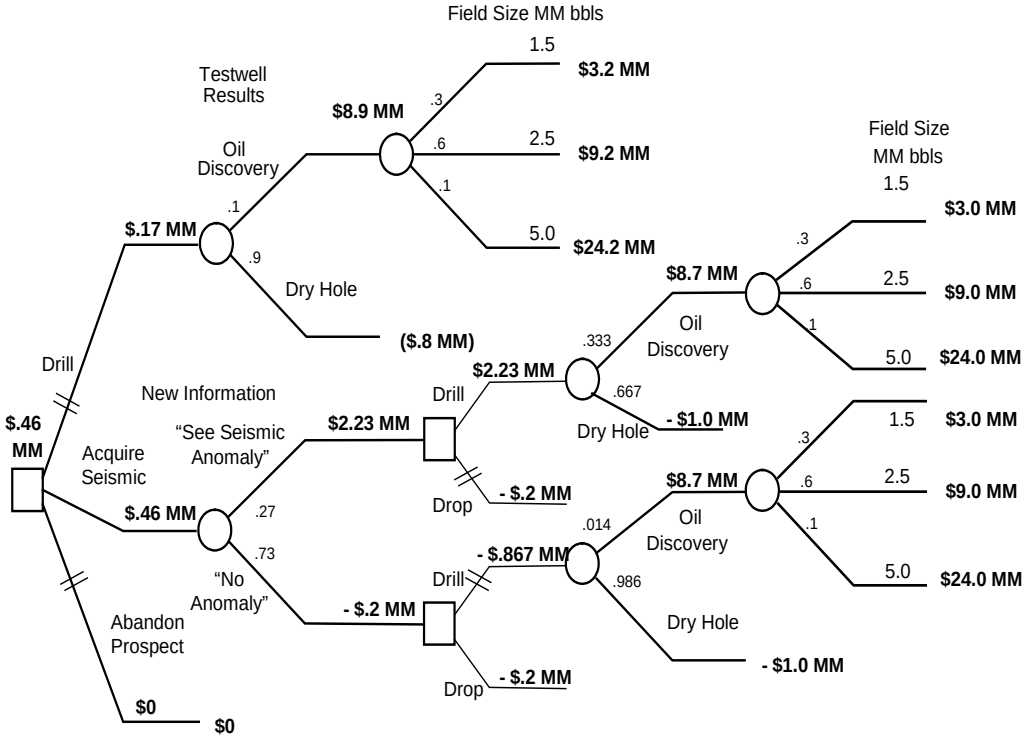
9. VALUE OF INFORMATION AND CONTROL

When additional information can be obtained, it is very useful to first determine the value of the new information. Proceed to acquire the new information if its cost is less than the value added

In petroleum exploration, a seismic survey is a popular way to gain additional information. The following decision tree analysis considers acquiring additional information:



The expected value ahead of each node is found by "folding back" the decision tree. The endpoint *present values* and node *expected monetary values* are shown in bold characters.

Drilling this oil prospect will cost $0.8 million if unsuccessful. For the 10% chance of success case, the resulting field size is approximated by a three-level distribution, ranging from 1.5 to 5 million barrels of oil ($3.2 to $24.2 million present value). The expected monetary value of "drill now" is $0.17 million.

Dropping the prospect will cost nothing in future value. We assume here, for simplicity, that any prior expenditures for lease acquisition, delay rentals, geologic, geophysical, and overhead costs to date are expensed, sunk costs and do not affect future net cashflow.

Another alternative—Acquire Seismic information—has been added to the drill/abandon decision. A seismic survey would be useful in identifying the presence, location and size of geologic anomalies which may contain oil. Acquiring and processing the seismic data will cost $0.2 million. It is believed that a seismic anomaly, if found, would be a favorable indicator of the presence of oil. And, incorporating best

judgments about the reliability of the information, there is a 0.33 chance that drilling an anomalous feature will result in a field discovery.

For this decision, having the alternative to acquire seismic information increases the value of the investment opportunity by \$0.46 – 0.17 = \$0.29 million. Adding the cost of the survey, the value of imperfect information is \$0.29 + 0.2 = \$0.49 million. The information is imperfect because, even if the seismic interpretation shows an anomaly, there is still some uncertainty about the presence of hydrocarbons.

Value of Perfect Information

Sometimes, it is useful to draw a tree as if information could be obtained which is 100% reliable. The hypothetical, redrawn tree has all chance nodes placed before the decision nodes. Then this tree calculation determines the ***value of perfect information***. This quick analysis sets an upper-bound on the amount that should be paid for all possible additional information and analysis. With the example above, without the seismic option, the value of obtaining perfect information from a clairvoyant for free is

$$\text{VPI} = \text{EMV}_{\text{with perfect foresight}} - \text{EMV}_{\text{current situation}}$$

$$= 0.10(\$8.9 \text{ million}) - \$0.17 \text{ million}$$

$$= \$0.72 \text{ million.}$$

Opportunity loss is synonymous with regret.

Expected opportunity loss (EOL) equals EV regret.

The above relationship also suggests the potential of an ***opportunity loss*****:** Our best choice may not provide the best outcome. Hindsight is 20:20, and we often wish we could change our decisions after the uncertainties become known. ***Regret*** or opportunity loss is the difference between what we would have obtained with perfect foresight and what we actually received. Calculated somewhat differently but arriving at the same value, Expected Opportunity Loss (or EV regret):

$$\text{EOL} = \text{VPI}$$

The decision rule that maximizes EMV is exactly equivalent to a decision rule that minimizes EOL.

On occasion, the outcome of certain events can be partially or wholly controlled. Examples include:

- management or contract controls to narrow cost uncertainties
- using futures contracts to hedge against commodity price risk
- more conservative designs and operating practices to reduce chance of failure

A calculation process similar to valuing information can determine the value of perfect control or the value of imperfect control.