

# Portfolio Management and Independent Oil Companies

## A Dichotomy of Terms??

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# Myths and Mysteries of the Oil Patch

- Boe
- Risk is not equal to Uncertainty
- No understanding of Central Limits Theorem
- Biasses
- Understanding of Decision Analysis mechanics
- Abuse of "Most Likely" (Mean/Median/Mode)
- Discount factors to allow for risk
- Winner's Curse

*[The] long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useful a task if in tempestuous seasons they can only tell us when the storm is long past, the ocean will be flat.*

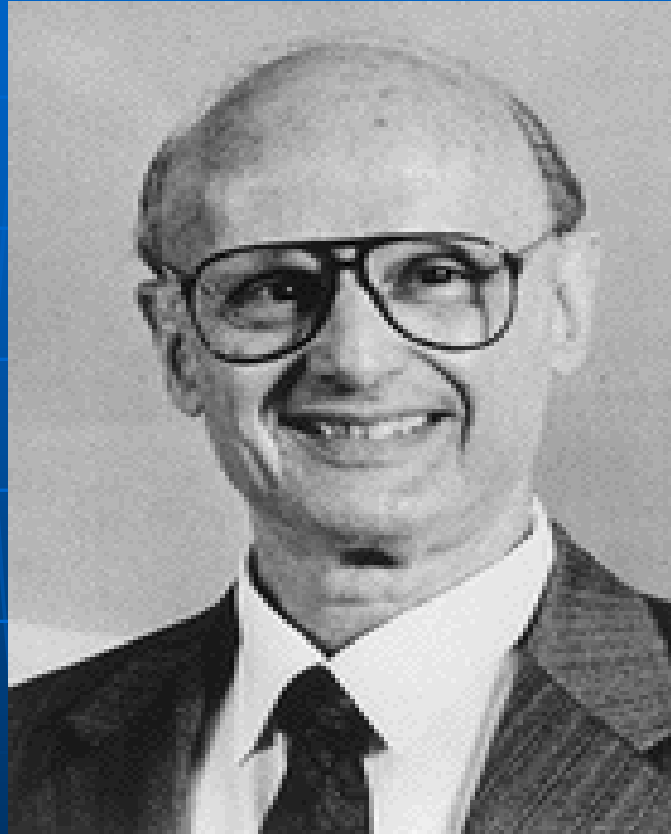
John Maynard Keynes

*My favorite holding period is forever*

Warren Buffet

# **What is Portfolio Management?**

# Harry Markowitz



*“Don’t tell me what a certain stock will do – what will it do for my portfolio?”*

# Portfolio Management...

is a process – a way of thinking about your business.

Portfolio management has four principles and characteristics that differentiate this process from other decision-making processes:

- Ties decisions directly to your business strategy.
- Defines how decision will impact your aggregate business.
- Describes risk and uncertainty at the aggregate business level.
- Leverages the interactions between projects and strategic goals.

# THE PROBLEM

Oil and Gas companies are constantly making choices as to which investment opportunities to pursue.

These opportunities consist not only of exploration projects, but of development drilling, EOR projects, acquisitions, divestitures, etc. as well.

# Most majors utilise.....

- Integrated Technical Teams
  - Systematic rigorous probabilistic project evaluation
  - Centrally coordinated portfolio management
- .....What about the independents??



- Who are the best implementers of portfolio management?







# HISTORICAL APPROACH TO PORTFOLIO MANAGEMENT

The traditional approach for choosing among projects has been some sort of ranking table based on Net Present Value or a derivative of it.

This method allows from the reasonable sounding premise that the purpose of the firm is to maximize value for its shareholders.



In reality, the firm must find a risk/value balance subject to certain constraints. The most extreme example of this would be a project that has a positive NPV due to cash flow of billions of dollars in 35 years, but negative cash flow until that time. Most firms would reject such a project because they have implicit cash flow and time horizon constraints. Similarly, firms have spending limits, reserve targets financial reporting goals, etc.

The NPV ranking tables address none of these constraints.

Traditionally, once chosen, projects are put into a planning model and summed, and then tested against the various goals of the firm. The projects are manipulated until an answer is achieved that meets all the firms' goals on an expected value basis. This "answer" becomes the long-term plan, until it is replaced in a year with a new plan.



There are (at least) two problems with the above method.

- Analysis stops when an answer, or perhaps two or three alternatives, is identified. There is no way of knowing if the answer found is the best one available, or indeed, what range of answers exist.

- There is no feel for the likelihood that the company's goals will be achieved in any given year. The fact that they may be achieved on an expected value basis can be quite misleading. For example, a huge project with a low probability of success can give a substantial expected value. A portfolio full of such projects can have reasonable expected values, but still have a low probability of meeting the firm's goals in a given year.

