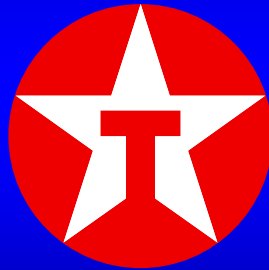


***Real Options Application:
From Successes in Asset Valuation to
Challenges in Portfolio Optimization***



Soussan Faiz - Texaco Inc.

**3rd Annual International Conference on Real Options
Leiden, Netherlands - June 1999**

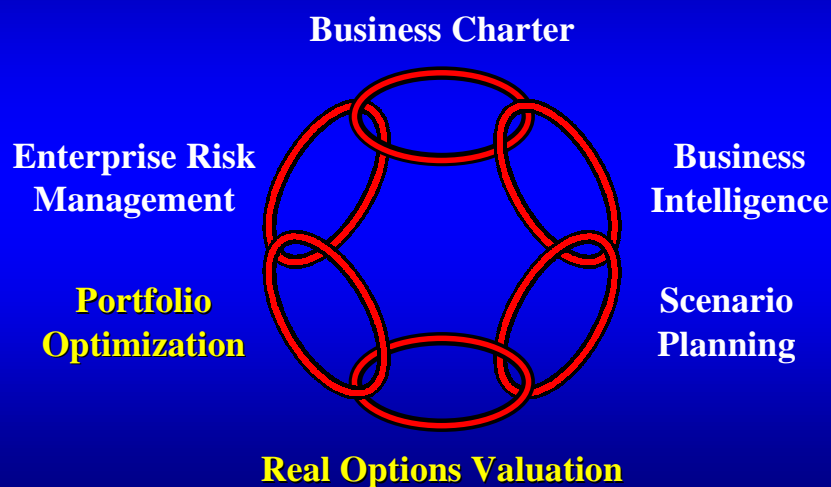
Outline

- **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 \Leftrightarrow 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?



Why Real Options Valuation (ROV)?

DCF

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

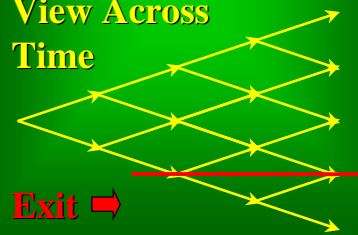
View Across Time



ROV

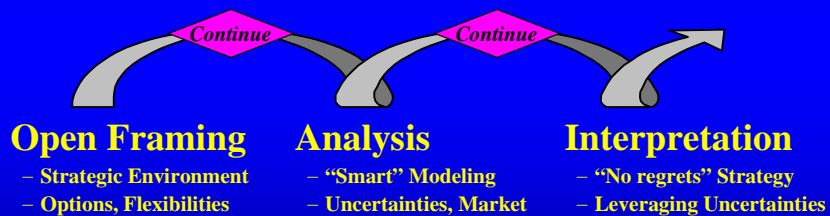
- Can defer, alter, maneuver
- Sequential and dynamic
- Active management
- Discounting for time, managed risk

View Across Time



ROV process improves all dimensions of decision complexity

Decision Makers



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:

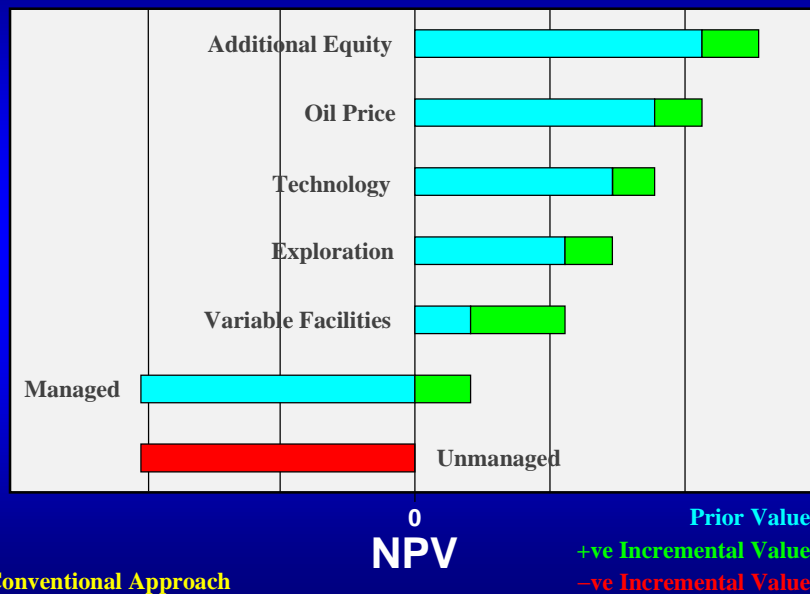
- Contract terms unacceptable
- Delays erode value
- Negative learning about:
 - » Reserves
 - » Recovery
 - » Initial production rates
 - » Well spacing

