2023
Capitalization Rate Study

Public Service Branch
Division of State Valuation, Office of Property Valuation
Kentucky Department of Revenue
502-564-8175

Background

To ensure fair and equitable unit assessment, taxation, and allocation of public service companies (as defined in KRS 136. 120 through KRS 136.180) the Kentucky Department of Revenue (DOR), Office of Property Valuation, Division of State Valuation, Public Service Branch turns to the following organizations that have developed standards for the unit appraisal of centrally assessed properties.

International Association of Assessing Officers (IAAO)
National Conference of Unit Valuation States (NCUVS)
The Western States Association of Tax Administrators (WSATA)
National Association of Certified Valuators and Analysts (NACVA)
Uniform Standards for Professional Appraisal Practice Standards (USPAP)

These nationally recognized professional organizations have established generally accepted appraisal principles and unitary appraisal methodologies that the DOR looks to for general guidance and support.

The DOR also sought the insights, procedures, methods, and techniques of nationally recognized professionals that include:

Dr. Aswath Damodaran of the Stern School of Business at New York University.
Robert P. Schweihs, Robert F. Reilly, CPA, Shannon P. Pratt, Roger Grabowski
McKinsey & Company – Tim Koller, Marc Goedhart, and David Wessels
P. Fernandez, T. Garcia, J.F. Acin
Thomas E. Copeland, Fred J Weston
Bradford Cornell, Richard Gerger
Richard A. Brealey, Stewart C. Myers
Ross & Westerfield
Alfred Kahn, Leonard Hyman & William Tilles

Other data sources accessed for this cap rate study and our general valuation appraisal process include:

Value Line Investment Survey	Business Valuation Resources (BVR)
KROLL	Mergent Bond Record
Moody's Investor Service	Standard & Poor's
Fed Energy Regulatory Commission Reports	SEC Financial Reports
Kentucky Public Service Commission Reports	Federal Aviation Administration

Introduction

In accordance with KRS 136.120 through KRS 136.180, the Kentucky Department of Revenue (DOR) is responsible for the assessment of the operating tangible and intangible (including franchise) property of air passenger carriers, air freight carriers, air charter carriers, air ambulance service providers, liquid pipelines, gas pipelines, railroad carriers, hydro-electric providers, commercial solar & wind electric providers, private water, private sewer, independent wholesale electric producers, electric utilities, and gas distribution utilities. The department's Division of State Valuation, Public Service Branch annually assesses these business enterprises in part, using the income approach to valuation.

Under the income approach, the department utilizes a direct capitalization rate analysis and a yield analysis by market segments. The department prepares this annual study for the purpose of completing unitary valuations of state assessed business enterprises operating within the Commonwealth.

The goal, for Kentucky ad valorem tax purposes, is to produce a fair market estimate of the total business enterprise value. This value is an economic measure reflecting the total market value of a business as of the lien date. Kentucky's lien date is December 31/January 1. It is the sum of all claims by all claimants. The value of a business enterprise contains all intangible elements, no exception. The intangible elements are a result of factors such as a trained work force, operational plant, necessary licenses, systems, and procedures in place. The fair cash value of the business to a potential investor, as of the lien date, is the assessment objective.

The following exhibits provide the results of the 2023 Kentucky Capitalization Rate Study per market segment.

Market Segments	Direct Capitalization Rate NOPAT	Capital	Structure	Debt Rate
Air Passenger Carriers	5.69%	36.00% Equity	64.00% Debt	4.76
Air Freight Carriers	7.21%	63.00% Equity	37.00% Debt	3.18
Electric Utilities	4.45%	62.00% Equity	38.00% Debt	3.87
Electric Independent Wholesale	5.59%	54.00% Equity	46.00% Debt	4.16
Natural Gas Distribution Utilities	4.34%	59.00% Equity	41.00% Debt	3.85
Natural Gas Pipelines	6.04%	59.00% Equity	41.00% Debt	4.63
Liquid Transportation Pipelines	7.39%	57.00% Equity	43.00% Debt	4.95
Private Water Utilities	3.12%	76.00% Equity	24.00% Debt	4.10
Railroads	4.69%	82.00% Equity	18.00% Debt	3.93

Market Segments	Direct Capitalization Rate *Gross Cash Flow*	Capital	Structure	Debt Rate
Air Passenger Carriers	12.08%	36.00% Equity	64.00% Debt	4.76
Air Freight Carriers	13.87%	63.00% Equity	37.00% Debt	3.18
Electric Utilities	8.26%	62.00% Equity	38.00% Debt	3.87
Electric Independent Wholesale	7.29%	54.00% Equity	46.00% Debt	4.16
Natural Gas Distribution Utilities	7.97%	59.00% Equity	41.00% Debt	3.85
Natural Gas Pipelines	9.72%	59.00% Equity	41.00% Debt	4.63
Liquid Transportation Pipelines	11.64%	57.00% Equity	43.00% Debt	4.95
Private Water Utilities	4.66%	76.00% Equity	24.00% Debt	4.10
Railroads	6.30%	82.00% Equity	18.00% Debt	3.93

Market Segments	Yield Capitalization Rate *Free Cash Flow Firm*	Capital	Structure	Debt Rate
Air Passenger Carriers	7.90%	36.00% Equity	64.00% Debt	7.13
Air Freight Carriers	7.60%	63.00% Equity	37.00% Debt	6.22
Electric Utilities	7.33%	62.00% Equity	38.00% Debt	6.02
Electric Independent Wholesale	7.30%	54.00% Equity	46.00% Debt	6.39
Natural Gas Distribution Utilities	7.16%	59.00% Equity	41.00% Debt	5.85
Natural Gas Pipelines	8.37%	59.00% Equity	41.00% Debt	6.46
Liquid Transportation Pipelines	8.41%	57.00% Equity	43.00% Debt	6.78
Private Water Utilities	7.56%	76.00% Equity	24.00% Debt	5.70
Railroads	8.78%	82.00% Equity	18.00% Debt	5.77

Market Segments	Yield Cost of Capital Rate	Direct Capitalization Rate NOPAT	Implied Growth Rate	
AIR CARRIER - Passenger	7.91%	5.69%	2.22%	
AIR CARRIER - Freight	7.61%	7.21%	0.40%	
ELECTRIC UTILITY	7.34%	4.45%	2.89%	
ELECTRIC Wholesale	7.29%	5.43%	1.86%	
GAS DISTRIBUTION	7.16%	4.27%	2.89%	
GAS PIPELINE	8.38%	6.04%	2.34%	
LIQUID PIPELINE	8.42%	7.39%	1.03%	
RAILROAD	8.79%	4.69%	4.10%	
WATER UTILITY	7.57%	3.12%	4.45%	

The implied Growth Rate is the difference between the yield rate and the direct rate.

