

ADDRESSING RISK IN TIMBERLAND ASSET VALUATIONS:

THE BUSINESS CASE FOR THE USE OF MONTE CARLO
ANALYSIS FOR DETERMINING EXPECTED OUTCOMES
IN VALUING FORESTS

Society of American Foresters - 2014 Annual Meeting

October 9, 2014

Salt Lake City, UT

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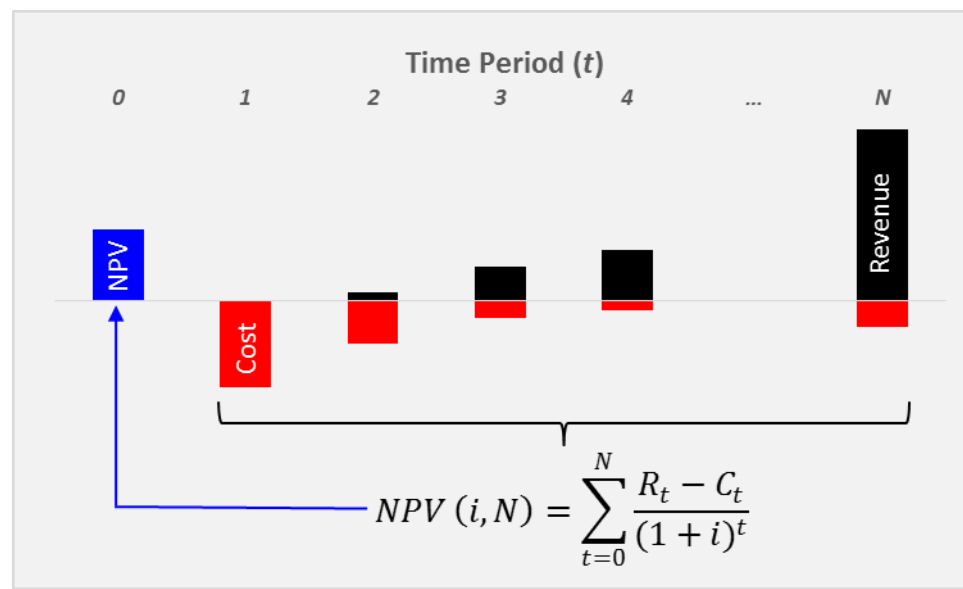


TIMBERLAND ASSET VALUATIONS

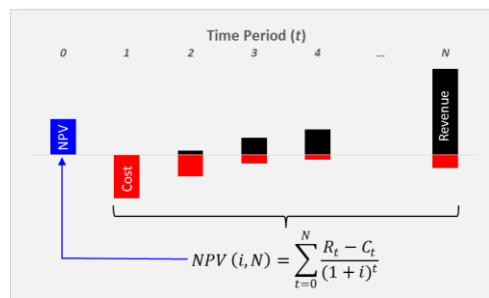
- Motivations
 - Purchase / sell / exchange timberland
 - Secure financing
 - Document investment performance
- Methods
 - Replacement value (not commonly used for timberlands)
 - Percentage of liquidation value
 - Transaction value based on comparable sales
 - Discounted cash flow (“DCF”)

COMPONENTS OF DCF

- Revenues
- Costs
- Time
- Discount rate
- Net present value (“NPV”)

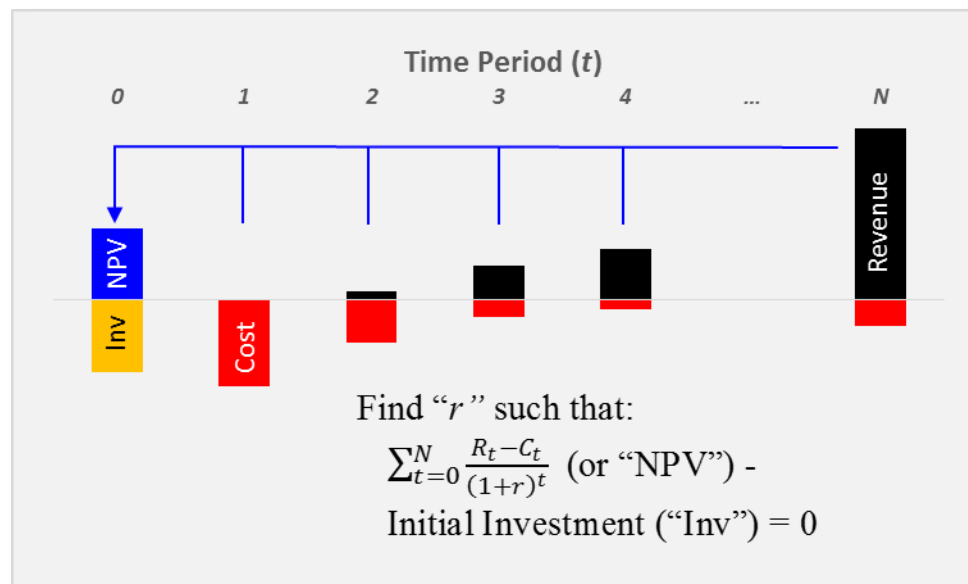


DISCOUNT RATE & IRR



- Discount rate is the required weighted-average return on invested capital for lenders and owners

