Differences between NPV, Decision Trees, and Real Options

1. NPV is flawed because it systematically undervalues everything due to simplifying assumptions
   a. Ignores options to expand, extend, contract, abandon and defer projects
      i. All expected cash flows are pre-committed
   b. Real option analysis uses decision trees to model optimal actions in the future given the resolution of uncertainty

2. NPV and ROA also deal with mutually exclusive options differently
   - NPV forces pre-commitment to one of many false mutually exclusive decisions, say the decision to defer for one year or two years
   - ROA works backward to arrive at the optimal deferral decision

3. Decision trees make state-contingent future decisions but with a constant discount rate, while ROA changes the discount rate at each branch if necessary
   - Replicating portfolio made up of default-free bonds and a twin security are used to hedge the option

Source: Financial Theory and Corporate Policy, Chapter 9

Risk Measures – Quantile

Definition: α-quantile risk measure is the $(N\alpha)^{th}$ value of the projected liability values

Confidence Interval: $(L_{0(N\alpha-A)}, L_{0(N\alpha+A)})$, where $A = \Phi^{-1}\left(\frac{1+\beta}{2}\right)\sqrt{N\alpha(1-\alpha)}$.

For GMMB, assume $F_k = S_k(1-m)^k$ and stock returns follow lognormal process, then

$$\Pr(G < F_n) = \xi = 1 - \Phi\left(\sigma\sqrt{n}\,\frac{\log(G/S_0) - n(\mu + \log(1-m))}{\sigma\sqrt{n}}\right)$$

and $V_\alpha = e^{-rn}(G - F_0 e^{-z_\alpha\sigma\sqrt{n} + n[\mu + \log(1-m)]})$: quantile risk measure

Quantile Negatives:

- not bounded below by mean loss
- not subadditive
- determined by only one point on loss distribution → sampling volatility

Source: *Investment Guarantees*, Chapter 9, pages 159-160, 162, 168-169

The Positive Announcement Effect of Tender Offers on Share Price: Five Separate Hypotheses

Hypothesis	
Information or signaling	Positive signal: Firm is expected to have increased future cash flows. Negative signal: Firm has exhausted profitable investment opportunities.
Leverage tax shield	If financed via a debt offering, firm leverage increases and so too does the tax shield.
Dividend tax avoidance	If more than 20% of a shareholder's holdings are sold back to the firm, the gains from repurchase are treated as capital gains rather than a dividend.
Bondholder expropriation	If repurchase reduces asset base of firm, bondholders are worse off because they have less collateral.
Wealth transfer among shareholders	Some shareholders will decide not to tender their shares due to different constraints, costs and/or information.

Source: Financial Theory and Corporate Policy, Chapter 16

Shareholder Rule

$V_N(F)$ = Value of firm's assets after loss before repair

$V_R(F)$ = Value of firm's assets after loss AFTER repair

C = Cost of repair, Assumed $< V_R(F) - V_n(F)$

P_N = Value Default put option with NO asset repair

P_R = Value Default put option WITH asset repair

Shareholder implements repair if:

$$(V_R(F) + P_R) - (V_N(F) + P_N) \geq C \quad \text{i. .e } NPV - P_N + P_R \geq C$$

Source: FET-108-07, Integrated Risk Management page 494

Characteristics of Corporate Debt Markets

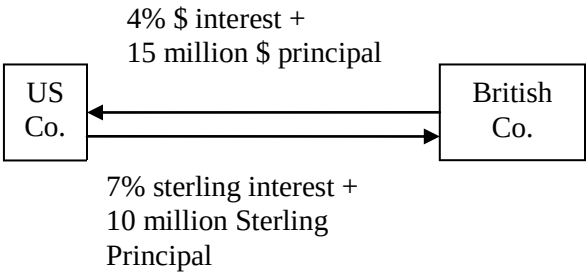
Key Liability Characteristics

1. maturity
2. priority
3. covenants

Issuer Type	**Multinational Issues**
corporations governments individuals	Eurobonds foreign bonds syndicated loans
Maturity	**Covenants**
commercial paper intermediate term long-term bonds	default triggers cash flow controls operating controls strategy controls

Source: FET-160-08, *Corporate Finance Theory*, Chapter 9, pages 402-408

Currency Swap



Exchange of currency principal is important

Source: Hull, Chapter 7

Analytic Calibration of RSLN

1. Conditional on R_n, the accumulation factor is lognormal with

$$\mu^*(R_n) = R_n\mu_1 + (n - R_n)\mu_2 \text{ and } \sigma^*(R_n) = \sqrt{R_n\sigma_1^2 + (n - R_n)\sigma_2^2}$$

2. The unconditional distribution function $F_{S_n}(x)$ is

$$F_{S_n}(x) = \sum_{r=0}^{n} \varphi\left(\frac{\log x - \mu^*(r)}{\sigma^*(r)}\right) p_n(r)$$

3. Then input MLE parameters into this analytic distribution function and calculate the resulting quantiles in order to compare them to the calibration points

Source: *Investment Guarantees*, Chapter 4, pages 65-75

Nash Equilibrium (NE) vs. Bayesian Nash Equilibrium (BNE)

	NE	BNE
Assumptions	Simultaneous-move game with complete information	Simultaneous-move game with incomplete information
Payoffs	$u_i(a_i, a_i) =$ $u_{Chris}(Steak_{Chris}, Red\ Wine_{Pat}$	$u_i(a_i, a_i; t_i)$ $= u_{Chris}(Steak_{Chris}, Red\ Wine_{Pat}, t_{Chris}$ = Chris's additional private utility for steak and red wine)
Def of Strategy	Action rule; ex: in the incomplete Dating game, Chris's strategy was a rule specifying his action for each possible value of t_c.	Action; ex: in the complete Dating game, Chris's strategy was simply to choose steak or chicken.
Def of Equilibrium	Pair of strategies such that each player's strategy is the best response to the other player's strategy where "strategy" is defined above for NE.	Pair of strategies such that each player's strategy is the best response to the other player's strategy where "strategy" is defined above for BNE.

Source: FET-156-08: An Introduction to Applicable Game Theory