Comparison of Cap Rate Studies

 For the 2023 tax year, the Kentucky Department of Revenue (DOR) reviewed and compared our capitalization rate study with the studies performed by the following states:

Washington	California
Montana	Missouri
Utah	Minnesota
Oregon	Oklahoma
Idaho	Colorado

It is useful to the DOR to review the capitalization rate studies of other states each year for a variety of reasons. One must, however, keep in mind that there are notable differences in property tax law and regulation between the states. Also, notable differences exist in valuation practices, assumptions, interpretations, and forecasts among appraisal professionals employed by the states.

Guideline Companies

Before the Kentucky appraiser can determine the appropriate capitalization rate(s) to be applied in an income approach, it is necessary to select a group of publicly traded guideline companies. The selection of guideline companies for the direct capitalization and the yield capitalization model is a subjective decision. Companies chosen should be relatively similar, not absolute.

Market data from publicly traded guideline companies provides a proxy for the market.

The guideline companies, used as a comparable, are selected from the appropriate industry group in the Value Line Investment Survey. Value Line industries / groupings accessed include:

Air Transport
Electric Utility (East, Central & West)
Power
Natural Gas Utility
Pipeline MLPs
Natural Gas Diversified
Oil & Gas Distribution
Railroad
Water Utility

Within these Value Line groups, the department reviews the guideline companies for relevancy and comparability in their market segments to companies conducting business in the Commonwealth of Kentucky. Certain guideline companies may be excluded from the study if they underwent a merger or acquisition in the previous calendar year. Other guideline companies may be excluded if they fail to represent the fundamental market segment (ex. a propane marketing company would not be included with gas pipeline companies or fluid pipeline companies) or the target line of business is a minimal percentage of the overall company operations. Other companies may be excluded if they are predominantly foreign-based operations or that they are no longer publicly traded. In some instances, a

diversified company may be included in two market segments /industry groups – i.e., an electric utility with a large natural gas utility distribution operation.

National Conference on Unitary Valuation States (NCUVS) standard > the chosen comparable(s) should be "reasonably similar" after an analysis of industry class, risk, growth, profitability, and size or physical characteristics.

Western States Association of Tax Administrators > "valid guideline companies can be found for most unitary companies by following some basic guidelines." … "These are the same guidelines used daily by the experts in the business valuation and security analysis field."

Methodology

The DOR develops a direct and yield capitalization rate for each centrally assessed utility industry group using the **band-of-investment technique**. This technique calculates the combined rate of the debt and equity components using the capital structure indicated by the market for the specific industry. This technique is referred to as the weighted average cost of capital (WACC). Both yield rates and direct rates are calculated using this method. Equity and debt financing is considered and weighted based on the capital structure for each industry.

Band of Investment – Weighted Cost of Capital (WACC)

A representative capital structure is developed for each industry group using the market value of the equity and the long-term debt. The market value of debt is derived from information found in the SEC Form 10-K

The rates of debt and equity are weighted by the respective amounts of such capital deemed most likely to be employed by a prospective buyer. The result is a representation of the typical capital structure of an industry group of companies, not that of the present owner. An optimum capital structure is created from the perspective of a potential investor.

Dividing the income of a company by the WACC generated rate provides an indication of value and represents a price that can be paid for the organization that would result in an income stream sufficient to satisfy the lender of debt and the investor in equity.

It should be noted that the capital structure of corporations versus master limited partnerships do vary. Master limited partnerships tend to trend towards higher debt and less equity. Partnerships cannot finance expansions and other capital projects using retained funds (since they must distribute all cash flow in distributions) like corporations. They must obtain funds by issuing debt and/or more additional partnership shares.

Dr. Aswath Damodaran states on the nature of the WACC:

"[T]he cost of capital in a valuation is not a return that you would like to make on the company that you are valuing and it is not a receptacle for your hopes and fears, where you respond to discomfort with uncertainty by increasing your discount rate. It should not be, though it often is, a mechanism for reverse engineering a pre-determined value."[1]

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[1] http://people.stern.nyu.edu/adamodar/pdfiles/papers/costofcapital.pdf

The following is an example of the Band of Investment (WACC) technique >

Source of Capital	Capital Structure	Cost of Capital Rate	Marginal Tax Rate	Cost of Capital After Tax	Weighted Cost
EQUITY	60.00%	10.00%	-	6.00%	6.00%
DEBT	40.00%	6.00%	26.00%	1.56%	0.62%
WACC	100.00%				6.62%
				Selected	6.62%

Debt Rate Component

The DOR utilizes **Moody's** and **Standard & Poor's** to determine an average credit rating of the guideline companies in each assessed industry. We then use the **Mergent Bond Record** to identify the corresponding yield to maturity, or market cost of debt for the subject industry.

For the 2023 tax year, the DOR analyzed the long-term bond indexes provided by **Mergent Bond Record** to estimate the debt rates for each market segment. Typical assessment theory requires the use of current yield for direct capitalization – yield to maturity for yield capitalization. The variation between these two calculated debt rates is fractionally small. For most new issues of debt, there is no variation.