- Internal rate of return (IRR) is the “break-even” interest rate (NPV – Initial Investment = 0)

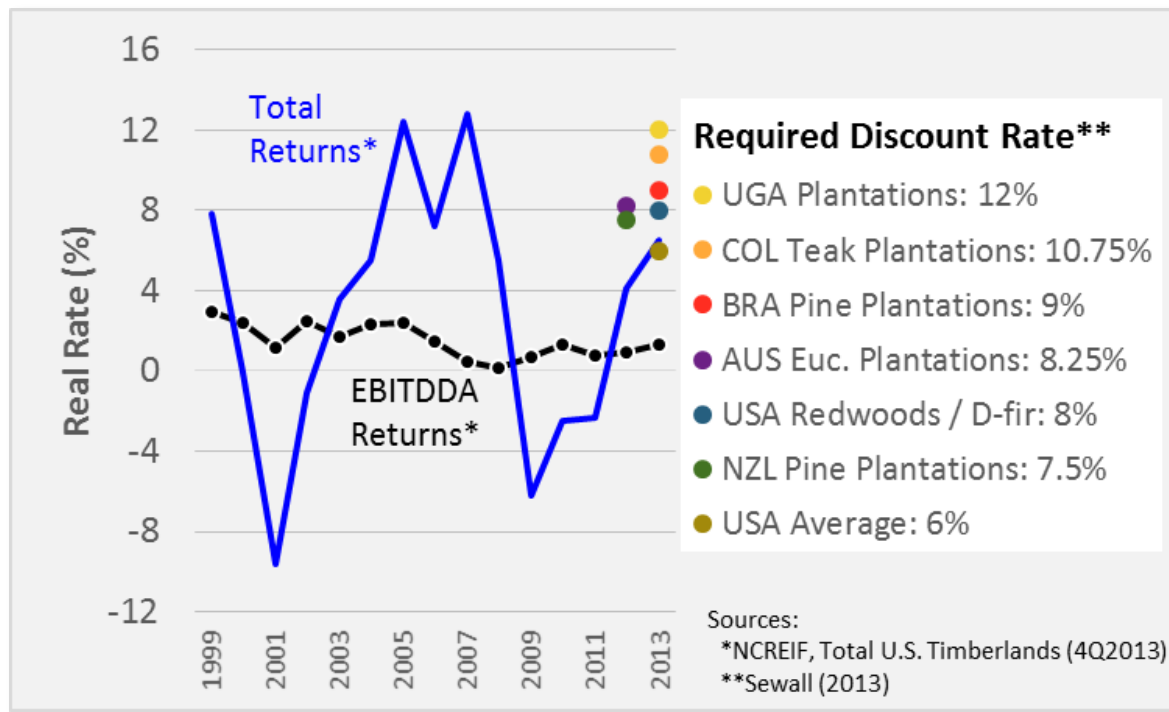


SETTING THE DISCOUNT RATE

- Typically, the literature focuses on “weighted-average cost of capital”
 - Lending risk vs. equity (owner) risk
 - Risk-free investment / Beta factors
 - Debt structure
- Practically, it is set by what is “required”
 - Alternative rates of return
 - Portfolio objectives and size
 - Finding a home for investment dollars

