

The seal of the Texas Comptroller of Public Accounts is faintly visible in the background. It features a central five-pointed star surrounded by a wreath of olive and oak branches. The words "THE COMPTROLLER OF PUBLIC ACCOUNTS" and "STATE OF TEXAS" are inscribed around the perimeter of the seal.

Glenn Hegar

Texas Comptroller of Public Accounts

2016 Property Value Study

Discount Rate Range
for Oil and Gas Properties

September 2016



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Discount Rate Range for Oil and Gas Properties

The Texas Comptroller of Public Accounts conducts a Property Value Study (PVS) that includes oil and gas property appraisals. These appraisals are conducted according to methods and procedures outlined in the Comptroller's *Manual for Discounting Oil and Gas Income*, as required by Property Tax Code Section 23.175.

As part of the PVS, the Texas Comptroller's Property Tax Assistance Division (PTAD) calculates a range of discount rates used to discount the projected future income of oil and gas produced from individual properties. For the 2016 PVS, PTAD will use a range of 13.70 to 20.46 percent unless property-specific risk requires use of a discount rate outside this range.

This report summarizes this year's methodology for the discount rate range determination. For more detailed information, please contact the [Property Tax Assistance Division at 1-800-252-9121](#).

Oil and Gas Property Appraisal

One of the primary economic parameters in oil and gas property appraisals is the discount rate used to convert future income streams to a present-day value. The process of discounting converts the value of cash projected to be received in the future to the current price investors would pay for the right to receive the income. This appraisal method is called a discounted cash flow analysis and it is a widely accepted appraisal method for oil and gas properties.

Each year, PTAD calculates a discount rate based upon the **overall mean weighted average cost of capital (WACC)** of a sample of petroleum companies. To account for inherent risk associated with oil and gas production from a single property rather than a company-wide portfolio of producing properties, PTAD adds two percentage points to the **overall mean WACC** to establish the **base discount rate** for each oil and gas property in the annual PVS. Other property-specific

risk considerations may warrant additional risk adjustments (increase or decrease) that are used to calculate an **adjusted discount rate** for each property. The **adjusted discount rate** will usually fall within the discount rate range determined each year.

In accordance with International Association of Assessing Officers (IAAO) guidelines, PTAD adds the county and school district ad valorem total tax rates to the **adjusted discount rate** to determine a **property-specific discount rate** (city and special district tax rates are not included). The **property-specific discount rate** is then applied in the PTAD appraisal to discount the projected future income of oil and gas produced from the property.

Discount Rate

There are three generally accepted methods for estimating a discount rate: analysis of oil and gas property sales, market surveys and the weighted average cost of capital. These methods are discussed in the following paragraphs. For simplicity, the sales analysis and market survey methods are presented together.

The Oil and Gas Property Sales Analysis and Market Survey Methods

The Western States Petroleum Association and the California Independent Petroleum Association commissioned an annual analysis of fully disclosed oil and gas property sales that occurred in California. The sales data were compiled by Richard J. Miller & Associates.

The Society of Petroleum Evaluation Engineers (SPEE) conducts an annual opinion poll market survey. Responses from petroleum company executives, industry consultants and energy banks concerning property acquisitions and divestitures offer insight into the discount rates used to analyze properties in the market.