According to **Western States Association of Tax Administrators (WSATA)** appraisal handbook on unit valuation of centrally assessed properties:

> *"The theoretically correct debt rate to use in a direct capitalization rate is the current yield. The current yield is the current interest expense divided by the market value of debt. If the appraiser makes the assumption that all debt is issued at par value, the yield to maturity rate can be used in the calculation of the direct capitalization rate."*

> *"Some appraisers advocate using the actual coupon rates on existing debt (embedded debt). The logic is that during times of rising interest rates a prospective purchaser would most likely assume the existing debt rather than refinance. This position lacks merit because, even in the case of an assumption, debt with a low nominal interest rate will be discounted in the marketplace at an effective rate equivalent to the current cost of debt. The use of embedded debt rates in estimating the current cost of capital results in a capitalized earnings indicator,*

which reflects high or low interest debt instruments at their face value rather than at their market value. Regardless of the regulatory practice of using embedded debt rates, their use is contrary to the market value concept."

The measure of the rate for debt used in the direct capitalization rate is the current yield. Current yield is equal to the annual coupon rate divided by price (expressed as a percent). While the measure of the rate of debt for the yield rate is yield to maturity. The yield to maturity is the interest rate that equates the present value of a bond's cash flow to its current price (expressed as a percent). Yield to maturity assumes that the bond will be held to maturity. If the bond is not held until maturity, or if the interim cash flows are reinvested at a rate that differs from the yield to maturity, an investor's actual yield will differ from the yield to maturity. The yield to maturity calculation equates a bond's cash flows to its current price; this yield calculation considers both coupon and income and any capital gain or loss the investor will realize by holding the bond to maturity. Valuation theory typically requires the use of current yields (the annual coupon rate divided by price) for direct capitalization and the use of yield to maturity for yield capitalization, the two rates will generally not vary significantly for seasoned issues (except under certain circumstances), and they will be the same for new issues.

Important Considerations

- Bond rate data was obtained primarily from **Mergent Bond Record** (January 2023 Vol. 88, No. 1) Mergent Incorporated. The long-term bond yield averages from the **Mergent Bond Records** for public utility, corporate, and industrial bonds provided the estimate of the market rate of debt, perceived as typical, for our various industry groups. The DOR selected the 4th quarter average bond ratings as representative.
- Only long-term debt obligations are included since only long-term liabilities are included in a capital structure.
- The corporate bond yield averages for public utility bonds from **Mergent Bond Rec**ord were used for the electric, gas, and water utilities. The corporate bond yield averages for corporate bonds from the **Mergent Bond Record** were used for the gas transmission, fluid pipeline, railroad, and airline segments.
- The debt rate selected for each market segment is an approximation.
- Flotation costs are not considered in the development of the debt component, because the market-determined opportunity cost of capital is not affected by the flotation costs of a particular firm.
- The estimated cost of debt is before income tax. The department adjusts the debt rate by the default income tax rate to incorporate the tax benefits of debt and to match the after-tax equity rate in the band-of-investment technique.
- Kentucky's selected debt rates for each market segment that are similar, if not parallel, to other state governments' performing 'cost of capital' and/or 'capitalization rate' studies.
- Development of the debt rate is from the expected position of a prospective buyer at the lien date.

Mergent's Bond Record January 2023

Corporate	Aaa	Aa	A	Baa
Figures are Percentages				
October	5.10 %	5.40 %	5.74 %	6.26 %
November	4.90 %	5.23 %	5.58 %	6.07 %
December	4.43 %	4.77 %	5.12 %	5.59 %
4th Qtr Median	4.90 %	5.23 %	5.58 %	6.07 %
4th Qtr AVG	4.81 %	5.13 %	5.48 %	5.97 %

Public Utilities	Aaa	Aa	A	Baa
October	0.00 %	5.68 %	5.88 %	6.18 %
November	0.00 %	5.54 %	5.75 %	6.05 %
December	0.00 %	5.06 %	5.28 %	5.57 %
4th Qtr Median		5.54 %	5.75 %	6.05 %
4th Qtr AVG		5.43 %	5.64 %	5.93 %

Industrials	Aaa	Aa	A	Baa
October	5.10 %	5.11 %	5.59 %	6.33 %
November	4.90 %	4.92 %	5.40 %	6.08 %
December	4.43 %	4.48 %	4.94 %	5.61 %
4th Qtr Median	4.90 %	4.92 %	5.40 %	6.08 %
4th Qtr AVG	4.81 %	4.84 %	5.31 %	6.01 %

Moodys	S&P	Grade	Risk
Aaa1,2,3	AAA+-	Invest. Highest Quality	Lowest Risk
Aa1,2,3	AA+-	Invest. Very High Quality	Low Risk
A	A+	Invest. High Quality	Low Risk
A	A	Invest. High Quality	Low Risk
A	A-	Invest. High Quality	Low Risk
Baa1	BBB+	Min. Invest. Grade	Med Risk
Baa2	BBB	Min. Invest. Grade	Med Risk
Baa3	BBB-	Min. Invest. Grade	Med Risk
Ba1	BB+	Junk, Speculative	High Risk
Ba2	BB	Junk, Speculative	High Risk
Ba3	BB-	Junk, Speculative	High Risk
B1	B+	Junk, Very Speculative	Higher Risk
B2	B	Junk, Very Speculative	Higher Risk
B3	B-	Junk, Very Speculative	Higher Risk
Caa1	CCC+	Junk, Default Possible	Higher Risk
Caa2	CCC	Junk, Default Possible	Higher Risk
Caa3	CCC-	Junk, Default Possible	Higher Risk
Ca	CC	Junk, Default Probable	Extr. Risk
C	D	Junk, imminent default	Highest Risk

Mergent Rating	S&P Rating	Corporate		Industrial		Utility		KENTUCKY	KENTUCKY
		4th Qt Avg		4th Qt Avg		4th Qt Avg		Corporate 4th Qtr Avg	Utility 4th Qtr Avg
Aaa1	AAA+	4.81%		4.81%					
Aaa2	AAA	4.81%		4.81%				4.81%	4.81%
Aaa3	AAA-	4.81%		4.81%					
Aa1	AA+	5.13%		4.84%		5.43%			
Aa2	AA	5.13%		4.84%		5.43%		5.13%	5.43%
Aa3	AA-	5.13%		4.84%		5.43%			
A1	A+	5.48%		5.31%		5.64%			
A2	A	5.48%		5.31%		5.64%		5.48%	5.64%
A3	A-	5.48%		5.31%		5.64%			
Baa1	BBB+	5.97%		6.01%		5.93%			
Baa2	BBB	5.97%		6.01%		5.93%		5.97%	5.93%
Baa3	BBB-	5.97%		6.01%		5.93%			
Ba1	BB+								
Ba2	BB							7.44% *	7.39% *
Ba3	BB-								
B1	B+								
B2	B							8.23% *	8.17% *
B3	B-								
Caa1	CCC+								
Caa2	CCC							9.02% *	8.95% *
Caa3	CCC-								

*Linear regression was used to extrapolate the average bond rates for issuances rated Ba1 to Caa3.