• CALL OPTIONS

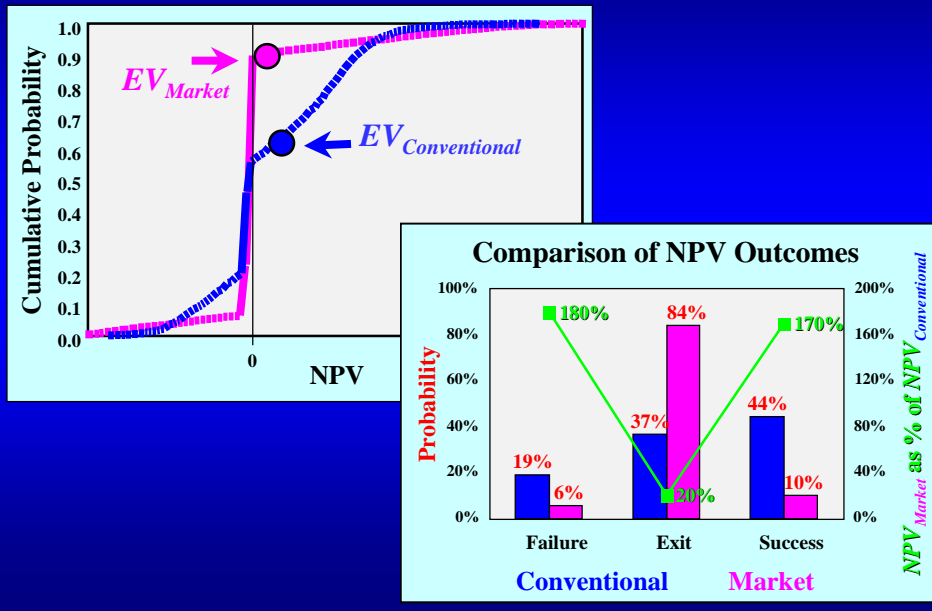
Add value with:

- Managerial flexibility
- Positive learning about:
 - » Reserves
 - » Recovery
 - » Initial production rates
 - » Well spacing
- Optimize facility capacity
- Exploration potential
- Technology potential

