Economic Risk and Decision Analysis for Oil and Gas Industry CE81.9008

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Managerial Flexibility in Project Valuation: Real Option Approach

Characteristics of the Investment Decision

- Investment cost is mostly Irreversible.
- Future cash flows are Uncertain.
- There is usually some degree of Managerial Flexibility as to the timing and operation of the project.

DCF Assumptions

- The project is a ***"now or never"*** opportunity
- Once the project is undertaken, it will not be affected by any future managerial decision.
- Expected future cash flows are taken as "given" – they are assumed to be **certain to happen**
- Project has **no synergies** with other projects the firm may have
- **Project risk** does not change throughout its life

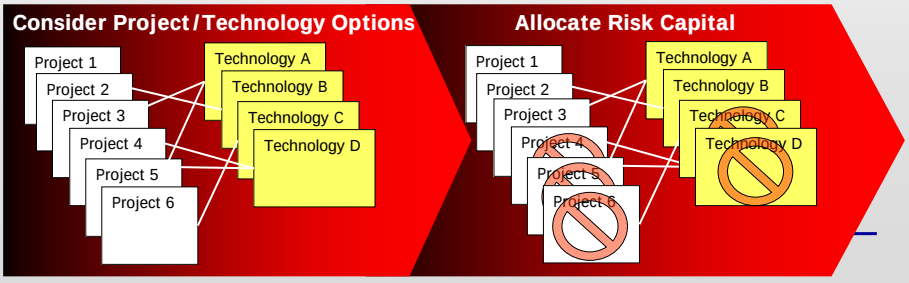
Traditional DCF Analysis

- Ignores the **option value** of investing
- Ignores project **uncertainties**
- Ignores the value of **managerial flexibility**
- Generally **underestimates** the value of projects that have real options
- Can lead to **non optimal** capital budgeting decisions

Challenge – Including Upstream Technology Investments in the E&P Portfolio

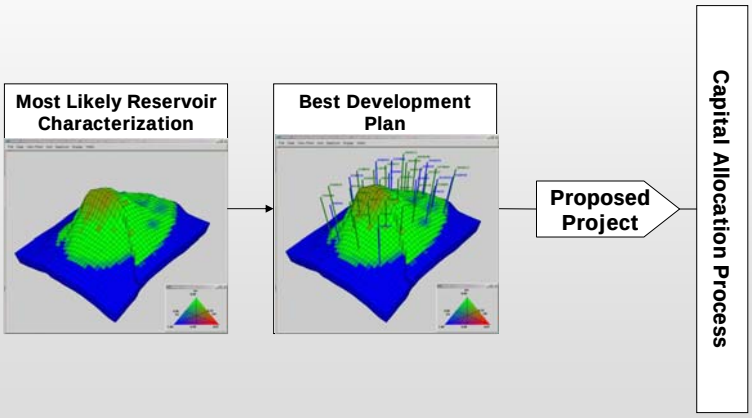
Modern technology investment approaches

- Measure risks & uncertainties
- Strategic alternatives
- Real options
- Portfolio valuation