Preferred Stock Component

The DOR does not provide a separate calculation for preferred stock in the band of investment (WACC) technique. Instead, the preferred stock is included in the debt portion of the capital structure. If the preferred stock can be valued, the department will incorporate the resulting market value with the long-term debt component. For most industry groups, preferred stock is not an issue. Preferred stock is included in the debt portion of the capital structure. Preferred stock is generally a small percentage of the capital structure. In most market segments, preferred stock was materially insignificant or nonexistent. Some states do not account for preferred stock at all.

Capital (Finance) Lease Component & Operating Lease Component

The DOR does not provide a separate calculation for finance leases and operating leases in the band of investment (WACC) technique. Instead, the two types of leases are included in the LT Debt portion of the capital structure. The present value of finance leases and operating leases, as reported in the guideline company annual reporting forms (10K), are included in the Debt portion of the band of investment (WACC) technique.

Tax Rate Component

The DOR performs research regarding the income tax rates paid by the selected guideline companies. Examination of the 2022 income tax rates paid for all company types reveals a wide variation ranging from 0% to 31.10%. Liquid pipeline companies and gas pipeline companies reported tax rates at the lower range (.1% to 15%).

The DOR has selected and applied a default income tax rate of 26.0% for imputing income tax as applied to the cost of debt in the band-of-investment (WACC) technique. The rate selected represents the combined state rate of 5% and Federal corporate tax rate of 21%. The DOR incorporates the default state and federal income tax rate of **26.0%** in the income approach to derive the various cash flows (NOPAT, GCF, and Net "Free" Cash Flow to the Firm) subject to capitalization.

Income Capitalization Models

Each year, the DOR determines the unit value of the public service companies defined in KRS 136.120, in part, using an income approach to valuation. Two basic income capitalization models that Kentucky appraisers employ are the: direct capitalization and yield capitalization.

Direct capitalization converts an estimate of a single year's expected net operating income into an indication of value for the subject property. This conversion is based on the market-observed relationship between an income level and market value. Direct capitalization rates are based on income-to-market ratios. Two direct capitalization rate models are used in this study:

Net Operating Income After Tax (NOPAT) Model	V = NOPAT / r
	V = NOPAT X multiplier
Gross Cash Flow (GCF) Model	V = GCF / r
	V = GCF X multiplier

NOPAT – net operating profit after income tax
GCF – gross cash flow after income tax   (includes non-cash expenses depreciation & amortization)

The direct equity component rate is determined using the average of both the historic and projected P/CF and P/E statistics provided by Value Line Investment Survey.

Price to Gross Cash Flow Ratio (P/CF)	The inverse of this ratio is the equity component.
Price to Earnings Ratio (P/E)	The inverse of this ratio is the equity component.

PRICE EARNINGS RATIO (P/E) Price Earnings is probably the most used market method to describe the price of a share of stock. This method utilizes price/earnings (P/E) ratios of comparable publicly traded companies involved in the same industry as the subject company.

Proponents of this method argue that the inverse or reciprocal P/E ratio of public companies in the same industry as the subject company is the best available comparable capitalization or discount rate for valuing a small, closely held business. P/E ratios are the inverse of the capitalization rate. This method has some appeal since P/E ratios for thousands of publicly traded companies are published daily.

PRICE/CASH FLOW (P/CF) Price per share divided by cash flow.

This measure is considered relevant for companies with high non-cash charges reflected in the income statement—usually found in depreciation and amortization.

The debt rate component is the 'current yield' (embedded rate annual coupon rate divided by the market price of the debt).

Yield capitalization calculates the net present value of the anticipated series of future income by discounting cash flows using the yield (discount) rate.

Free 'Net' Cash Flow to Firm Model $$V = FCFF_1 (1+ g) / (r – g)$$

+ Net Operating Profit after Income Tax
+ Depreciation & Amortization Expenses
+ CAPEX + Investment change in Working Capital
+ Other Non-Cash Charges (asset write downs, stock-based compensation, unrealized gains & losses,
deferred income taxes & invest. Credits, goodwill impairments)
= FCFF

The yield equity component rate is estimated using one or more of the following models:

Capital Asset Pricing Model (CAPM)
Modified Capital Asset Pricing Model (MCAPM)(ECAPM)
Dividend Growth Model (or Gordon Growth Model) (DGM) – **One Stage, Two Stage, Three Stage**
Earnings Capitalization Model
Risk Premium Model
Build-up Model (BUM)

The DOR selected the market rate of equity for each market segment after considering fourteen (14) different CAPM models, fourteen (14) different empirical capital asset pricing models (ECAPMs), and three (3) different dividend growth models (DGMs). From these widely used and recognized methods, a range of equity rates was determined. The DOR selects an appropriate equity rate from this range of acceptability. The equity rate should reflect the representative cost of equity financing for a given industry group / type.

The debt rate component for yield capitalization is determined by an analysis of 'yield to maturity' (YTM). A yield rate, a discount rate, and the opportunity cost of capital are all synonymous terms. However, they are fundamentally different from a direct capitalization rate.

Cost of equity refers to the minimum annual rate of return a shareholder requires on an equity investment. It is the rate of return that could have been earned by putting the same money into a different investment of equal risk. The cost of equity reflects the opportunity cost of investing for the shareholder. Equity rates should reflect the cost of equity financing typical for a company operating in each industry as of the appraisal date.

There is no single commonly accepted method for making this estimate; consequently, the appraiser is best advised to apply at least two of the recognized methods to develop a range of equity rates. The DOR uses the Capital Asset Pricing Model and the Dividend Growth Model to develop these estimates.