EXAMPLE

- What TIMOs say their return objective is
- What data suggests it is

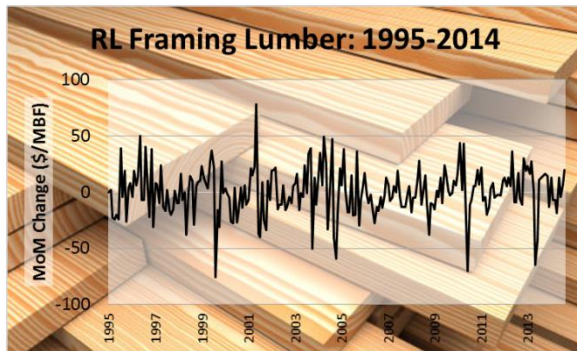
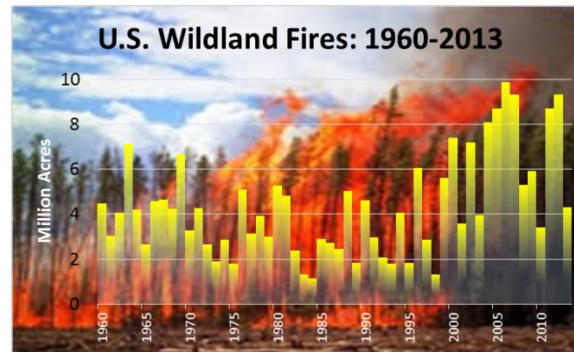
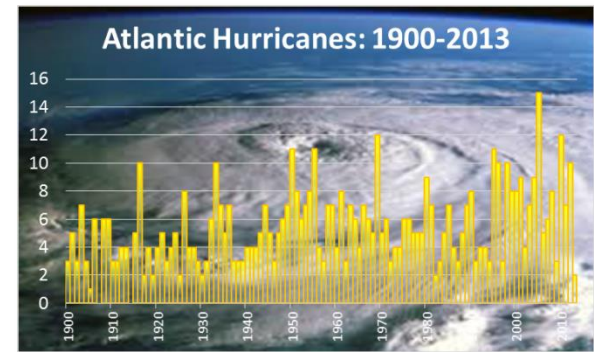


EXPLICIT ASSET-SPECIFIC RISK?

- Timberland assets often carry risks not explicitly incorporated into market rates
- Examples
 - Future stumpage – global to local market effects
 - Yields
 - Regulatory / legal / judicial (“country”)
 - Catastrophic loss

ADDRESSING THESE RISKS

- Conventional method has been to increase the discount rate to account for these asset-specific risks
 - Subjective determination
 - Risk is “lumpy” – occurs unevenly over time

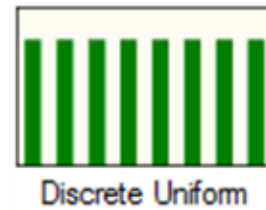
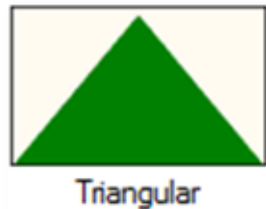
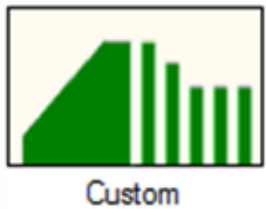
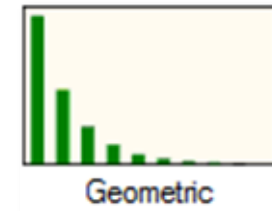
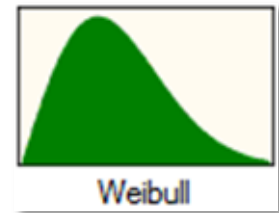


AN ALTERNATIVE METHOD

- Expand DCF models to incorporate probability distributions for valuation parameters rather than a single fixed value
 - The probability distribution for a parameter reflects the range and frequency of occurrence
 - Distributions can be derived analytically and/or incorporate expert opinion
 - Simulate model many times (“Monte Carlo”)
 - DCF outcomes, such as NPV, are computed for each varying combination of inputs, yielding a distribution of outcomes

MONTE CARLO TOOLKIT

- Continuous and discrete distributions (including binary and binomial)
- Symmetric, asymmetric, or uniform
- Distributions can change over time
- Distributions can be correlated with one another
- Generalized application

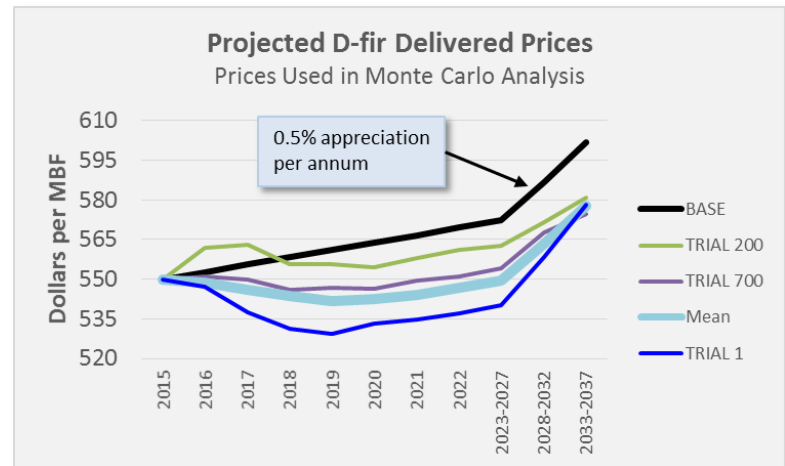
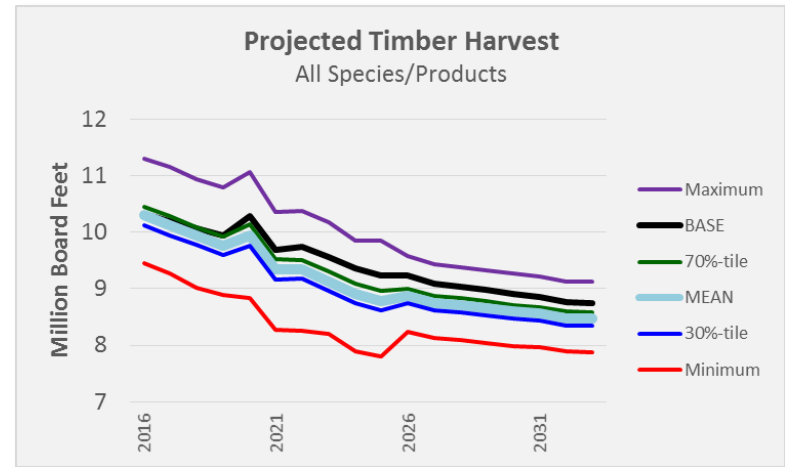


