Real Options Application: From Successes in Asset Valuation to Challenges in Portfolio Optimization

Soussan Faiz - Texaco Inc.
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Outline

• Rationale

• Why Real Options?
  – Application & Benefits

• Why Portfolio Optimization?
  – Application & Benefits

• Need for Integration

• Need for Enterprise Solution
Globalization and knowledge are changing the energy industry

- Increased M&As, consolidations, strategic alliances
- Competitive landscape: NOCs ⇔ niche independents
- Deregulation and privatization of utilities
- Convergence of gas, power, and electricity
- Advances in operational and business technology
- Higher customer expectations
- Expanded stakeholder expectations (e.g. SVA²)

What business competencies differentiate the winners?

- Business Charter
- Enterprise Risk Management
- Portfolio Optimization
- Real Options Valuation
- Business Intelligence
- Scenario Planning
Why Real Options Valuation (ROV)?

**DCF**
- Now or never
- Unchangeable across life
- Passive management
- Constant discounting for time and risk

View Across Time

**ROV**
- Can defer, alter, maneuver
- Sequential and dynamic
- Active management
- Discounting for time, managed risk

View Across Time

Exit

ROV process improves all dimensions of decision complexity

Decision Makers

Open Framing
- Strategic Environment
- Options, Flexibilities

Analysis
- “Smart” Modeling
- Uncertainties, Market

Interpretation
- “No regrets” Strategy
- Leveraging Uncertainties

Asset Team + Other Experts
Real Options Team
An ROV application
Sell or hold asset “dilemma”?  

**PROS**
- Discovered reserves
- Potential impact project
- Regional growth potential
- Low holding cost
- Additional equity
- Exploration potential

**CONS**
- Uncertainties
  - Political environment
  - Project delays
  - Reservoir quality
  - Development costs
- Investment efficiency

**Issues:** Minimum sale price? Timing? Exposure?
Future potential value? Best policy map?

**ROV process converged team’s objectives and understanding**

**Open Framing**
- Brainstormed & catalogued key drivers
- Mapped decisions, uncertainties, & learning

**Analysis**
- Prioritized & pruned to solvable form
- Developed associated models
- Technical & political expert assessments
- Finalized & ran model

**Interpret’n**
- Results
- Recommendations
**ROV process identified other value sources enhancing the base plan**

- **PUT OPTIONS**
  - Monetize or exit if:
    - Contract terms unacceptable
    - Delays erode value
    - Negative learning about:
      » Reserves
      » Recovery
      » Initial production rates
      » Well spacing

- **CALL OPTIONS**
  - Add value with:
    - Managerial flexibility
    - Positive learning about:
      » Reserves
      » Recovery
      » Initial production rates
      » Well spacing
    - Optimize facility capacity
    - Exploration potential
    - Technology potential

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**Result: Differentiated Sources of Value**

<table>
<thead>
<tr>
<th>Source of Value</th>
<th>Managed NPV</th>
<th>Unmanaged NPV</th>
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</thead>
<tbody>
<tr>
<td>Additional Equity</td>
<td></td>
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<tr>
<td>Oil Price</td>
<td></td>
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<tr>
<td>Technology</td>
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<tr>
<td>Exploration</td>
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<tr>
<td>Variable Facilities</td>
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**Prior Value**

- +ve Incremental Value
- –ve Incremental Value

**Conventional Approach**

0 NPV
Result: NPV Risk Profile

Comparison of NPV Outcomes

<table>
<thead>
<tr>
<th>Probability</th>
<th>Conventional</th>
<th>Market</th>
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<tbody>
<tr>
<td>0%</td>
<td>180%</td>
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<tr>
<td>20%</td>
<td>20%</td>
<td>44%</td>
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<tr>
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<td>6%</td>
<td>20%</td>
</tr>
<tr>
<td>100%</td>
<td>19%</td>
<td>37%</td>
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Result: Optimal Policy Maps, Likelihoods, Future E(NPV)s, Ranges, Exposures

Well Test Results

Market-based Approach
Conclusions on asset “dilemma”

- Modeling managerial flexibility (option value) had significant impact on valuation
  - Fixed facility sizing or forced pilot limited value potential
  - ROV exceeded risked base plan by 225%

- Policy maps provided a robust dynamic asset management strategy at each decision milestone
  - Likelihoods, E(NPV) & range, exposure, timing

- Market-based approach corroborated and quantified intuitive concerns
  - High & late expenditures, capital efficiency
  - New methodology, corporate issue

Why Portfolio Optimization?

**Project Ranking**

- Over simplification of risk
- Little consideration to asset interplay
- Max return + min risk

<table>
<thead>
<tr>
<th>Rank</th>
<th>Project</th>
<th>NPV</th>
<th>Reserves</th>
<th>Capex</th>
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<tr>
<td>1</td>
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<td>5</td>
<td>A</td>
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Accept and Fund “Best” Projects
No More Budget

**Efficient Portfolios**

- Full attention to risk/uncertainty
- Focus on interplay and exploit “hedges”
- Risk & return tradeoffs

Efficient Frontier
Risk
Return
An efficient portfolio effectively integrates goals, constraints, uncertainties & interplay

Optimize the portfolio mix subject to minimize risk (or maximize return) and …
Achieve $\geq$ target $\quad$ Limit to $\leq$ target

- E(NPV)
- Reserve addition
- Short-term earning
- Long-term cash flow
- Production Profile
- ROCE ...

- CAPEX
- Expenses (e.g. in year 3)
- Finding cost
- Lifting cost
- % interest in proj X
- If proj Y then not proj Z ...

A Portfolio Optimization application

![Graph showing relationship between E(NPV) and Shortfall Risk]
Benefits of Portfolio Optimization

- Selection of efficient portfolios (not ranked projects)
- Knowledge of risk and uncertainty
- Attention to tradeoffs (the right balance)
- Exploitation of asset interplay (natural hedges)
- Insights from “what if” games
- Portfolio conversation and accountability
- Shareholder focus
Real Options + Portfolio Optimization
(A wedlock made in heaven)

- Real-world problems need real-world solutions
  - Partial project selection
  - Certainty of uncertainty
  - Project dynamics and learning
  - Timing options

- Integration catalysts are needed
  - Lack of available (shared) know-how
  - Critical interest

Enabling a seamless enterprise solution
is challenging but highly rewarding