- Stochastic simulations of possible projects
- Projects characterized consistently, probabilistically and objectively
- Find best portfolios that fit goals, budgets and strategy

# Benefits of Portfolio Management

- Reduce volatility of EP program results
- Balance reserves growth versus cash flow needs
- Plan by assessing interactions and results of various choices
- Choose projects that complement strategy
- Deliver what was promised

# Required Skills

- Unbiased project evaluations
- Statistical Characteristics of project interactions (honor the data points!)
- Sophisticated software that allows project rollup into the portfolio



# Barriers to Implementation

- Technical
- Conceptual
- Human and Organizational

Source: Peter Rose, AAPG 2002

Knowledge of the Decision makers is a  
barrier to unbiased portfolio  
management

# QUESTION

You have a large inventory of possibilities, each with a 20% probability of success. Each is geologically independent of the others.

How many wells must you drill this year to be 90% confident of at least one success? (Hint: there should be at most a 10% probability of total failure, where total failure is a result with all dry holes.)



# Barriers – Resistance to Change

- Focus on results rather than Activity
- Objective evaluations rather than biases and hype
- Expressing reserves probabilistically
- Centralization versus Decentralization (not invented here!)
- Avoidance of Accountability
- Misalignment of Incentives with goals

# Overcoming Barriers to Implementation

- Top-down leadership
- Emphasis on portfolio performance rather than business unit funding
- Decision making authority differentiation between choice of projects and execution of projects

# Overcoming Barriers to Implementation

- Realistic goals, Time frames, Budgets
- Use achievable and valid performance metrics
- Training and education for all levels of personnel for portfolio management concepts as well as probabilistic methods (Peter Rose & Assoc.; Portfolio Decisions Inc.; Jim Murtha)

# Overcoming Barriers to Implementation

- Transparent Risk Analysis at Business Unit level
- Efficient processes for project evaluation
- Reward staff professionalism and objectivity
- Frequent feedback and and honest lookback reviews

# Summary

- Risk Analysis and Portfolio Management doesn't find oil & gas directly – though it should reduce the number of poor projects
- Project evaluation should be kept at business unit level while coordinated portfolio management can be undertaken centrally

# Summary (2)

- Elegant software tools cannot fix problems that are behavioral, cultural or behavior
- Portfolio management allows you to choose options that match corporate strategy
- Portfolio management can change corporate cultures
- Are asset teams really suitable for independents?

- Keynes famously commented: "*I would rather be vaguely right rather than precisely wrong.*" Moreover, he believed that "there is nothing so dangerous as the pursuit of a rational investment policy in an irrational world".



Seen anything unusual?



# SOLUTION

One well drilled:

$$P(S) = 0.2 \quad P(F) = 0.8$$

Two wells drilled:

If both are dry holes (failures):

$$P(F) = 0.8 \times 0.8 = 0.64$$

$P(S)$  of either or both:

$$1 - 0.64 = 0.36$$

## SOLUTION (CONT.)

So:

No. Of Prospects	Probability all are dry	Probability of at least one success
1	$(0.8)^1 = 0.8000$	$1 - 0.8000 = 0.2000$
2	$(0.8)^2 = 0.6400$	$1 - 0.6400 = 0.3600$
3	$(0.8)^3 = 0.5120$	$1 - 0.5120 = 0.4880$
4	$(0.8)^4 = 0.4096$	$1 - 0.4096 = 0.5904$
5	$(0.8)^5 = 0.3277$	$1 - 0.3277 = 0.6723$
6	$(0.8)^6 = 0.2621$	$1 - 0.2621 = 0.7379$
7	$(0.8)^7 = 0.2097$	$1 - 0.2097 = 0.7903$
8	$(0.8)^8 = 0.1678$	$1 - 0.1678 = 0.8322$
9	$(0.8)^9 = 0.1342$	$1 - 0.1342 = 0.8658$
10	$(0.8)^{10} = 0.1074$	$1 - 0.1074 = 0.8926$
11	$(0.8)^{11} = 0.0859$	$1 - 0.0859 = 0.9141$

You will need to drill 11 wells to be 90% confident that you will have at least one success.

## EXTRA SOLUTION

This can be checked using the formula for Gambler's Ruin.

If you want a 90% chance of having at least one successful well, then you can have only a 10% chance of having all dry holes:

$$\begin{aligned} P(\text{all failures}) &= P(F)^n \\ 0.1 &= (0.8)^n \end{aligned}$$

$$\begin{aligned} \ln(0.1) &= n \ln(0.8) \\ n &= \ln(0.1) / \ln(0.8) \\ n &= -2.3026 / -0.2231 \\ n &= 10.3 \sim 11 \text{ wells} \end{aligned}$$

Both methods yield the same answer, as we would expect.