CASE STUDY

- Forested property in Western U.S.
- Perceived risks –
 - Forest Practices Act regulations
 - Endangered species (Habitat Conservation Agreements)
 - Fire
 - Local market risk (impact of mill closures on timber markets)
 - Yields
 - Log prices
 - Management costs
- “Add a percent to the discount rate” or explicitly consider risk?

EXAMPLE “INPUTS”

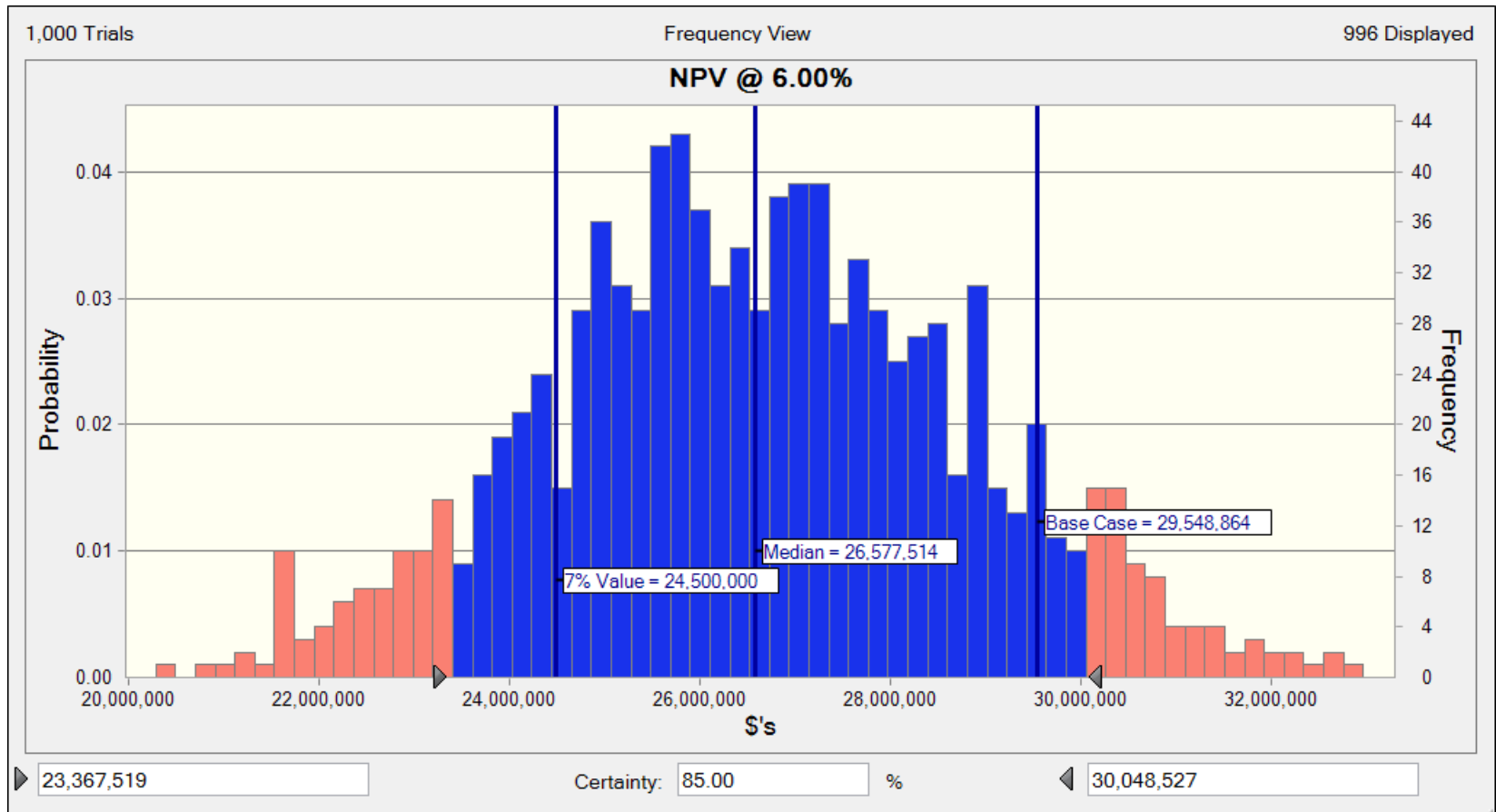
- Specified parameters & distributions result in projected outcomes
 - Harvest
 - Inventory demographics
 - Harvest intensity
 - Log Prices
 - Business cycle
 - Shifting markets over time