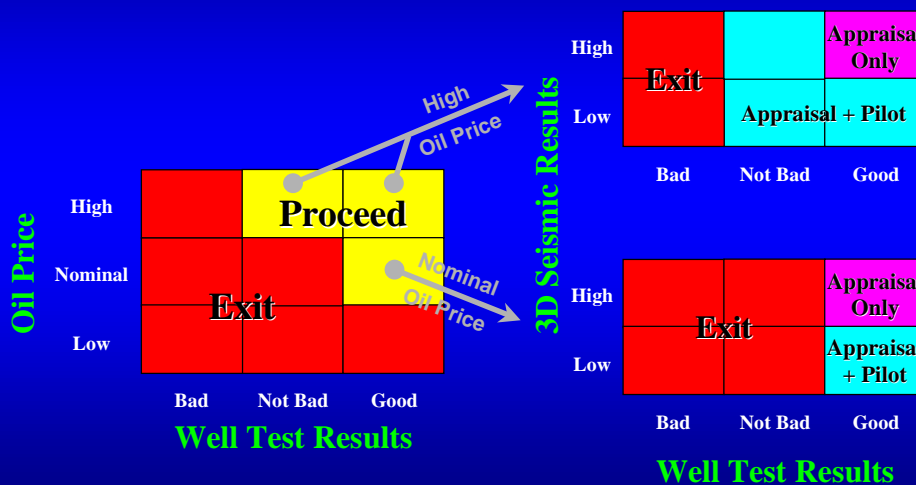
Result: Differentiated Sources of Value



Result: NPV Risk Profile



Result: Optimal Policy Maps, Likelihoods, Future E(NPV)s, Ranges, Exposures



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

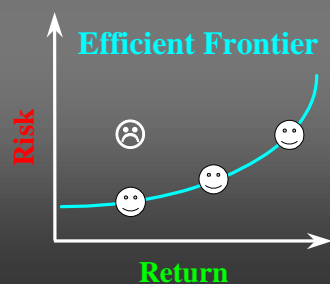
Rank	Project	NPV	Reserves	Capex
1	B			
2	F			
3	C			
4	G			
5	A			

Accept and Fund “Best” Projects

No More Budget

Efficient Portfolios

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



An efficient portfolio effectively integrates goals, constraints, uncertainties & interplay

Optimize the portfolio mix subject to
minimize risk (or **maximize return**) and ...

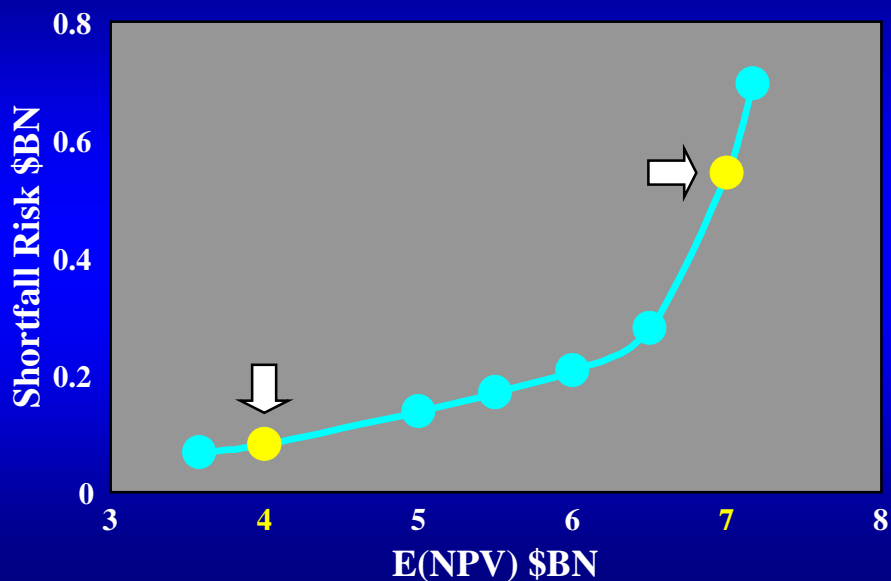
Achieve \geq target

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 ...

