NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 9, ISSUE 5, May. -2022

OVER-OPTIMISM OF OIL AND GAS PROPERTY EVALUATION: A REVIEW

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ABSTRACT
Oil & gas exploration and production is associated with a lot of uncertainties and risks but it is surprising that even with the potential negative outcomes, the value of petroleum assets are usually overly optimistic and over-confident. This over-confidence usually arises during evaluation of the assets. It has been deduced from intense research that most of the over-optimism results from either human bias, error from evaluation models or both.
In this paper, the possible causes of the over-optimism in oil property evaluation and the possible effects on both technical and economic decisions are highlighted and discussed. Improper evaluation of oil and gas assets in the past has made some oil and gas companies to write down their assets which has attracted legal actions and fines.
Thus, this research work is of great importance to oil and gas companies as it will help prevent over-optimism in evaluating their assets and also stresses the need to employ standard tools and procedures while making economic valuation.

1.0 INTRODUCTION

Oil and gas property evaluation also known as Petroleum property evaluation refers to the techniques use in determining the value or economic worth of petroleum assets. Just like all other assets it is very important to determine the value of an asset before purchasing it or investing in it.
Therefore, in a more technical term Petroleum Property Evaluation can be defined as the analytical process in which the commercial value of oil and gas field is assessed. The most reliable and tested method must be employed in evaluating the value of petroleum assets. A wrong evaluation may result in the over or under valuing an asset. Petroleum assets are subjected to a lot of uncertainties in the future which may affect the value of the asset therefore the valuation procedure must take into account the unpredictable fluctuations that would cause field development, operations, and performance to deviate from the expected outcome.

2.0 REASONS FOR EVALUATING PETROLEUM ASSETS AND CHARACTERISTICS OF OIL AND GAS ASSETS

2.1 Reasons for Evaluating Petroleum

Here are some of the important reasons why economic evaluations are necessary for the oil and gas industry.

2.1.1 Project evaluation: The decision to develop an oil and gas field must be backed by economic justification that comes from accurate and proper evaluation of the asset.

2.1.2 Acquisition and Divestiture: Buyers and sellers of properties need valuations to prepare for acquisition and divestiture transactions. The buyers need for an evaluation is to get the best value for their

money while Sellers with a compulsion to seek the highest compensation usually prepare an economic evaluation to gauge the adequacy of an offer.

2.1.3 Financing: In order to secure loans to finance project it is expected that the producer tenders known value of company's property portfolio or specified group of properties as collateral.

2.1.4 Taxation: Government also determines the amount of tax a company will pay based on the value of its oil and gas reserve.

2.1.5 Prioritize Opportunities: When presented with set of investment opportunities and there is financial constrain. Economic evaluation of each opportunity will guide in ranking them and selecting the most profitable.

2.2 Characteristics of oil and gas Assets

It is important to discuss the unique characteristics of oil and gas assets. This will help us in determining those things we have to watch out for while determining its value.

2.2.1 Exploration and Development Risk

Oil and gas assets are characterized by Uncertainties. These uncertainties may come up in different form and at different time in the life of the asset. For example, during the exploration stage of the asset there is a lot of geology and engineering uncertainties that is associated with evaluating our reserves which may result in erroneous reserve estimate. Also, technical

Failures, barren geologic formation, bad judgment may result in drilling of drill holes which can cause the producer to lose it investment. Furthermore, risk also arises after development in the form of fluctuating oil and gas price. Therefore, oil and gas asset is indeed a very risky business, although some of the risks are diversifiable.

2.2.2 Capital Intensive

Another important characteristic of oil and gas property is that it requires huge capital or investment for its development. For example the cost of exploring for petroleum fields may be in excess of $200Million, cost of further development (drilling appraisal wells, drilling injection wells, gas lifting, and other Secondary recoveries) and also the setting up infrastructures and facilities will result in additional cost and investment. Thus, making petroleum assets to be very expensive.

2.2.3 Value depreciate with Time

Unlike land and other assets whose value appreciate with time the value of oil and gas asset actually depreciate with time. At the early stage of production, the new field is classified as green field because the reserve is still in large quantity but as production decline with time the value of the asset begins to depreciate until the economic limit of the asset is reached and the field is abandoned.

Having enumerated some of the important characteristics of petroleum assets, it can be deduced that the oil and gas assets are expensive to manage and at the same time prone to a lot of risk. Thus, it is important that the evaluation of the asset be done by using well approved methods and taking into consideration future occurrences that may affect the asset.

3.0 METHODS AND MODELS USED FOR ECONOMIC EVALUATION

An economic evaluation process is designed to produce an unbiased estimate of the value of property. The evaluation process is a systematic approach to property valuation. It consists of defining data requirements, assembling the best available data, and applying an appropriate evaluation method. Two evaluation methods are discussed: (1) the comparable sales approach and (2) the income approach. In the comparable sales approach, the value of a property is estimated from prior sales of comparable properties. The basis for estimation is that the market would impute the value to the subject property in the same manner that it determines the value of comparable competitive properties.