Capital Asset Pricing Model (CAPM)

The CAPM model is the most widely used, dominant financial theory model. This equity model was primarily developed by Nobel laureate in economics, William Sharpe in the early 1960s and is based on the idea that an investor demands a minimum rate of return equal to the return on a risk-free investment plus a premium for taking on the extra risk of investing in a stock. The model includes a factor known as "beta" to account for the risk in a specific industry or market compared to the overall market. The beta was obtained from Value Line Investment Survey.

The formula for this model is: $K_e = R_f + [\beta * (ERP)$

K_e = Market Cost of Equity
R_f = Risk-Free Rate
β = Beta R_m = Return on Market
ERP = Equity Risk Premium (R_m-R_f)

Empirical Capital Asset Pricing Model (ECAPM)

The DOR completed this ECAPM model for each market segment using the components used in the CAPM model. This model is a modification of the CAPM model.

The purpose of this model is to reduce the sensitivity of the cost of equity estimate to changes in the beta coefficient.

The formula for this model is: $K_e = (ERP * \beta * 75\%) + ((ERP) * 25\%) + R_{f0}$

K_e = Market Cost of Equity
R_f = Risk-Free Rate
β = Beta R_m = Return on Market
ERP = Equity Risk Premium (R_m-R_f)

Dividend Growth/Discount Model (DGM or DDM)

A Dividend Growth Model, or commonly known by its acronym, DGM is a financial equity valuation model based on the Gordon Growth Model developed by financial economist Myron Gordon, PhD in 1956. Other names for this model include the Dividend Discount Model (DDM) and the Discounted Cash Flow model (DCF), but regardless of the name, these variants represent different mathematical forms of the same equity model. This equity model states that the cost of the equity component is equivalent to the current dividend yield plus the expected growth rate of these same dividends.

The formula for this model is: $K_e = (D_1/P_0) + G_1$

K_e = Cost of Equity
D_1 = Expected dividend per share
P_0 = Price per share
D_1/P_0 = Expected dividend yield
G_1 = Projected Short Term 5-year growth rate

Two Stage Dividend Growth Model (DGM)

The DOR completed the Two Stage DGM model for each market segment. This model is based upon the assumption that growth is not constant. The model is broken into stages – short, intermediate transition period, and long-term. The short term uses a short-term growth estimate. The long-term uses a sustainable growth estimate.

The purpose of this model is to reduce the sensitivity of the cost of equity estimate to changes in the beta coefficient.

The formula for this model is: $K_e = (Dy * (1 +.50(G))) +.067 (G_1) + .33 (g)$

Ke = Cost of Equity
Dy = Dividend yield (See Value Line)
G1 = Projected Short Term 5-year growth rate
G = Average Growth Rate (Avg. of G1 and g)
g = Stable Growth

Equity Risk Premium

According to **Pratt and Grabowski >** the equity risk premium is the extra return over and above the expected yield on risk-free securities that investors expect to receive from an investment in a diversified portfolio of common stocks.[2]

According to **Pratt and Grabowski >** "There is no one universally accepted method for estimating the ERP [equity risk premium]. A wide variety of premiums are used in practice and recommended by academics and financial advisors. "[3]

According to **Bradford Cornell >** the equity risk premium is the difference between the return on common stock and the return on government securities.[4]

According to **Dr. Aswath Damodaran >** "Broadly speaking, there are two ways of estimating equity risk premiums, with the first being a historical premium estimated by looking at the difference between past returns on stocks and the risk-free investment and the second being a forward-looking estimate, where you back out from stock prices what investors are building in as an expected return on stocks in the future."[5]

The DOR reviewed several publicly available, independent estimates of the equity risk premium. The sources include:

- **Dr. Aswath Damodaran**
- **The CFO Survey**, issued by Duke University's Fuqua School of Business and the Federal Reserve Banks of Richmond & Atlanta.
- **Business Valuation Resources** (2023), Historical, Arithmetic and Geometric Mean, ERP (20 Yr. T-Bond)
- **Pablo Fernandez, Teresa Garcia de Santos, and Javier F. Acin**: *Survey: Market Risk Premium and Risk-Free Rate Used for 95 Countries in 2022*
- **S& P Global Market Intelligence** / Simply Wall Street
- **Ibbotson, Three Stage Ex Ante growth model** of S&P 500

The equity risk premium (ERP) is used in the following formula to calculate the market rate of equity using the capital asset pricing model (CAPM).

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[2] Pratt, Shannon and Grabowski, Roger, (2010). Cost of Capital Applications and Examples, 4th Ed., Pages 115-116.
[3] Pratt, Shannon and Grabowski, Roger, (2010). Cost of Capital Applications and Examples, 4th Ed., Pages 113.
[4] Cornell, Bradford, (1999). The Equity Risk Premium, Page 18.
[5] Damodaran, Aswath, Dr. (April 2016). The Cost of Capital: The Swiss Army Knife of Finance, Page 11. Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/papers/costofcapital.pdf

Market Rate of Equity per Market Segment = (ERP X β) + Rf

ERP = Equity risk premium
β = Beta
Rf = Risk free rate

Risk Free Rate Component

The risk-free rate is the rate the investor has no reason to doubt will be achieved when buying a risk-free investment. This rate includes growth and inflation expectations.

Most all states select, and most appraisal experts encourage, the use of the U.S. Treasury 20-year coupon bond or the U.S. Treasury 30-year coupon bond as proxy for the risk-free rate.

Dr. Aswath Damodaran states:

> "In the long term, the real riskless rate will converge on the real growth rate of the economy and the nominal riskless rate will approach the nominal growth rate of the economy.... A simple rule of thumb on the stable growth rate is that it should not exceed the riskless rate used in the valuation"[6]

Based on this perspective, the risk-free rate can be viewed as the maximum constant growth rate for each market segment.