DISTRIBUTION OF OUTCOMES

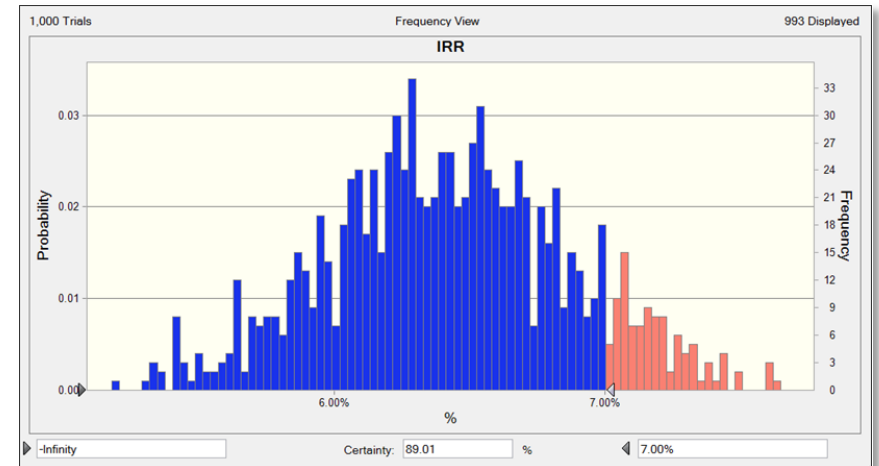
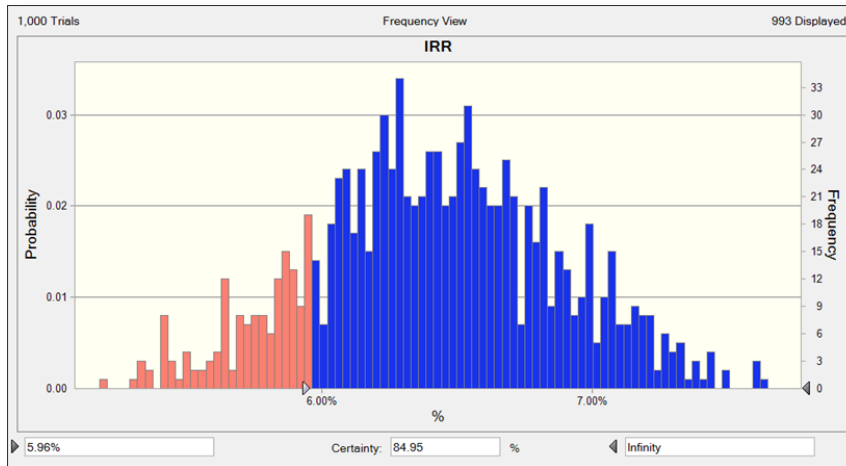
- Even the deterministic outcome is from a distribution
 - We just don't think about it that way
 - Shape of the distribution is unknown
(Is the conventional result really the 50th percentile?)
- Conventional method often suffers from the cumulative effect of "Conservatism Bias"
- Stochastic method allows explicit recognition of risk in modeled inputs and their joint interaction
- This method presents outcomes as a probability, not a single point
- More robust than conventional sensitivity analysis

CONVENTIONAL VS. RISK-ADJUSTED NPV



WHAT'S YOUR RISK PREFERENCE?

