Modern Petroleum Economics and Application

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Overview

Economic evaluation is very important in petroleum investment and planning, it coordinates most of the functional departments in petroleum company. Economic evaluation and decision analysis are integrated and performed throughout the process of new project investment, project contract negotiation, project screening and comparison, asset divesture, project portfolio management and optimization, and corporate strategy making. Major methods for petroleum assets valuation are deterministic NPV assessment, Scenario-based decision tree EMV, probabilistic NPV asessment.

Economic evaluation and decision analysis has changed from single project to portfolio evaluation and pptimization. Practical application of portfolio management in the energy sector provides a process and format which introduces consistency in the decision making process.Prevents different organizational units from using different methodologies which may cause unfair bias in the perceived potential of its opportunities – gives decision makers more confidence in the flow of information. It provides a framework to quickly evaluate the commercial viability of new business ventures and provides a process by which industry experience can be used to evaluate the probability of full cycle commercial value – helps to define what has to be accomplished for positive full cycle value.

For production project, which has the possible scenarios of the extension of a field development ,assuming the field continues to produce as normal, and also if the additional development plan or new wells are drille , economists may use incremental project economic evaluation.

Methodolgy

We analyze and summarize the workflow of economic evaluation and decision dnalysis in upstream projects, The framework of petroleum project economic modeling and evaluation is to integrate production profile, oil price, Capex, Opex, to form cash flow in accordance with the requirements of fiscal and tax terms, then select a reasonable discount rate, and calculate economic indicators such as NPV and IRR.

We compare the main mertrics of economic evaluation and their applications. For the major economic evaluation methods, such as NPV ,EMV, S curve, Monte Carlo, and projecportfolio optimization, we all give project cases study.

Results

We build ecnomic model for major economic evaluation methods for single project.

We summarize that successful E&P portfolio management has three parts: first, adequately define probabilistic range of reserves and production for baseline production fields under development, and future exploration opportunities; second, project economics – deterministic and probabilistic project economic models which are in a consistent architecture (realistic range of an asset's reserves, production, costs, timing, economic metrics, etc. has to be defined) – not only single deterministic models but an project economic description which is scenario based with robust sensitivity analysis; finally, portfolio modeling – once each asset's range of performance can be defined it is possible to define the probable range of a portfolio's performance.

Conclusions

We show the trend of contemporary oil &gas project economic evaluation: from deterministic model to probabilistic model, from single project to portfolio evaluation and optimization. The application of economic evaluation and decision analysis in upstream projects illustrates that study on project economic and portfolio evaluation is valuable.