TABLE 1
Petroleum Companies' Financial Information Used for WACC Method

| Company Name | Total Capital | Total Equity | Total Convertible Preferred Stock | Total Long-Term Debt | Equity % Of Capital | Convertible Preferred Stock % Of Capital | Long-Term Debt % Of Capital | Beta Factor | After Income Tax Cost of Equity, % | Before Income Tax Cost of Equity, % | Cost Of Convertible Preferred Stock % | Cost Of Debt % | Before Income Tax WACC % |
|--------------------|-------------------|-------------------|-----------------------------------|----------------------|---------------------|--|-----------------------------|-------------|------------------------------------|-------------------------------------|---------------------------------------|----------------|--------------------------|
| Anadarko | \$40,411,214,000 | \$24,693,214,000 | \$0 | \$15,718,000,000 | 61.10 | 0.000 | 38.90 | 1.45 | 11.66 | 17.94 | 0.00 | 6.71 | 13.58 |
| Apache | \$25,588,179,762 | \$16,811,179,762 | \$0 | \$8,777,000,000 | 65.70 | 0.000 | 34.30 | 1.40 | 11.36 | 17.48 | 0.00 | 5.47 | 13.36 |
| Cabot | \$18,924,247,323 | \$16,919,247,323 | \$0 | \$2,005,000,000 | 89.41 | 0.000 | 10.59 | 1.10 | 9.56 | 14.71 | 0.00 | 5.62 | 13.75 |
| Chevron | \$203,041,947,440 | \$169,377,947,440 | \$0 | \$33,664,000,000 | 83.42 | 0.000 | 16.58 | 1.15 | 9.86 | 15.17 | 0.00 | 3.25 | 13.20 |
| Conoco Phillips | \$81,161,639,933 | \$57,708,639,933 | \$0 | \$23,453,000,000 | 71.10 | 0.000 | 28.90 | 1.25 | 10.46 | 16.10 | 0.00 | 5.54 | 13.05 |
| Devon | \$25,513,000,000 | \$13,376,000,000 | \$0 | \$12,137,000,000 | 52.43 | 0.000 | 47.57 | 1.50 | 11.96 | 18.41 | 0.00 | 7.10 | 13.03 |
| EOG | \$45,578,178,409 | \$38,924,493,409 | \$0 | \$6,653,685,000 | 85.40 | 0.000 | 14.60 | 1.40 | 11.36 | 17.48 | 0.00 | 3.23 | 15.40 |
| Exxon Mobil | \$343,885,200,000 | \$323,960,200,000 | \$0 | \$19,925,000,000 | 94.21 | 0.000 | 5.79 | 1.00 | 8.96 | 13.79 | 0.00 | 3.20 | 13.18 |
| Hess | \$20,411,490,009 | \$13,867,490,009 | \$0 | \$6,544,000,000 | 67.94 | 0.000 | 32.06 | 1.50 | 11.96 | 18.41 | 0.00 | 6.43 | 14.57 |
| Marathon | \$15,799,430,000 | \$8,523,430,000 | \$0 | \$7,276,000,000 | 53.95 | 0.000 | 46.05 | 1.50 | 11.96 | 18.41 | 0.00 | 6.03 | 12.71 |
| Murphy | \$6,902,773,262 | \$3,862,179,262 | \$0 | \$3,040,594,000 | 55.95 | 0.000 | 44.05 | 1.45 | 11.66 | 17.94 | 0.00 | 8.72 | 13.88 |
| Newfield | \$7,790,244,722 | \$5,323,244,722 | \$0 | \$2,467,000,000 | 68.33 | 0.000 | 31.67 | 1.65 | 12.86 | 19.79 | 0.00 | 8.07 | 16.08 |
| Noble | \$22,194,939,769 | \$14,218,939,769 | \$0 | \$7,976,000,000 | 64.06 | 0.000 | 35.94 | 1.30 | 10.76 | 16.56 | 0.00 | 6.31 | 12.88 |
| Occidental | \$58,515,320,693 | \$51,632,320,693 | \$0 | \$6,883,000,000 | 88.24 | 0.000 | 11.76 | 1.25 | 10.46 | 16.10 | 0.00 | 3.64 | 14.63 |
| Pioneer | \$21,936,226,786 | \$18,729,226,786 | \$0 | \$3,207,000,000 | 85.38 | 0.000 | 14.62 | 1.45 | 11.66 | 17.94 | 0.00 | 5.95 | 16.19 |
| Range | \$6,861,878,081 | \$4,166,878,081 | \$0 | \$2,695,000,000 | 60.73 | 0.000 | 39.27 | 1.10 | 9.56 | 14.71 | 0.00 | 10.47 | 13.04 |
| Southwestern | \$7,607,549,854 | \$2,773,549,854 | \$106,000,000 | \$4,728,000,000 | 36.46 | 1.393 | 62.15 | 1.30 | 10.76 | 16.56 | 6.14 | 13.05 | 14.24 |
| TOTAL | \$952,123,460,043 | \$784,868,181,043 | \$106,000,000 | \$167,149,279,000 | 1,183.80 | 1.393 | 514.80 | 22.75 | 186.88 | 287.50 | 6.14 | 108.79 | 236.75 |
| ENTRIES | | | | | 17 | 1 | 17 | 17 | 17 | 17 | 1 | 17 | 17 |
| AVERAGE | | | | | 69.64 | 1.39 | 30.28 | 1.34 | 10.99 | 16.91 | 6.14 | 6.40 | 13.93 |
| STANDARD DEVIATION | | | | | 15.93 | 0.338 | 15.76 | 0.18 | 1.06 | 1.64 | 1.49 | 2.62 | 1.10 |