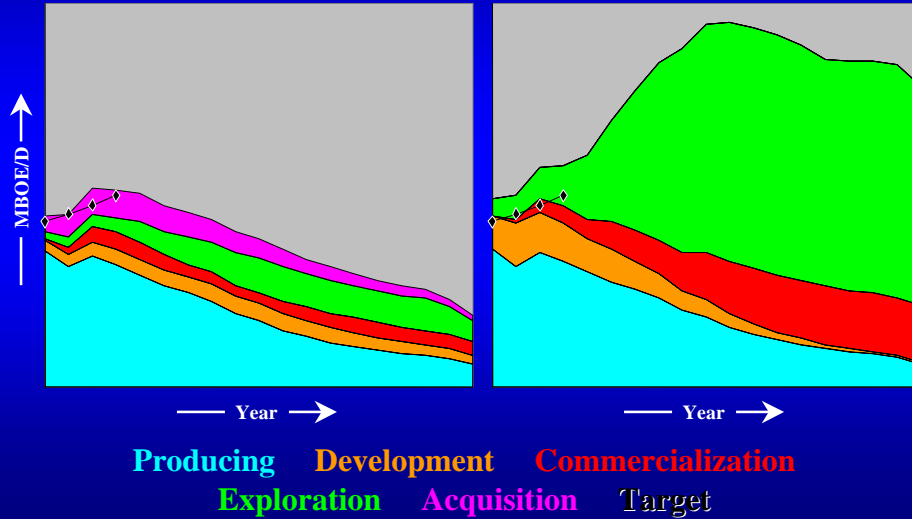
A Portfolio Optimization application



Comparison - Production

\$4BN Portfolio

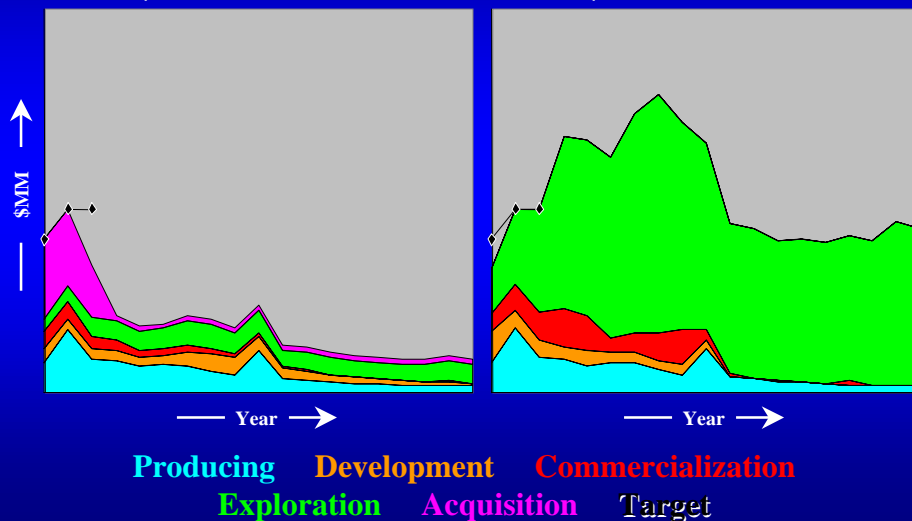
\$7BN Portfolio



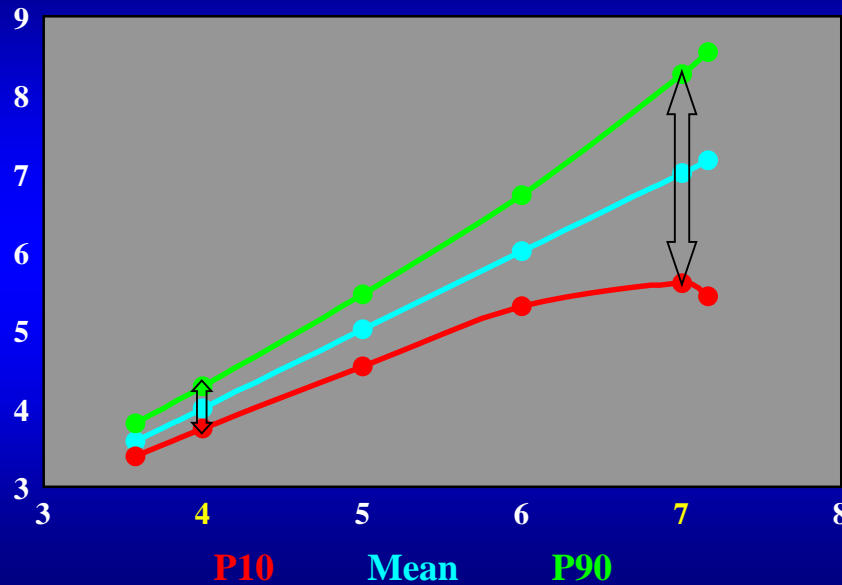
Comparison - Capex

\$4BN Portfolio

\$7BN Portfolio



NPV (\$BN) Confidence Curves

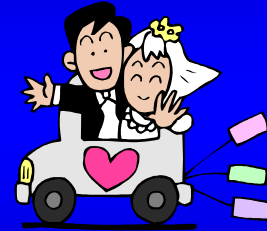


Benefits of Portfolio Optimization

- 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