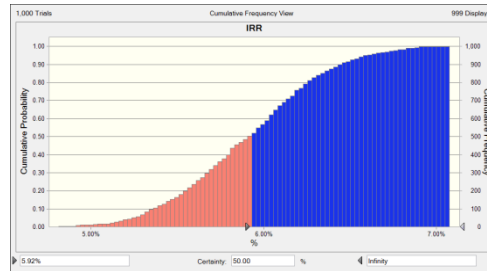
- Distribution of IRR* in case study
 - 85% probability of greater than 6%
 - 89% probability of falling below the “BASE” result of 7%



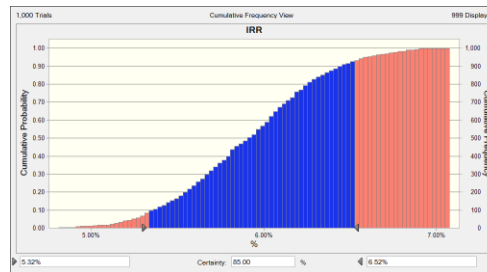
***At purchase price of \$24.5 million = Base Case NPV @ 7%**

RETURNS ON RISK-ADJUSTED PURCHASE PRICE

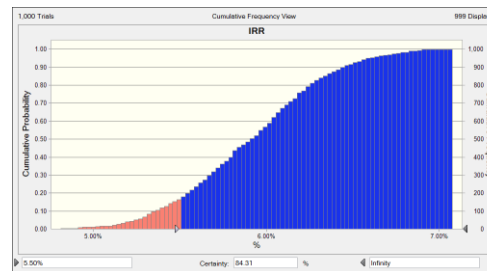
- Prior IRR distributions were generated when purchasing the tract at the “6% + 1%” purchase price of \$24.5 MM
- What does the IRR distribution look like when purchasing at the risk-adjusted price of \$26.6 MM?



50% probability
IRR exceeds
5.92%



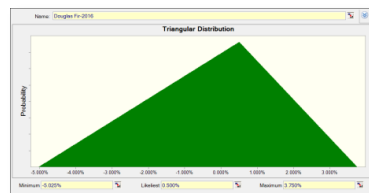
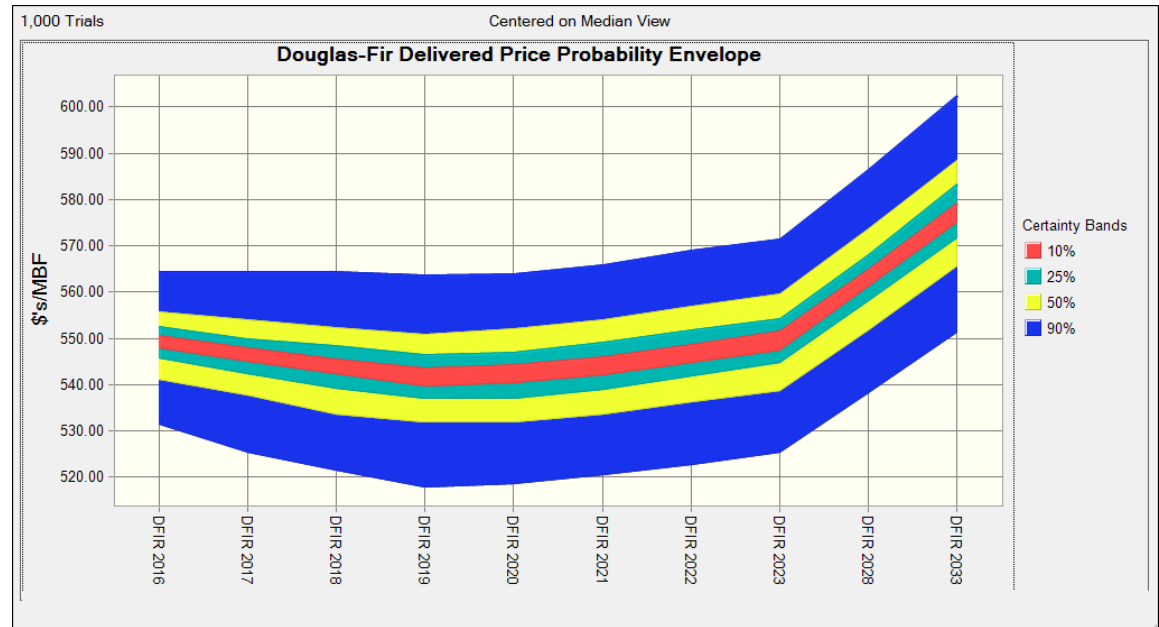
85% probability
IRR ranges
between 5.32
and 6.52%



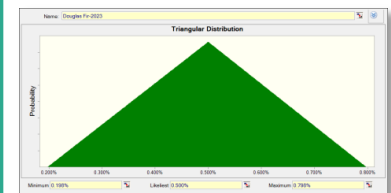
84% probability
IRR exceeds
5.50%

RISK IS NOT CONSTANT OVER TIME

- LOG PRICE EXAMPLE:
Portray degree of vulnerability to either upside or downside exposure over time
 - Location in business cycle
 - Local market depth