The Weighted Average Cost of Capital (WACC) Method

Each year PTAD calculates the WACC for several petroleum companies operating in Texas that are listed on the New York Stock Exchange or the Over-The-Counter stock market. PTAD calculates a discount rate based upon the average of the companies' WACC.

For the 2016 PVS, PTAD compiled year-end 2015 financial data for 17 petroleum companies to calculate the WACC for each company. Results of the WACC calculations are presented in **Table 1**. The overall mean WACC for the 17 companies is 13.93 percent with a standard deviation of 1.10 percent. Information on the methodology used to calculate

a WACC can be reviewed in the Comptroller's *Manual for Discounting Oil and Gas Income*.

Base Discount Rate for All Oil and Gas Properties in the Property Value Study

PTAD adds two percentage points to the overall mean WACC of 13.93 percent to establish the base discount rate of 15.93 percent for the 2016 PVS. The two percentage points account for inherent risk associated with oil and gas production from an individual property. Other considerations may warrant additional property-specific risk or risk reduction in determining the adjusted discount rate for an individual property.



Adjusted Discount Rate

The base discount rate may be adjusted to reflect a wide variety of property-specific risks. PTAD considers specific risks associated with a property to determine its adjusted discount rate. Some common examples of risk routinely considered by PTAD and the associated adjustments are shown below.

Limited History

Limited production history is frequently cited as the major risk associated with appraising oil and gas properties. Decline curve analysis requires sufficient production history and some knowledge of the reservoir drive mechanism to enhance the confidence level for reserve forecasts.

| Type of Risk | Added Percentage Points |
|-----------------------|-------------------------|
| Limited History: | |
| Less than one year | 3 |
| One to two years | 2 |
| Two to three years | 1 |
| More than three years | 0 |

Single Completion Leases

Single completion leases have a greater chance of early abandonment because they do not involve or exhibit the potential for production from additional zones in a single well bore. Multiple completion wells are not adjusted for this risk.

| Type of Risk | Added Percentage Points |
|-------------------------|-------------------------|
| Single Completion Lease | 1 |

Offshore Leases

Offshore properties often involve production and economic risks greater than those associated with onshore properties.

| Type of Risk | Added Percentage Points |
|----------------|-------------------------|
| Offshore Lease | 2 |

Enhanced Oil Recovery (EOR) Leases

This recovery method, by definition, involves complex production methods and additional economic risks. Early-stage projects have a high degree of uncertainty for success, and pilot projects experience unusual risks associated with expansion throughout the field.

| Type of Risk | Added Percentage Points |
|--------------|---|
| EOR Projects | Varies from 1 to 3 based on an individual project's ranking in the <i>Oil and Gas Journal</i> biennial EOR Survey |

Other Adjustments

Other risk adjustments may be applied to individual properties at the appraiser's discretion.

| Type of Risk | Adjustment Trend |
|----------------------------------|-------------------|
| Short Remaining Life (< 2 years) | may increase risk |
| High or Increasing Water Cut | may increase risk |
| Gas Curtailment | may increase risk |
| Environmental Concerns | may increase risk |
| Erratic Production | may increase risk |
| Long History, Stable Production | may decrease risk |

Reconciling Results into the Discount Rate Range

This year's discount rate range of 13.70 to 20.46 percent is defined at the lower end by PTAD's base discount rate. PTAD establishes the upper end of the discount rate range by reconciling sales, survey and study data as shown in **Table 2**. The upper end of the discount rate range is the average of the "high-end" values listed in the Upper Discount Rate Range column. Similarities are evident when comparing the statistical results of the data; however, differences in the data highlight contrasting views in the market.



