



VALUE SCOPE

Focusing analytics through experience.

Petroleum Reserves: PV10 ≠ Fair Market Value

Appraisals Bridge the Gap Between these Two Concepts of Value

Executive Summary

The issue:

How much are a company's oil and gas reserves actually worth on a fair market value basis?

Misconception:

Many investors believe that the company's reported "PV10" reserve value (as required by the SEC) is equivalent to FMV. This is a common, but incorrect, assumption as PV10 ignores many key value drivers.

How is FMV different?

*Fair market values of petroleum reserves and E&P companies are based on expected **future** prices, expected **future** costs, **after-tax** cash flows, and risk-adjusted discount rates considering market rates and company capital structures.*

ValueScope's professionals have developed hundreds of these analyses relied upon by investors, investment advisors, Corporate Board members, estate planners and other legal advisors.

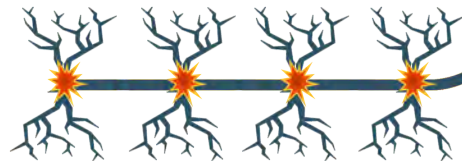
Our team of professionals provides:

- *Experience: decades of combined valuation experience determining FMVs for tax and economic damage matters*
- *Staffing: Petroleum Engineers, Ph.D.'s, CFA's, CPA's, and MBA's*
- *Independence*

The Issue at Hand

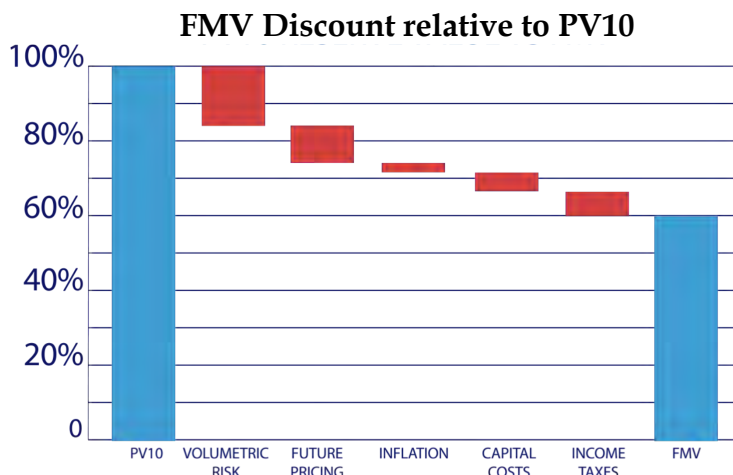
The SEC mandates publicly traded companies include summary reserve report information in their annual Form 10-K filings, including calculation of the PV10 value, an acronym for "present value at 10%." The prevalence of this reporting has led to private E&P companies & their investors also calculating PV10 values and using them as a proxy for the fair market value (FMV) of their reserves.

However, **PV10 values absolutely do not represent fair market value (FMV)**. Many factors, such as volumetric risk, required rates of return, future pricing, inflation, capital costs, and taxes can discount the fair market reserve value of an oil & gas asset by as much as 30% to 60% below the PV10. Unfortunately, many investors and their legal/financial advisors assume that PV10 and FMV are equivalent, and therefore make improper or inaccurate investment decision or transfers between business entities.



