

Those Pesky Reserve Definitions: Why is it so Hard to Make Everyone Happy?

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Retired¹

Disclaimer:

Thoughts and material presented today
are my own

Who uses reserve definitions?

- Securities Regulators
- Government Regulators
- Investors
- Lenders
- Rating Agencies
- Corporate Planners
- Strategic Planners
- Policy Creators

Given all these users, is a single reserve
and resource definition used by
everyone, realistic?

Let's look at some of the problems

Problem #1

Some users don't appreciate the difference between estimates and measurements

- Reserves are estimates
- Production is measured

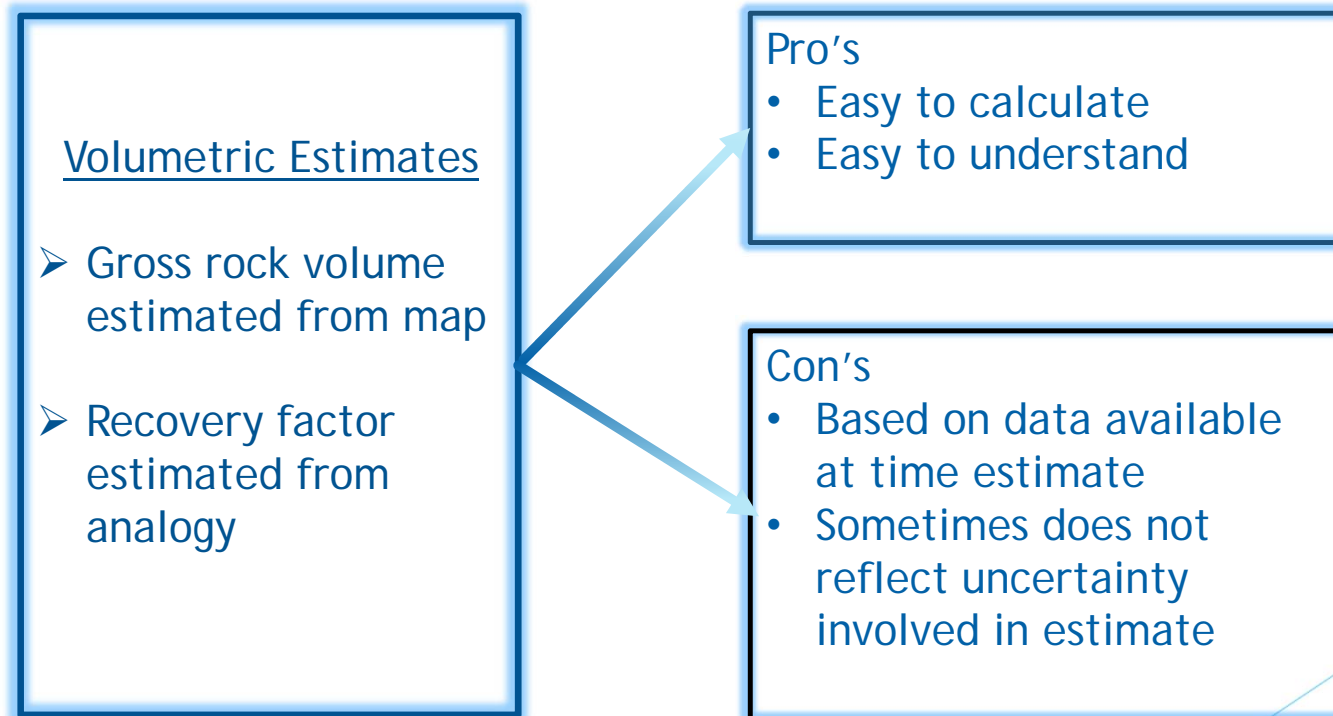
Problem #2

Some users may not understand the difference between estimation types

- Volumetric
- Probabilistic
- Performance

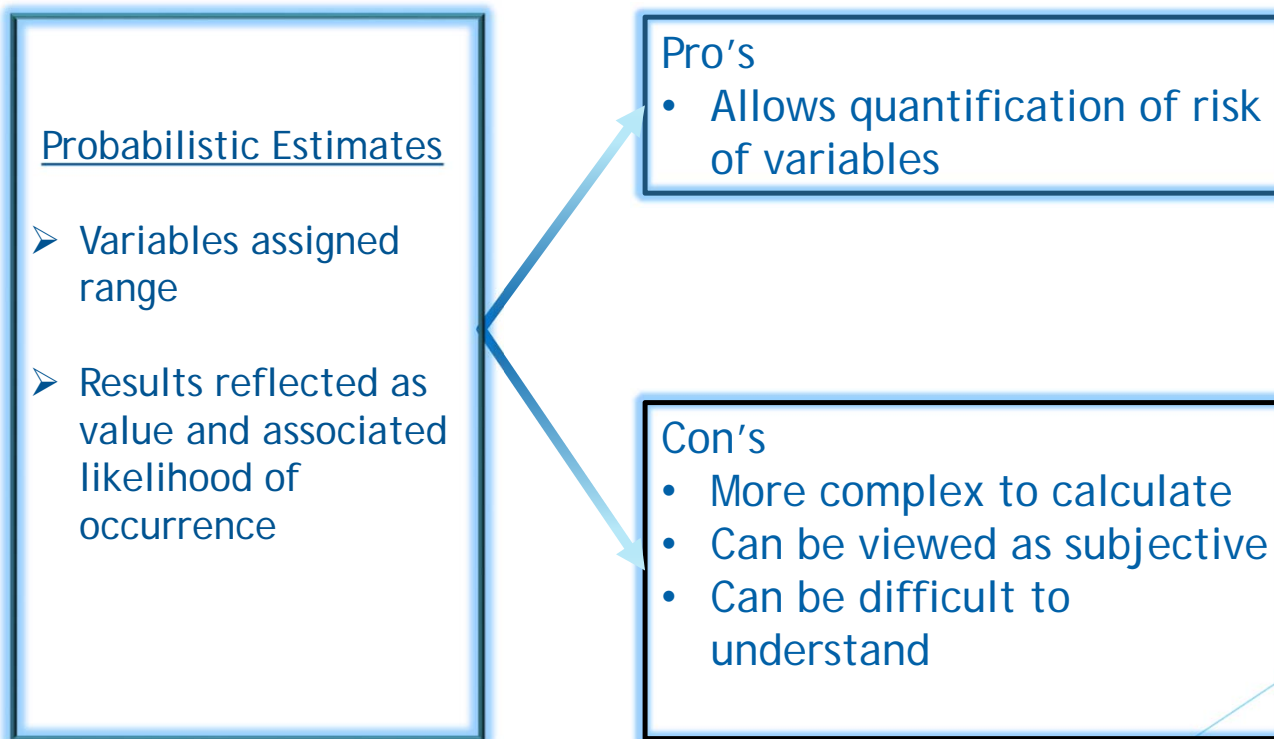
Problem #2

Difference between estimation types



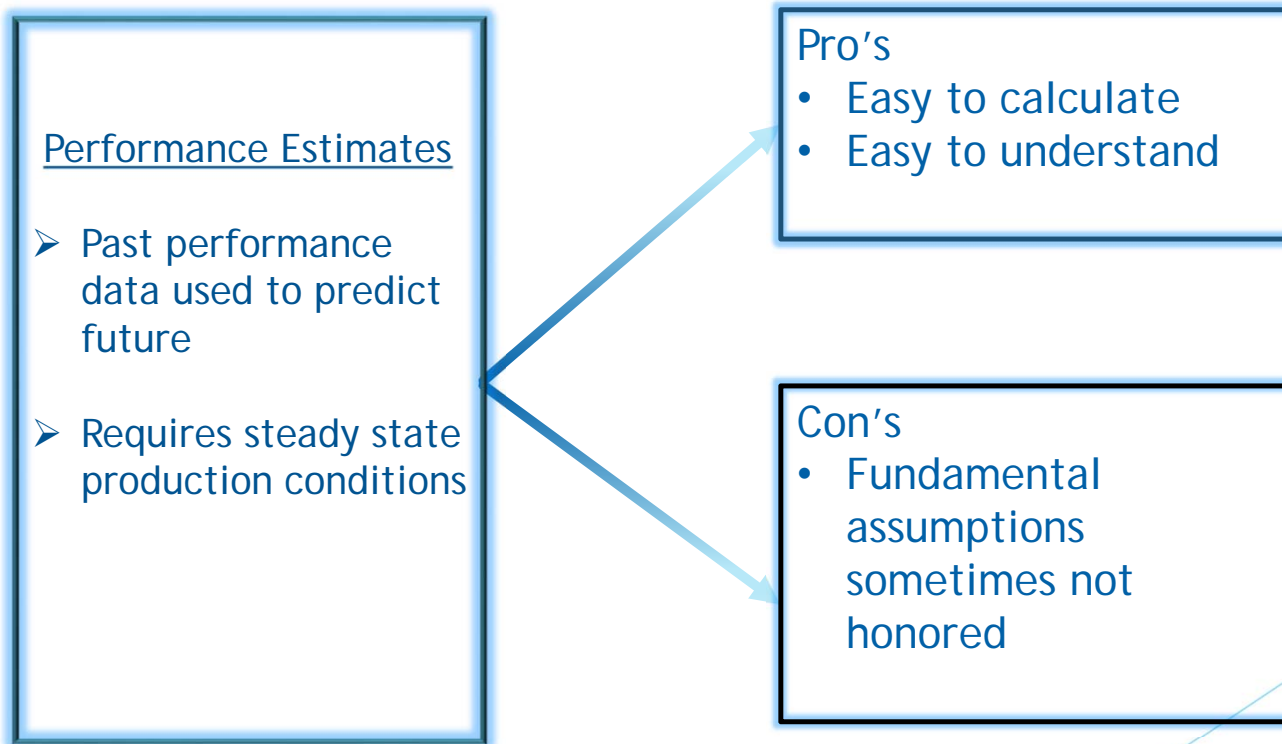
Problem #2

Difference between estimation types



Problem #2

Difference between estimation types



Problem #3

Different users may want different types of reserve estimates

Problem #3

What volume do user really want?