4.14 %	Risk Free Rate (December 30, 2022)	U.S. Treasury Bills Long Term 20 Year Coupon
4.06 %	Risk Free Rate (January 3, 2023)	U.S. Treasury Bills Long Term 20 Year Coupon
3.97 %	Risk Free Rate (December 30, 2022)	U.S. Treasury Bills Long Term 30 Year Coupon
3.88 %	Risk Free Rate (January 3, 2023)	U.S. Treasury Bills Long Term 30 Year Coupon

Federal Reserve Statistical Release December 30, 2022. http://www.federalreserve.gov/Releases/H15/Current/

Based on the actual year end rates above, the DOR concluded the risk-free rate to be 4.14%.

Long Term Real Growth Rate (GDP)

The DOR reviews forecasts from several respected sources to derive an estimate of the long-term growth for the economy. These sources include the US Congressional Budget Office, the Federal Reserve Bank, the Economist Intelligence Unit, the World Bank, and Trading Economics.

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[6] Damodaran, A. Chapter 2, Intrinsic Valuation, Page 32, Retrieved from
http://people.stern.nyu.edu/adamodar/pdfiles/DSV2/Ch2.pdf

Dr. Aswath Damodaran states:

> *"[s]ince no firm can grow forever at a rate higher than the growth rate of the economy in which it operates, the constant growth rate cannot be greater than the overall growth rate of the economy."[7]*

Based on this perspective, the risk-free rate can be viewed as the maximum constant growth rate for each market segment.

The results of our analysis >

1.50%	<	The US Congressional Budget Office – 2024
1.50%	<	The US Congressional Budget Office – 2025 to 2026 avg.
1.70%	<	The US Congressional Budget Office – 2027 to 2032 avg.
1.80%	<	The Federal Reserve Bank
1.50%	<	The Economist Intelligence Unit – 2021 to 2050
1.60%	<	The World Bank – 2024 (.50% for 2023)
1.90%	<	Trading Economics – 2025
1.96%	<	The Federal Reserve Bank of Philadelphia / Survey of Professional Forecasters Mean
1.97%	<	The Federal Reserve Bank of Philadelphia / Livingston Survey Mean

Based on the projections / forecasts above, the DOR concluded the long-term <u>real</u> growth rate of the U.S. economy to be 1.77%

Inflation

Inflation is defined as the percentage change in the value of the Wholesale Price Index (WPI) on a year-to-year basis.

To estimate the expected long term inflation rate, as of January 2023, the DOR examined the forecasts of several reputable sources: The Congressional Budget Office (CBO); The Board of Governors of the Federal Reserve System / Federal Reserve Board members and Federal Reserve Bank presidents; The Federal Reserve Statistical Release; The Federal Reserve Bank of Philadelphia / Livingston Survey; The Federal Reserve Bank of Philadelphia / Survey of Professional Forecasters

The DOR also performed a simple calculation, using a 5-, 10-, 20- & 30-year indexed U.S. Treasury securities, to derive the long-term inflation rate. The calculation compares the inflation indexed U.S.

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[7] 1 Damodaran, Aswath, Dr. (n.d.) The Stable Growth Rate,
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/valquestions/stablegrowthrate.htm

Treasury securities to the non-inflation indexed U.S. Treasury securities. The difference between the two types of securities is the inflation rate.

U.S. Treasury Security Type Dec. 30, 2022	Inflation Indexed U.S. Treasury Security %	Inflation Non-Indexed U.S. Treasury Security %	Computed LT Inflation %
5 Year	3.99%	1.63%	2.36
10 Year	3.88%	1.58%	2.30
20 Year	4.14%	1.61%	2.53
30 Year	3.97%	1.66%	2.31

Based on the calculations above and the forecasts below, the DOR concluded the long-term inflation rate of the U.S. economy to be 2.37%.

2.00%	<	The Congressional Budget Office (CBO) Mean 2025 - 2026
2.00%	<	The Congressional Budget Office (CBO) Mean 2027 - 2032
2.30%	<	The Congressional Budget Office (CBO) Mean 2021 - 2031
2.00%	<	The Board of Governors of the Federal Reserve System / Federal Reserve Board members and Federal Reserve Bank presidents
2.50%	<	The Federal Reserve Bank of Philadelphia / Livingston Survey Mean
2.55%	<	The Federal Reserve Bank of Philadelphia / Livingston Survey Median
2.44%	<	The Federal Reserve Bank of Philadelphia / Survey of Professional Forecasters

Long Term Sustainable Growth Rate

The DOR used a projected nominal GDP growth of the US economy as a proxy for long-term sustainable growth rate. This rate is not a short-term growth rate. This rate is long-term, that includes both a real GDP growth factor and an inflation component. We view this as a conservative estimate for the reasons stated by Dr. Damodaran below.

Dr. Aswath Damodaran states:

> *"[s]ince no firm can grow forever at a rate higher than the growth rate of the economy in which it operates, the constant growth rate cannot be greater than the overall growth rate of the economy."*[8]

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[8] Damodaran, Aswath, Dr. (n.d.) The Stable Growth Rate,
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/valquestions/stablegrowthrate.htm

Dr. Damodaran advises the following: *"this growth rate [in the Gordon growth model] has to be less than or equal to the growth rate of the economy in which the firm operates. No firm, no matter how well run, can be assumed to grow forever at a rate that exceeds the growth rate of the economy."*[9]

The DOR determined the long-term sustainable growth rate, applied in our yield income valuation model, is to be 4.00%. We believe this rate is reasonable.

It is generally accepted that a sustainable long-term growth rate is impossible to sustain into perpetuity if it exceeds inflation plus population growth. The rate does not include growth in overall company cash flows dependent on future capital investment. A common error is to use a rate of growth that could not be achieved without additional capital investment(s). Often, this is related to the position of the company in its life cycle. What is its state of maturity? Is it experiencing rapid growth, slow growth, stagnation, or decline?

Beta Measurements

According to Value Line Investment Survey, the Beta measurement is a relative measure of the historic sensitivity of the stock's price to overall fluctuations in the New York Stock Exchange Composite Index.

The market has a beta of 1.00. If a stock has a beta above 1.00, it is more volatile than the overall market. A beta below 1.00 means a stock is less volatile than the overall market.