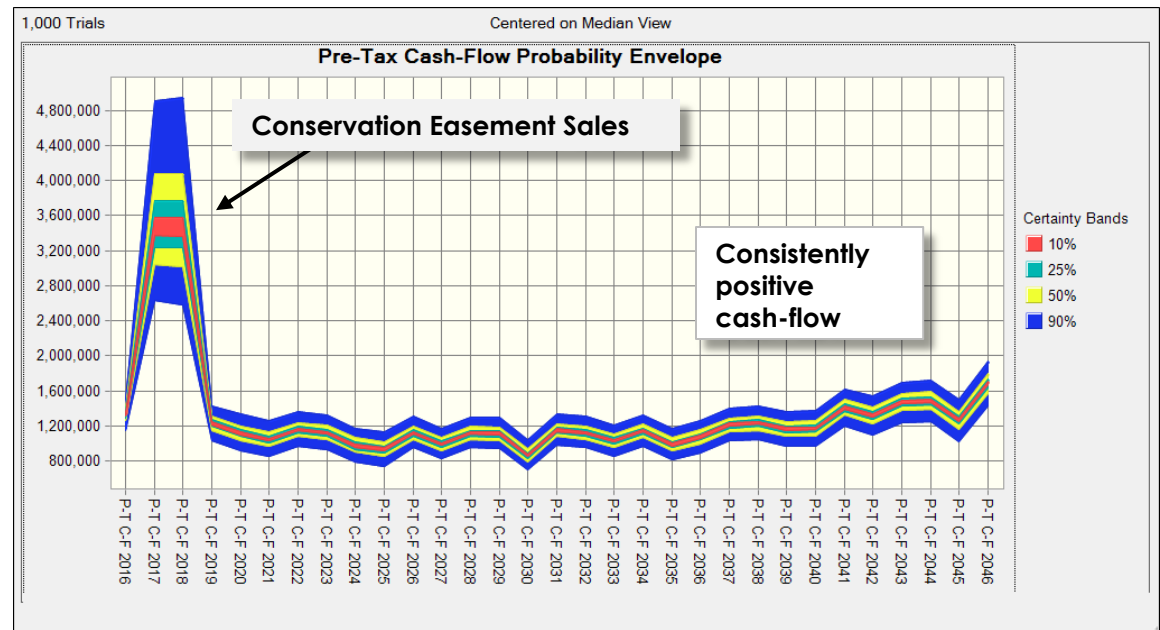


<< CAGR thru 2016
downside risk, high volatility
CAGR thru 2022 >>
balanced risk, low volatility
long-term