3.1 Comparable sales approach:

The comparable sales approach relates the value of the property being appraised to the value of similar properties previously leased or sold. However, variations in property attributes (such as reserves) between the property being evaluated and the comparable properties may exist. They may sometimes be accounted for through a monetary adjustment to each comparable property's value. Adjustments can be measured based on the impact of variation in development attributes on a representative discounted cash flow value. Adjustment may also be made by simply comparing the value of assets which are similar except for a single characteristic difference. For example, comparable sale values per oil equivalent barrel can frequently be calculated or acquired and they can be used to value assets with different amounts of reserves.

3.2 Income Approach Analysis

Another way of evaluating the value of a petroleum assets is to predict the future cash inflow that will be generated by the producing the field. Therefore, measuring and weighing the projected cash flows give an estimated monetary worth of the property and how much investment can be committed into it.

3.2.1 Projecting Cash Flow

Projected schedule of quantities of reserves from a deterministic reserves study projected in selected time frames usually in years also schedules of future prices and costs are projected for the same time frame. Volumes are multiplied to the projected cash flow stream, and the results are reported. A table presenting a suite of present worth values over a range of discount rates is usually included. The individual projections are usually made by each well and the total projection is gotten by summing the projection of all the wells.

Thus, the projection of net cash flow for the field as a whole is a combination of many interrelated but distinct cash flow streams. Some components are fixed by contract and can typically be projected with relative certainty (e.g., royalty, tax and rental payments), but others require trained guesswork that leaves a wide margin of error (e.g., future production rates and oil price trends). It is therefore reasonable that those components of the cash flow that are known with certainty are given greater weight while determining the value of the filed.

3.2.2 Discounted net present value

In projecting the future cash inflow for a project, it is very important to take into consideration the time value of money because money loses its value due to inflation over time. The effect of inflation on cash flow is adjusted to the present by using the discount rate (or the inflation rate). The sum total of all the discounted cash inflow gives the net present value of the asset.

The challenge now is to determine the best discount rate to be used in the valuation process. Also, it is important to note that the cash streams from oil and gas business are risky; therefore the discount rate must also be adjusted to compensate for risk.

4.0 CAUSES OF OVER-OPTIMISM OF OIL AND GAS PROPERTY EVALUATION

Although oil and gas are known to be a very risky with a lot of uncertainties and risks surround the business. There is high probability of drilling a dry hole and there is also a problem of volatile oil price for example at the pick of covid-19 pandemic in March 2020, oil price was negative. With all the risk and uncertainty associated with oil and gas it is expected that the value of the assets be low accompanied with little investment but reverse is the case.

This paper thus highlights some of the reasons why oil and gas asset evaluation may be overly optimistic even in the face of uncertainties and risks. Some of the factors that may be responsible for this are Unrealistic Production Forecast Assumptions, Human Bias and Reservoir Modeling limitations.

4.1 Unrealistic Production Forecast Assumptions

As discussed earlier that one of the major tools used in determining the value of petroleum asset is the Discounted Net Present Value which depends on the production forecast. In most cases to predict future production, dynamic models are used and the assumptions used are frequently either optimistic or lack realism, resulting in over- prediction of the production profiles. Project schedules often assume flawless execution and ignore or underestimate the potential for delays and unexpected events. In reality, however, there is a high probability of activity slippage during drilling, hookups, construction, and startup of new facilities. Forecasters quite often assume that operational efficiency will be 100% during the life cycle of the project. However, significant deferments are seen because of operational constraints of various facilities during the production cycle.

4.2 Human Bias

Forecasters and decision makers tend to be optimistic about their capability to judge outcomes of uncertain situations. They may underestimate uncertainty and have positively biased expectations about the consequences of their actions. They may ignore risks or underestimate the effect of risks on the forecast. A tendency toward overconfidence may lead to overlooking certain realities. If a forecaster interprets data with a bias to confirm preconceived notions, it may result in an unrealistic outcome.

4.3 Reservoir-Modeling Limitations

Another important cause of over optimism may arise from numerical simulation models because they approximate the production mechanisms of complex hydrocarbon accumulations. They suffer from inherent limitations in capturing the physical properties of reservoirs, wells, and process facilities. And thus, they over predict production because actual geology and physics are often more complex than can be captured realistically in a numerical model. These above factors are some of the causes of over-optimism in the valuation of petroleum assets, which will tend to raise the value of the asset than expected.

5.0 CONSEQUENCES OF OVER- OPTIMISM OF OIL PROPERTY EVALUATION

The major cause of over evaluation of oil and gas asset results from reserves overbooking. And it has been observed that companies that engage in reserves overbooking no longer exist as the temporal benefits of such practice disappear when those reserves are removed. Over estimating petroleum assets can also result in an investor committing more investment than necessary which will lead to wasting of capital and inability to recover cost. This can prompt investors to seek redress or justice through class action legal law suit against the company. Moreover**,** it can lead to severe sanction (such as huge fines) from relevant agency such as the Security exchange commission (SEC). Aside external effect of over optimism on the company,

internal costs are also common such as the possible loss of Job for affected employees, resentment against and lack of trust in the company's management.