TABLE 2
**Summary of Findings from Annual Sales Analysis,
 Market Survey and the Property Value Study**

| Study Author | Discount Rate | Standard Deviation | Discount Rate Range | | Data Points |
|---|---------------|--------------------|---------------------|----------|-------------|
| | | | Lower | Upper | |
| Richard J. Miller & Associates* | 22.10 | 5.90 | 16.20 | to 28.00 | 78 |
| Society of Petroleum Evaluation Engineers** | 11.20 | N/A | 9.00 | to 15.70 | 32 |
| Texas Comptroller of Public Accounts / Property Tax Assistance Division*** | 16.79 | 0.88 | 15.91 | to 17.67 | 5,950 |
| Average | 16.70 | 3.39 | 13.70 | 20.46 | |

* Discount Rate based on 78 PDP transactions 1990 - 2005: *Analysis of Oil and Gas Transactions and Sales*, January 11, 2006

** Discount Rate based on 32 survey responses: *Survey of Parameters Used in Property Evaluation*, June 2016

*** Discount Rate based on the appraisal of 5,950 properties (average, excluding ad valorem taxes): *2015 Property Value Study*

Conclusions

A range of discount rates adjusted for individual property risk is appropriate for the appraisal of the wide variety of oil and gas properties in Texas. Use of a particular adjusted discount rate should be tailored to the appraiser’s perception of risk associated with a specific property. Based upon the reconciliation of data from the sales analysis, market survey, WACC and study results, PTAD concludes that a discount rate range of 13.70 to 20.46 percent is generally suitable for the appraisal of oil and gas properties in the 2016 Property Value Study unless property-specific risk requires use of a discount rate outside this range. PTAD adds the appropriate ad valorem tax rates to the adjusted discount rate to determine the property-specific discount rate that is applied in PTAD’s appraisal to discount the projected future income of oil and gas produced from the property.

References

1. *Analysis and Management of Petroleum Investments Risk, Taxes and Time*. John M. Campbell & Co., Campbell Petroleum Series, Norman, Oklahoma, March 1987.
2. *Western States Petroleum Association and the California Independent Petroleum Association Report: Analysis of Oil and Gas Transactions and Sales*. Richard J. Miller & Associates, Inc., Jan. 11, 2006.
3. *Financial Theory and Corporate Policy*, 2nd Ed. Thomas E. Copeland and J. Fred Weston, University of California at Los Angeles, Addison-Wesely Publishing Company, Inc., 1983.
4. *Mineral Property Economics, Volume 1: Economics Principles and Strategies*. John M. Campbell and Co., Campbell Petroleum Series, Norman, Oklahoma, July 1978.
5. Society of Petroleum Evaluation Engineers. *The Survey of Economic Parameters Used in Property Evaluation*. June 2016.
6. *Standard & Poor’s Bond Guide, 2015 Year-End Prices*. Standard & Poor’s Publishing, January 2016.
7. *2016 Valuation Handbook, Guide to Cost of Capital, Duff & Phelps/Wiley, Hoboken, New Jersey*.
8. Texas Comptroller of Public Accounts, Property Tax Assistance Division. *Texas Property Tax Manual for Discounting Oil and Gas Income*. Tax Publication #96-1703. Austin, Texas, February 2012.
9. *The Wall Street Journal*. The Dow Jones & Company, Jan. 4, 2016.
10. U.S. Securities and Exchange Commission. *Form 10-K Annual Reports, Year-End Dec. 31, 2015*, Washington, D.C.
11. Value Line Investment Survey, *2015 Ratings and Reports*. Value Line Publishing Company, New York, New York.
12. “Which Fair-Market-Value Should You Use?” Forrest A. Garb, *Journal of Petroleum Technology, SPE Paper No. 20276*, January 1990.

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