Chapter 10
Waterflood Project With Production Scenarios

ABSTRACT

A waterflood project analyses where recoverable oil must be estimated, and one of four production schedules is used to generate a revenue stream. The model combines volumetric estimates, prices, costs, and production scheduling. The overall objective is to estimate the NPV and IRR for the project over an 18-year horizon, given information about initial costs, operating costs, reservoir description, production schedules, prices, working interest, and taxes. The volumetric analysis calculates the total reserves STB. The initial startup costs are considered fixed, but the annual electricity, labor, and overhead costs, as well as the price of oil, are modeled as random walks, using the parameters shown. The key aspect of the model is the production schedule: the percentage of total reserves extracted each year. Four possible production schedules are listed. On each iteration, one of these schedules is chosen randomly. Outputs from the simulation are averages over the possible schedules.

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INTRODUCTION

Oil Production Scenarios

Peak oil refers to the hypothetical point at which global crude oil production will hit its maximum rate, after which production will start to decline. This concept is derived from geophysicist Marion King Hubbert's "peak theory," which states that oil production follows a bell-shaped curve.

In the traditional vision of peak oil, the production decline accelerates as the cost of extracting new reserves grows. This would put pressure on existing reserves that are drawing down over time. If new reserves are not brought online more rapidly than the existing reserves drawdown, then peak oil has been reached. Peak oil has been declared several times, but each deceleration has proved premature because of new extraction technologies like hydraulic fracturing and better surveying techniques.

- Peak oil is a hypothetical scenario where oil production hits a maximum rate and begins to decline.
- When peak oil is reached, the discovery of new reserves cannot keep pace with the decline in existing reserves.
- Although declared several times, peak oil has not happened thanks to new technology that helped sustain oil production, keeping global supplies flowing.
- Peak oil might also happen due to declining demand, which would result from more efficient technologies and alternative energy sources.
- Studies of climate change suggest that a decline in oil consumption in favour of alternative energy sources will be necessary to avert catastrophic climate change.

Because oil is a non-replenishing resource, there is a limit to how much the world can extract and refine. However, the scenario of total depletion is just one version of peak oil. In theory, peak oil can be brought on by the production squeeze—the drawdown as new reserves get more expensive to extract. It can also be caused by a production decline when oil alternatives