term Govt Bonds (IA SBB US LT Gov TR USD), Intermediate-term Govt Bonds (IA SBB US IT Gov TR USD), T-bills (IA SBB US 30 Day Ybill TR USD), Inflation (IA SBB US Inflation). All rights reserved. Used with permission. (ii) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2018 Center for Research in Security Prices (CRSP), University of Chicago Booth School of Business. (continued on next page)