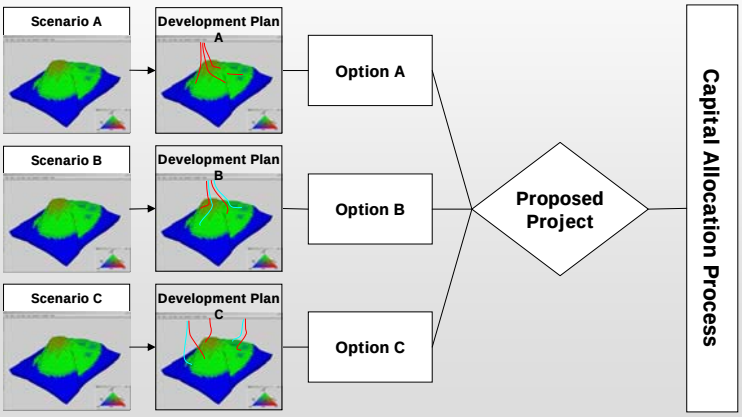
Capital allocation methodologies

Traditional deterministic planning



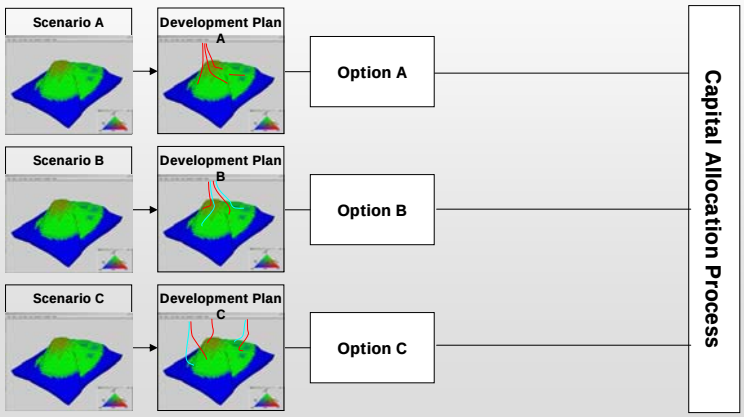
Capital allocation methodologies

Scenario-based stochastic planning



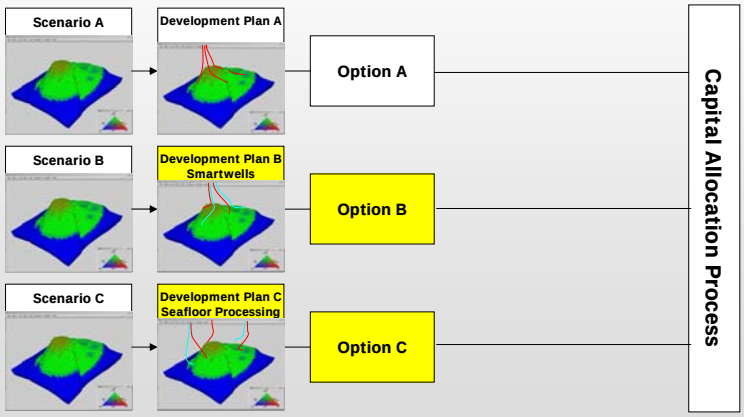
Planning methodologies

Option selection at the portfolio level



Planning methodologies

Technology-based options

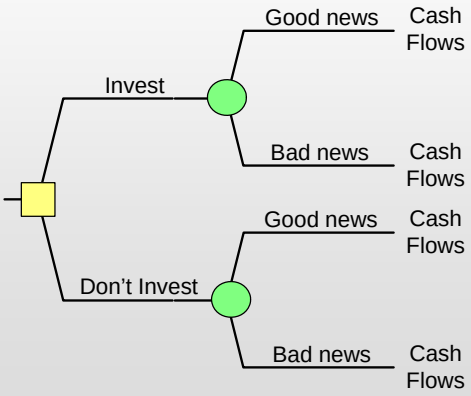


Capital Projects as Real Options

- An approach to capital budgeting that relies on **option pricing theory (OPT)** to evaluate projects.
- Real options approach is intended to **supplement**, ***not replace***, capital budgeting analyses based on standard DCF methodologies.
- **Real Options** values the **managerial flexibility** embedded in many projects and which is disregarded by traditional DCF methods.
- Insights from **option based analysis** can improve estimates of project value.
- Real options analysis has potential, in certain cases, to significantly enhance project management.

DCF and Real Options

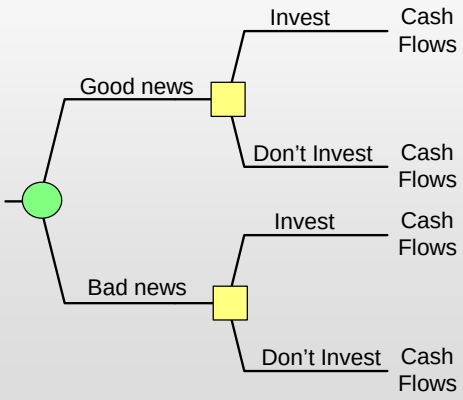
A) <u>This is not an option</u>



- Standard DCF techniques treat projects as shown in figure A.
- For some projects this may be an inadequate representation
- This tree assumes managers do not interfere with project operations

DCF and Real Options

B) <u>This is an option</u>



- Sometimes managers have the *option* to wait and see what happens regarding one or more sources of uncertainty before making a decision.
- An efficient capital market would not place the same value on both of these projects.

Asset-in-Place vs. Options

- Many corporate investment proposals contain elements of both project types (Figures A & B).
- ***Assets-in-place*****:** Cash producing assets that can be evaluated with traditional **DCF methodologies**.
- ***Growth Options*****:** Opportunities to make future investments, which require an **OPT methodology**.
- Growth options are known as **real options** to distinguish them from financial instruments.
- Ideally, we want to separate a project's assets-in-place from its growth options.

Optimal Valuation Methods

Degree of technical uncertainty

Low — High

Degree of economic uncertainty

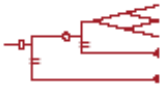
High — Low

Real Option Valuation (*RO*) — 3

- Advanced valuation tool based on an analogy with financial option theory.
- A dynamic version of *DCF*, where the project value depends upon the values and volatility of the present value of the project.
- *Takes into account managerial flexibility arising from economical uncertainty*

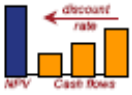
Combination of *RO* and *DTA* — 4

- Advanced valuation tool that combines the techniques of both *DTA* and *RO*
- *Takes into account managerial flexibility arising from both technical and economical uncertainty*



Discounted Cash Flow (*DCF*) Analysis — 1

- Baseline valuation tool to determine value based on timing of free cash flows
- *Does not take into account managerial flexibility*



Decision Tree Analysis (*DTA*) — 2

- Advanced valuation tool based on decision sciences
- A dynamic version of *DCF*, where probabilities are assigned to potential outcomes at each stage in the valuation
- *Takes into account managerial flexibility arising from technical uncertainty*