6.0 CONCLUSION AND RECOMMENDATIONS

Evaluating the value of petroleum asset is accompanied with a lot of uncertainties and risk. Therefore, care must also be taken not to under estimate the value of the asset in the process avoiding over-estimating the value which may lead to lack of investment in the asset.

Also some of the important causes and consequences of over –confident in petroleum asset evaluation have been discussed above. Thus, in evaluating value of oil and gas assets caution must be exercise and the use of standard techniques and review of results by external bodies should be encouraged.

REFERENCES

1. Journal of petroleum engineering technology.
2. Paddock, J. L., Siegel, D. R., and Smith, J. L. (1988). "Option Valuation of Claims on Real Assets: The Case of Offshore Petroleum Leases," Quarterly Journal of Economics 103(3):479-508.
3. Production and forecasting: Optimistic and Overconfident- Over and over again by Reidar B Bratvold and Erlend Mohus, University of Stavanger; David Petutschnig and Eric Bickel, University of Texas at Austin.
4. ADEYEMI TEMITAYO SHERIFF and OJO IBUKUN JOEL (2021) "APPLICATION OF LAPLACE-DIFFERENTIAL TRANSFORM METHOD TO TRANSPORT PROBLEMS IN POROUS MEDIA", International Journal of Innovations in Engineering Research and Technology, 7(06), pp. 12–21.
5. Jacoby, H. D. and Laughton, D. G. (1992). "Project Evaluation: A Practical Asset Pricing Method," Energy Journal 13(2):19-47.
6. Pindyck, R. S. (1999). "The Long-Run Evolution of Energy Prices," Energy Journal 20(2):1-27.
7. Ogbunike, Jude, and Temitayo Adeyemi. "Development of a Novel Compressibility Factor Correlation for High Pressure-High Temperature HPHT Reservoirs using Stochastic and Robust Optimization Approach." Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Virtual, August 2020. doi: https://doi.org/10.2118/203619-MS
8. Petroleum property valuation. James L. Smith* Department of Finance Southern Methodist University Dallas, TX 75275, June 2, 2003.
9. OJO IBUKUN JOEL, & ADEYEMI TEMITAYO SHERIFF. (2021). A NOVEL APPROACH TO FORECASTING PRODUCTION RATE OF DRY GAS WELLS. International Journal of Innovations in Engineering Research and Technology, 6(11), 1–6. Retrieved from https://repo.ijiert.org/index.php/ijiert/article/view/1860
10. Economic Evaluation of Oil and Gas Properties Handbook
11. McCray, A. W. (1975). Petroleum Evaluations and Economic Decisions. Prentice-Hall, Englewood Cliffs, N.J.
12. Risk and Reward: The Relationship between Prospectively and Fiscal Regimes. G,K Kellas and S.G, Hodgshon, Petroconsultants UK.
13. Adeyemi, T. S. (2021). Analytical Solution of Unsteady-state Forchheimer Flow Problem in an Infinite Reservoir: The Boltzmann Transform Approach. Journal of Human, Earth, and Future, 2(3), 225-233. doi: https://dx.doi.org/10.28991/hef-2021-02-03-04
14. Adeyemi, T. S., & Rufus, D. O. (2021). Analytical Development of an Improved Inflow Performance Relationship (IPR) Model for Solution Gas Drive Reservoirs. Journal of Human, Earth, and Future, 2(2), 125-135.

15. T. SHERIFF, "APPLICATION OF THE LINEAR FLOW DIFFUSIVITY EQUATION IN ESTIMATING WATER INFLUX IN LINEAR WATER DRIVE RESERVOIRS", as, vol. 1, no. 3, pp. 12-25, Dec. 2018.
16. Lerche, I. and J. A. MacKay (1999). Economic Risk in Hydrocarbon Exploration. Academic Press, San Diego, CA.
17. Sheriff, Adeyemi Temitayo. "Development of Two-Phase Compressibility Factor Correlations Using a Stochastic and Robust Gradient-Based Optimization Algorithm." Paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, August 2019.doi: https://doi.org/10.2118/198792-MS
18. Adelman, M. A., and Watkins, G. C. (1997). "The Value of United States Oil and Gas Reserves: Estimation and Application," Advances in the Economics of Energy and Resources 10:131-184.
19. Dixit, A. K. and Pindyck, R. S. (1995). "The Options Approach to Capital Investment," Harvard Business Review 73(3):105-118.
20. Adelman, M. A. (1990). "Mineral Depletion, with Special Reference to Petroleum," Review of Economics and Statistics 72(1):1-10.