Certainty of Estimate

- Security Regulators may want volumes with a high degree of certainty of recovery
- Investors may want realistic view of recovery
- Policy Developers may want most optimistic estimate

Problem #3

What volume do user really want?

What estimate represents

- Security Regulators and Investors want volumes directly related to a specific entity
 - Net
 - Remaining
- Policy and Strategy Developers may want
 - Gross
 - Sales Volumes

Problem #4

Some users may not appreciate the uncertainty inherent to reserve estimates

Problem #4

How should we reflect Uncertainty?

What is it that's uncertain?

- Reservoir properties
 - Geologic variables (thickness, area)
 - Rock properties (perm, porosity, connectivity)
 - Fluid properties (oil, gas, water, viscosity, GOR)

Problem #4

How should we reflect Uncertainty?

What is it that's uncertain?

- Development Plan
 - Number, location and timing of wells
 - Facility and artificial lift plan
 - Secondary recovery timing
- Costs, prices, inflation, exchange rates

Problem #4

How should we reflect Uncertainty?

Some ways Uncertainty is represented

Volumetric Estimates

- High, Med, Low
- Single multiplier
 - Undev X 0.5
 - Prob X 0.25
- Tornado chart
 - Vary input
 - Vary economic parameters

Probabilistic Estimates

- Variables assigned range
- Results reflected as range and associated likelihood of occurrence

Performance Estimates

- Curve fitting
 - Optimistic
 - Best fit
 - Conservative

Problem #5

Some users want reserves to remain static over the life of the property

Problem #5

Are reserves Static?

Estimates can change over the life of a property due to

- Technical information gathered during development and production
- Innovative technology
- Changing global economic conditions
- Changing regulatory environment
- Natural or man-made disasters

Problem #6

Some users want comparable estimates across all properties

Problem #6

Comparability

For reserves to be comparable, estimates must be calculated using same criteria

- Quantity and quality of data
- Price, cost and discount forecast
- Discount rate

Problem #7

Should 'economics' or 'commerciality' impact
reserve estimates

Problem #7

Confusion between 'economic' and 'commercial'

- Economic is a calculation that requires
 - Production, price, and cost forecast
 - May or may not be discounted

Problem #7

Confusion between 'economic' and 'commercial'

- Commercial
 - Means all regulator and legal barriers to production have been removed
 - Single development scenario *that meets all internal hurdles* has been selected
 - Partners have all agreed

Problem #8

Many users do not understand that all barrels are not created equal

Problem #8

Factors impacting value of reserves

Many reserves disclosures do not reflect

- Variances in quality of products
 - Gravity
 - Sulphur content
 - Waxiness
- Variances in profitability of products
 - Tariffs
 - Differentials

Problem #8

Factors impacting value of reserves

Use of Barrel of Oil Equivalent (BOE)

- Originally developed normalize energy content
- Does not reflect value of products

Problem #8

Factors impacting value of reserves

Maturity and type of development can impact reserves

- Fuel gas
 - Some consider it immaterial
 - Material for some operations like
 - LNG
 - Oil Sands
- Abandonment Costs
 - Not material in early life
 - Significant as decommissioning approaches

Given all these problems with understanding of reserve estimates, is a single reserve and resource definition used by everyone, realistic?

Let's look at some of the options

Who should develop and enforce 'multi-purpose' reserve and resource definitions

Industry Volunteers

- SPEE
- SPE

Pro: Understand calculations

Con: Volunteers should not provide legal guidance

Who should develop and enforce 'multi-purpose' reserve and resource definitions

Consortium

- UN
- IASB

Pro: Broad view of needs and uses

Con: May not have expertise or authority to enforce

Who should develop and enforce 'multi-purpose' reserve and resource definitions

Regulators

- SEC
- CSA

Pro: Power to enforce

Con: May have limited understanding of estimation
challenges

Is a single reserve and resource definition realistic?

- Problems understanding estimates
- Issues with who should develop and maintain definitions

In my opinion, No.

Is a single reserve and resource definition used by everyone, realistic?

- Would require change
- Most developers and users of reserve definitions don't think the gain is worth the pain

Remember, it is my opinion

What can reserve estimate preparers do to mitigate these problem?

More disclosure?

Only helps if users read it!

What can reserve estimate preparers do to mitigate all these problem?

- Intellectual honesty
 - Don't let the intended outcome influence your estimates
- Educate the users
 - Make every effort to inform users of estimate limitations

Again, it is my opinion

Thanks for your attention

Questions?