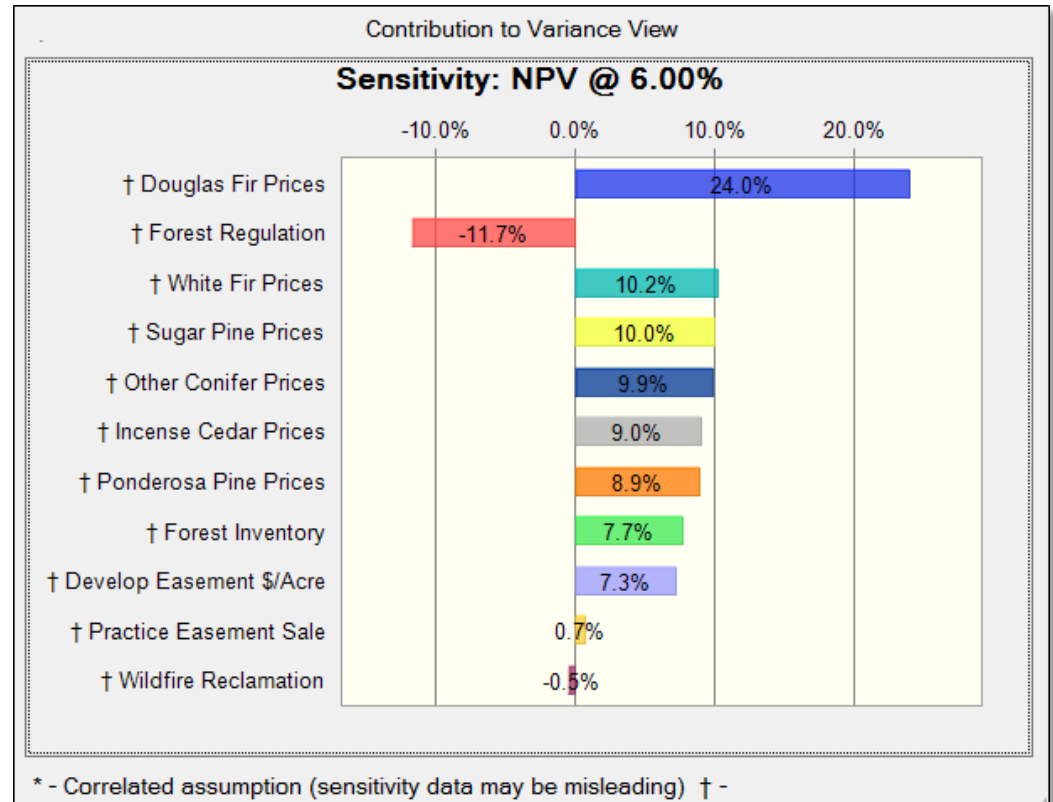
OTHER POSSIBLE RISK-ADJUSTED METRICS

- Other metrics can also be monitored (e.g., interest coverage ratios, payback periods, forest inventory)
- Risk influences these metrics differently; essential to consider the holistic effect of both risk and time on the project



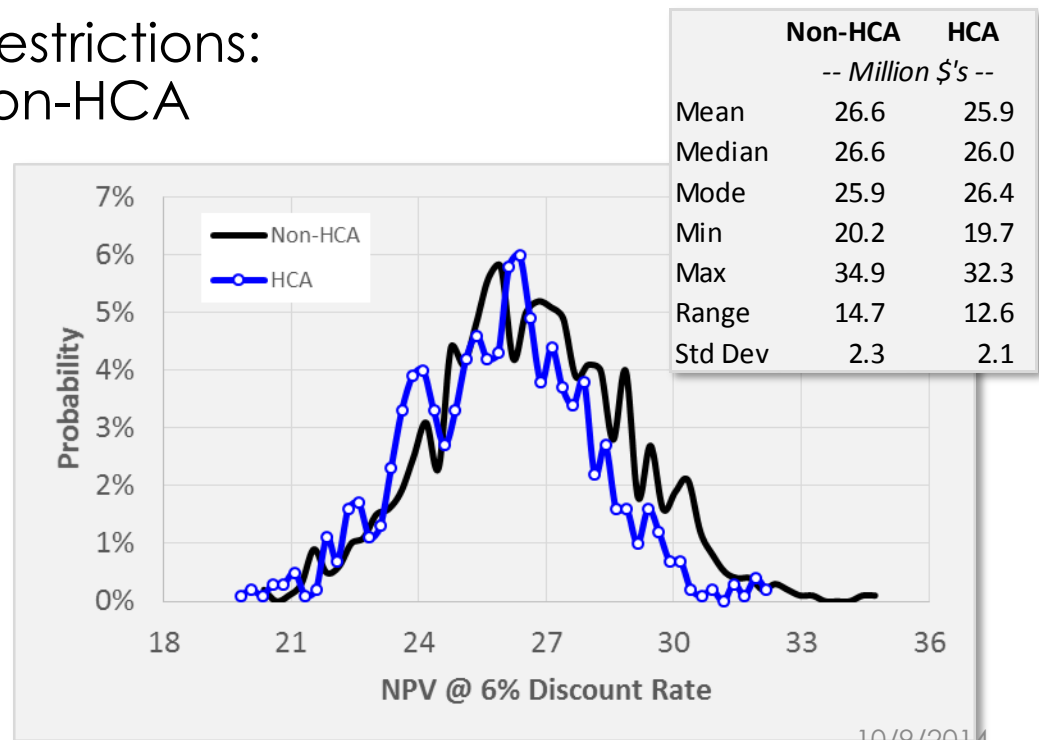
WHAT'S CRITICAL?

- Tornado diagram
- Manageable vs. non-manageable



INTEGRATING SCENARIO PLANNING

- HCA vs. Non-HCA
 - Estimated beginning inventory: Higher variability, Non-HCA
 - Initial harvest restrictions: Greater, HCA
 - Subsequent harvest restrictions: Greater variability, Non-HCA
 - Regulatory creep: More exposure & variability, Non-HCA



WRAP UP

- Objective assessment of risk improves the understanding of risk's effect on timberland asset valuation
- Monte Carlo analysis promotes objective investigation of the risk effects
- Incorporates expert opinion
- Decision makers must acknowledge their risk preference
- Methodology works for both financial and non-financial metrics

ACKNOWLEDGEMENTS & CONTACTS

- Growing Excellence
 - David New (also, associate of ATICA)
- Delphi Advisors
 - Tom Montzka (Straight Arrow Consulting)
 - Mike Huebschmann (Huebschmann & Associates)

Contact Tom@DelphiAdvisors.com for a copy of this presentation or further information

Analysis conducted in Microsoft Excel™ using Oracle's Crystal Ball™