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

Dr. Aswath Damodaran > Firms that survive in the market tend to increase in size over time, become more diversified and have more assets in place, producing cash flows. All of these factors push betas towards one. [10]

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[9] Damodaran, Aswath, Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, 3rd Edition, 2012, Ch 13, pg. 327

[10] Damodaran, Aswath., "Estimating Risk Parameters". Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/papers/beta.pdf

Illiquidity & Size Premiums

The DOR does not adjust the capitalization rates for illiquidity and size premiums. We do not consider these adjustments to be based upon generally accepted appraisal practice.

According to the **Appraisal Institute (2013). The Appraisal of Real Estate, 14th edition, Page 458** > "a discount rate that is constructed by adding allowances for these components can be misleading and inaccurate."

Reconciliation of the Equity Rate Models for Yield Capitalization

There is no specific formula or process for reconciling the estimates of the market cost of equity derived from the CAPM and DGM models. This process does not involve a simple averaging of the different estimates but does require careful consideration of which model would be most appropriate to estimate the cost of equity for a given industry. It should also be consistent with the capitalization technique selected using informed judgement.

Flotation Costs

When new issues of both debt and equity capital are sold to investors, the issuing company incurs transaction costs such as underwriting fees, legal expenses, and prospectus preparation costs. These costs of issuing securities are known as flotation costs. Much like loan fees or points on a mortgage, flotation costs effectively reduce the net proceeds that a firm will receive from issuing securities. For further insight on this topic, please see the **Western States Association of Tax Administrators**, Appraisal Handbook – Unit Valuation of Centrally Assessed Properties, 2009, page III-30 through III-31.

The DOR did not include flotation cost adjustments in our direct capitalization rate. Financial theory suggests and observes evidence that supports the fact that firms do not typically issue new common equity as a common practice. Therefore, the direct capitalization rate does not include an adjustment for flotation costs. In addition, the income stream is not adjusted for hypothetical flotation costs. The direct rate is not a mechanism to recover the cost of doing business.

Thomas E. Copeland and Fred J. Weston believe that "adjusting for flotation costs in the rate of return is erroneous because it implicitly adjusts the opportunity cost of funds supplied to the firm. The true market-determined opportunity cost is unaffected by the flotation costs of a particular firm. The correct procedure for the economic analysis of flotation costs does not alter the weighted average cost of capital."[11]

Mr. Richard Simonds had this to say in the Journal of Property Tax Assessment & Administration, "When capitalizing net operating income in the income approach, a flotation-cost adjustment cannot be applied to the cost of capital. Advocates of an adjustment may be confusing the concept of the allowed rate of

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[11] *Copeland, T. & Weston, J., Financial Theory and Corporate Policy (3rd ed.), Addison-Wesley Publishing Company at 534*.

return on invested capital in a rate-regulated environment with the concept of the market-determined opportunity cost of capital."[12]

The incorporation of flotation costs by some state tax organizations does occur. California, Nevada, and Louisiana allow flotation cost adjustments while Minnesota, Washington, Kentucky, Missouri, and Oklahoma do not adjust for flotation costs.

Consideration > When you buy a house, is your long-term bank loan (APR) rate adjusted for one time closing costs (legal fees, underwriting, points, and other fees)? The answer is "no." Similarly, a flotation cost adjustment should not be applied to the cost of capital when capitalizing net operating income in the income approach.

Operating Leased Property

In Kentucky all companies as defined and listed in KRS 136.120, are subject to annual central assessment. All operating property both owned and leased plus the franchise is subject to taxation. The Kentucky operating leased property is subject to taxation and treated as if owned. The lessor's interest plus the lessee's interest is taxable.

Operating leased property for most guideline companies is relatively small (less than 2% of the total debt financing). The exception is air transportation carriers and railroad carriers. Leased property financing, for railroad carriers, is in the range of 4% of the total debt financing. Air carriers fall in the range of 33% or more of the total debt financing. Adjustment for these long-term lease commitments in the assessment process is critical. Both appraisal experts and credit rating agencies recognize operating leases as a debt equivalent.

Important considerations>

The income stream used in the Income Approach is not adjusted for operating leased property rental expenses. In other words, operating leased rental expenses remain in the income cash flow.

For all market segments, the Kentucky allocation (interstate) factor, that is applied to the system unit value, is void of any non-mobile operating leased property in the development of the overall factor.

Beginning 2023, all non-mobile operating leased property located in Kentucky, on the assessment lien date, will be directly added to the taxpayer's Kentucky allocated assessment value. This step will take place and be illustrated in the taxpayer's valuation worksheet.

The system book and market values attributable to the non-mobile operating leased property are excluded in the development of the Cost Approach system value for all market segments (excepting mobile aircraft held by airlines and mobile rail locomotives & cars held by railroads).

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[12] *Simonds, R., "Income Capitalization, Flotation Costs, and the Cost of Capital," Journal of Property Tax Assessment & Administration, Volume 3, Issue 4, 2006.*

For some airlines companies, the "right to use" values reported in the SEC 10-K annual report may not be complete. Be aware that some airlines have excluded their variable operating lease asset values from the figures reported in the balance sheet.

Kentucky places little to no weight on the Cost Approach (HCLD) in the assessment process since the approach is devoid of non-mobile operating leased property, real property converted to market value, intangible properties booked or non-booked, and the franchise value.

Selecting the Income to be Capitalized

Under Kentucky law, all public service companies are appraised annually. Under both the direct capitalization model and the yield capitalization model, the appraiser determines projections of growth, no growth, or declining earnings during the annual reassessment process. The one-year earnings estimate/projection, performed by the appraiser, is a critical function in the direct capitalization model. If growth is expected in the subsequent year, then the earnings projection is adjusted upwardly. If the income is declining, then the earnings projection is adjusted downwardly. If the earnings are flat and no growth is expected, then the previous year's earnings might be appropriate. If the earnings have a history of variability, then the earnings projection may be derived using a 3-year or 5-year average or weighted average.

In the income approach, an appraiser may consider the following techniques to forecast the single years' projected income:

Last year's income
Straight Average (5 year or 3 year)
Weighted Average (5 year or 3 year)
Regression Analysis
Analyst Forecasts
Performance Ratios

Historical income should always be adjusted to remove the effects of extraordinary income or expenses that will not be incurred in subsequent years.