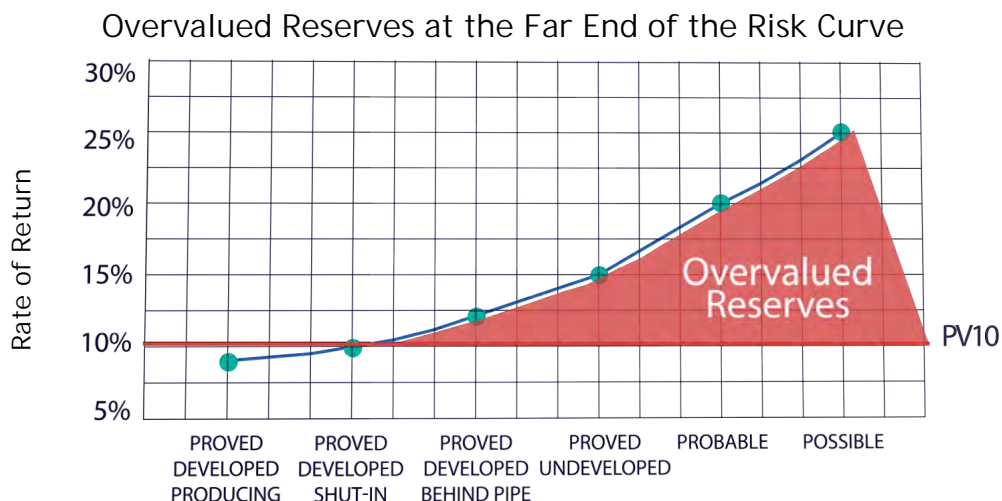
A ValueScope principal was recently retained to act as an expert in a rollup transaction dispute. Several entities contributed reserve assets in exchange for equity shares in the new corporation. One of the entities claimed its reserves were valued at their FMV when in fact they were over-valued at their undiscounted PV10 values. This resulted in that particular entity being incorrectly granted a disproportionate amount of equity relative to its contributed asset value.

ValueScope's expert performed extensive analyses that considered both the engineering reports and current market data to determine the correct FMV for the disputed reserves.



As shown in the graph above, the FMV of the reserves was actually only 60% of the stated PV10 value. Note that this percentage was calculated for a specific set of wells as of a specific date and therefore should not be considered a universal benchmark or comparable indicator for other FMV comparisons.

As shown in the graph below, a flat PV10 analysis also does not account for the variance in expected risk return profile between reserve types. Proven Developed Producing (PDP) reserves by their nature are the least risky and deliver a lower annualized rate of return, frequently below 10%. On the other hand, Proven Undeveloped (PUD) and "Possible" reserve types demonstrate a much higher risk profile for investors and accordingly demand a higher rate of return. **However, a standard PV10 analysis treats PDPs, PUDs, and Possible reserve types as equals when clearly they are not. As such, riskier reserve types may be greatly overvalued while PDPs may be slightly under valued in a flat PV10 analysis.**