Normalizing Income prior to Capitalization

In analyzing past income, the appraiser should adjust historical income to better reflect ongoing earning power. Adjustments are commonly made for unusual and infrequent occurrences that include:

- Extraordinary gain or loss on the sale of assets
- Insurance proceeds
- Effects of strike or extended shortage of critical materials
- Write-offs (on time charges)
- General rate cases
- Other non-recurring conditions (calamities of nature)

Income Growth without Capital Expenditures

Positive income (gross & net) growth may be achieved without increased investment in capital expenditure. The following are possible ideas:

- o A regulated utility company may be in a position to obtain a rate increase from their State Public Service Commission or similar agency.
- o An organization may improve their operational efficiencies - cut production & delivery operating expenses / cut losses / improve employee morale / reward efficiencies / improve capital productivity / make sound replacement & maintenance decisions / reduce waste / cut duplications / reduce operating costs.
- o Innovate (research & development).
- o Identify recurring failures.
- o Change depreciation accounting practices.
- o Adopt and/or modify, rewrite, computer code (software systems).
- o Change, expand, and/or streamline advertising tactics to attract new customers.
- o Increase equity financing.

Market To Book Ratios - Obsolescence

The DOR analyzed the market-to-book ratios of all guideline companies by market segment. The purpose of this exercise was to measure how the market perceives the value of these assets relative to the book value. A ratio below one (1.00) would indicate there may be obsolescence affecting the market segment. A ratio of one (1.00 +) of above would indicate no obsolescence.

The result of our analysis > No obsolescence Indicated for any market segment.

Market Cost of Equity vs. Allowed Return on Equity

The allowed rate of return is a form of price setting decided by governing bodies that regulate rates and services of public utilities. Its determination is often influenced by elected and appointed officials, politics, environmental considerations, and negotiated settlements. Investor-owned utilities operate as natural monopolies, and the allowed rate of return is used as a substitute for the effects of a competitive market on shareholder returns and rate-payer prices. The job of the regulator is to attempt to strike a balance between the interests of several stakeholders.

The differing objectives and principles behind the calculation of the market cost of equity and the allowed rate of return are what set them apart from one another. The allowed return on equity is an often-negotiated benchmark for a fair rate of return on investment for a utility; while the market cost of equity is the minimum return on equity required by a shareholder looking to invest in a firm with similar risk. In his text, The Economics of Regulation, Alfred Kahn argues that the cost of equity is the starting point, not the end goal, in setting the rate of return. Kahn also suggests that regulatory policies should create incentives for utilities to innovate, which aligns well with the regulatory goal of balancing shareholder and ratepayer interests.

Alfred Kahn points out "*Many in the regulatory community believe that the utility's rate of return is the sole value driver, and that rates of return are set at the cost of equity. Neither of these perceptions is correct. Instead, the financial "value engine"—the difference between a utility's return on investment and its cost of capital—drives shareholder returns.*"[13]

Courts in the U.S. have commented on the relationship between allowed rates of return and rates used in valuation. In 2020, Utah Second District Court, stated:

"*Authorized returns on equity are neither correlated to nor determinative of the calculation of the cost of equity for valuation purposes. The cost-of-equity rates calculated in rate cases serve the regulatory purpose of setting rates but are not appropriate to establish value in a long-term perpetuity cash flow model.*"[14]

Utility industry economist **Leonard Hyman** sums it up best: "*the market determines the cost of capital. Regulator's don't.*"[15]

The DOR concurs that the allowed return on equity is not an appropriate substitute for the calculation and analysis of a market derived cost of equity used in valuation. For 'rate based' companies, the maximum allowed 'rate of return' established by state regulators is not comparable (a mismatch) to the 'cost of equity'. While regulators establish a maximum allowed rate of return for a specific company, the study is estimating the cost of equity for each market segment (industry).

Rate regulators set rates, not market value.

Actual returns on equity are consistently below the allowed return on equity.

Basically, there are two measures of return > Book value and Market value. They don't equal each other.

The cost of equity is most always below the regulator's allowed rate of return on equity. If they were close or equal to each other, then the market price of common stock would be close to or equal to the book value of the stock.

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[13] Kahn, Alfred, The Economics of Regulation: Principles and Institutions, John Wiley & Sons (1970), p. 44
[14] PacifiCorp, Inc. v. Utah State Tax Commission, No. 180903986 TX, pg. 8 (Utah 2nd D.C. 2020)
[15] Leonard Hyman & William Tilles, Don't Cry for Utility Shareholders, America, Public Utilities Fortnightly (October 2016)

Income Approaches

The following provides the structural mechanism of our yield and direct income approaches.

YIELD MODEL – FCFF

$$V = \frac{FCFF_0\,(1+g)}{WACC - g}$$

2023 Projected Normalized NOPAT	$ -
Add: Projected Depreciation	$ -
=	$ -
Add: '2023 Projected LT Sustainable Growth (g)	$ -
Add: 'Other Non-Cash Charges	$ -
Subtract: 'Change in Working Capital	$ -
Subtract: 'Capital Expenditures	$ -
Net 'Free' Cash Flow to the Firm	$ -

Yield Model / FCFF Discount Rate less LT Sustainable Growth (g)   0.00%

Capitalized Value Indicator	$ -

Add: CWIP (New Plant / Expansion / Growth Only)	$ -

UNIT VALUE AS INDICATED BY INCOME APPROACH $ -

DIRECT MODEL – NOPAT

Value = $NOPAT_1$ X   Dm

2023 Projected Normalized NOPAT	$ -
Direct Model / NOPAT Multiplier	-
Capitalized Value Indicator	$ -
Add: CWIP (New Plant / Expansion / Growth Only)	$ -
UNIT VALUE AS INDICATED BY INCOME APPROACH	$ -

DIRECT MODEL – GCF

Value = GCF_1 X   Dm

2023 Projected Normalized GCF	$ -
Direct Model / GCF Multiplier	-
Capitalized Value Indicator	$ -
Add: CWIP (New Plant / Expansion / Growth Only)	$ -
UNIT VALUE AS INDICATED BY INCOME APPROACH	$ -