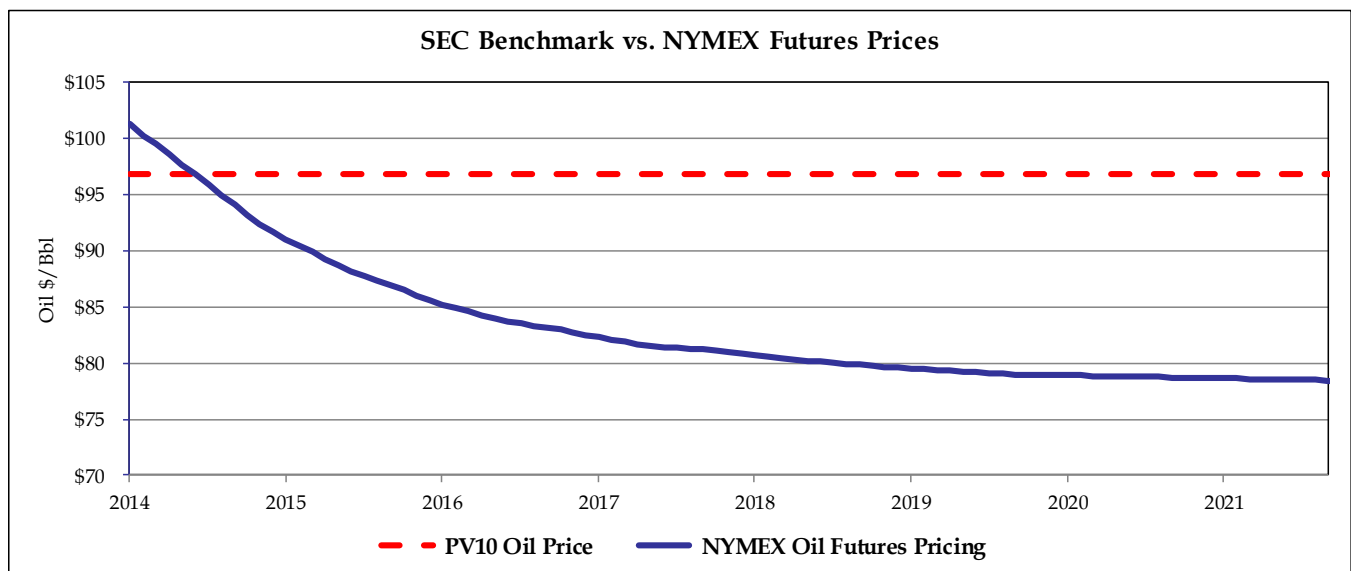


SEC PV10 Reporting

As previously stated in this paper, the SEC requires publicly traded companies to release summary reserve report information in their annual Form 10-K filings. These requirements include calculating the “PV10” value, an acronym for “present value at 10%.” The prevalence of this reporting has led to private E&P companies and their investors also calculating PV10 values.

In these reports, reserves are quantified (usually in terms of barrel of oil equivalent) by how much is expected to be economically producible under existing market conditions and available technology. Petroleum leases are considered to have reached their economic limit when their projected costs exceed projected revenues, considering their production decline curves. In support of comparability between reporting companies, the SEC mandates a common set of assumptions for every company in order to comply with its definition of “existing conditions.”

Two key assumptions have to do with oil & gas prices and operating costs. Since new financial reporting rules were adopted in 2010, “existing conditions” reflect the price that oil and gas was sold at “un-weighted arithmetic average of the first day of the month price for the previous year.” In a reserve report, these prices are held constant for all future years regardless of recent changes or market expectations. As shown in the figure below, in early 2014 historical prices were above \$95 for oil, while the market’s expectation for declining prices was clearly priced into the futures markets at that time.



For PV10 reporting, projected operating costs are also held constant based on expenses observed during the previous year regardless of future expectations or recent changes.

The cash flows considered in “PV10” values are the projected revenues and expenses based on previously discussed flat prices and costs as well as projected state and local production taxes

to calculate future net revenue. The future net revenues are then converted to a present value amount at the pre-tax discount rate of 10% (hence the common PV10 name).

As will be discussed below, the PV10 value does **not** equal the FMV of the reserves. In fact, every SEC reserve report notes that “the present value calculation is intended to show the impact of the time value of money—it is **not** intended to be representative of fair market value.” If not to provide an indication of the FMV to investors, just what are reserve reports actually for? According to the SEC, they are to “help investors evaluate the **relative** reserve quantities between oil and gas companies.”

SEC reserve reports allow investors to compare the estimated recoverable reserve quantities between different companies, on a given date, knowing that all companies are following the same set of core assumptions in their calculations.

Fair Market Value

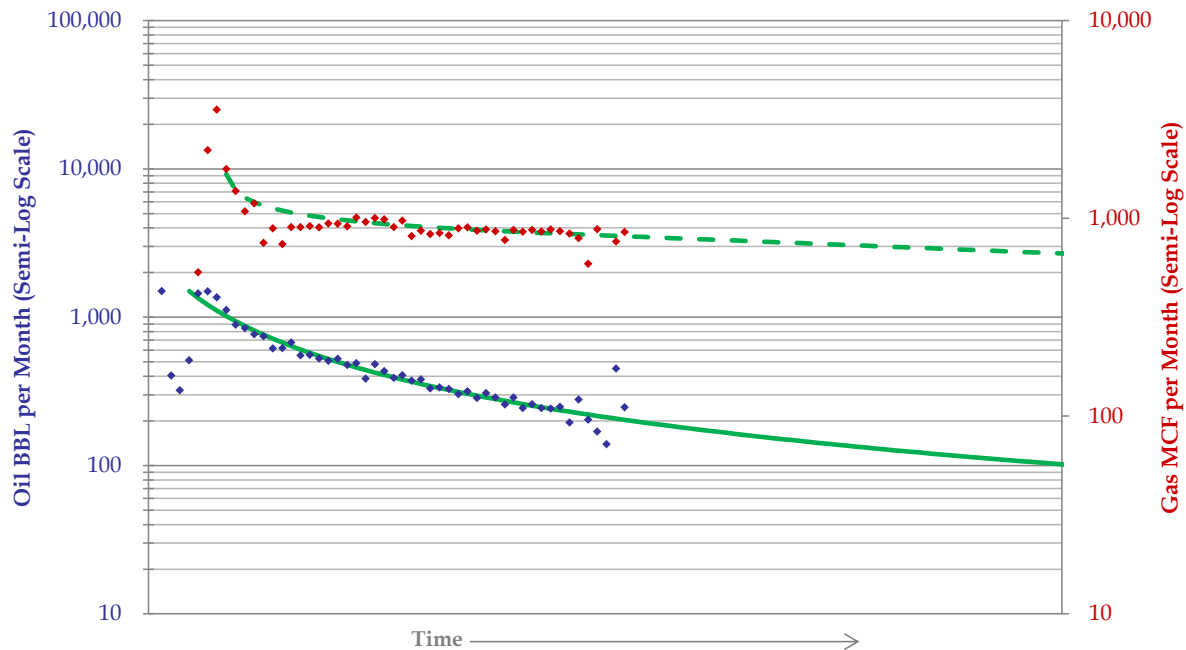
Fair Market Value has a very specific meaning based on IRS Revenue Ruling 59-60 for an arm’s length transaction, which defines FMV as:

“The amount at which the property would change hands between a willing buyer and willing seller, when the former is not under any compulsion to buy, and the latter is not under any compulsion to sell, both parties having reasonable knowledge of relevant facts.”

How would a hypothetical buyer decide what they are willing to pay? How would a hypothetical seller determine the price at which they are willing to sell? There are several factors that would be considered. Obviously, the projected quantities of oil and natural gas are primary variables. Projected quantities are often based on review of historical production amounts or operating data from analogous geologic formations, using decline curve extensions based on the Arps¹ decline curve calculations.

¹ J.J. Arps was an American geologist who published a mathematical relationship for the rate at which oil production from a single well declines over time (1945).

Decline Curve Analysis



The second most important factor is the expected future prices for oil and natural gas. The price of NYMEX futures contracts for oil & natural gas provide investors with the market's expectation for prices (as of a valuation date) several years out. As of this writing, current NYMEX trading data suggests that market investors expect West Texas Intermediate (WTI) oil prices to hover around \$45 to \$50 per barrel for the next twelve months.

FMV appraisals for oil and gas assets should incorporate NYMEX market price projections rather than flat prices based on historical data. The next key cash flow measure considered by hypothetical buyers and sellers are lease operating expenses (LOE). Assumptions for FMV analyses include adjusting LOEs based on expected inflation and other market factors. Under current market conditions, costs are actually decreasing due to excess capacity and increased competition. With PV10, flat LOEs based on historical costs are used, without adjustments for inflation or operational improvements. **FMV appraisals also do not ignore income taxes.**

Finally, hypothetical buyers and sellers consider a company's capital structure and risks when determining an appropriate after-tax discount rate. The discount rate reflects the rate of return investors require in order to compensate for the risk of actually receiving future cash flows. Elements such as leverage, operating history, location, reserve type, and other economic factors influence the discount rate, which may be significantly different than the 10% pretax rate required by the SEC.

FMV Versus the SEC's PV10 Standard

When compared to the SEC's PV10 reporting requirements, FMV assumptions result in different projected quantities of economically recoverable reserves, after-tax cash flows, and net present values. Depending upon market expectations, this may have a profound impact on the FMV of petroleum reserves.

How ValueScope Can Help

ValueScope's knowledge of FMV concepts and their conceptual application to petroleum reserves enables us to provide credible and independent analyses, consultation, and documented reports of FMV. ValueScope's team includes experienced petroleum engineers, Ph.D. economists, Chartered Financial Analysts, Certified Valuation Analysts, and Certified Public Accountants that provide rigor and credibility to our analyses and reports.

Clients routinely retain our professionals to:

- Develop independent analyses of the FMV of petroleum reserves,
- Develop independent analyses of the FMV of E&P corporations shares and limited partnership units, and
- Provide economic damage calculations and valuation support/expert testimony in litigation matters.

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The information presented here is not, nor should it be, treated as legal, financial, or tax advice and is not intended to be used to make legal, tax or investment decisions.