

Review of 1st half of course

- **A thumbnail outline of major elements**
- **Intended as a study guide**
- **Emphasis on key points to be mastered**

Major Elements Covered

- **Valuation of Projects**
 - * **Discount rates ; evaluation criteria**
- **Modeling of production possibilities**
- **Optimization of production and cost**
 - * **constrained optimization ; marginal analysis**
- **Recognition of Uncertainty**
- **Contribution of Flexibility**
 - * **Specifically, in capacity expansion**
- **Decision Analysis ; Value of Information**
- **VARG Diagram**

Valuation Issues -- over time

- **Resources have value over time**
 - * Discount rate (DR) , r %/period
 - * Formulas; e^{rt} for continuous compounding
- **Choice of discount rate defined by best alternatives, at the margin**
- **DR ~ 10% or more -- long term benefits beyond 20 years have little consequence**
- **Money may change value via inflation**
- **Make sure you are comparing like with like**

Valuation Issues – choice of rate

- **Basic Idea – Opportunity cost**
 - * A project should return at least as much as next best alternative opportunity
 - * ... this is “at the margin”
- **WACC – an average measure**
- **CAPM – includes idea that discount rate should reflect uncertainty – of activity**
 - * However, may be possible to diversity risk of individual projects

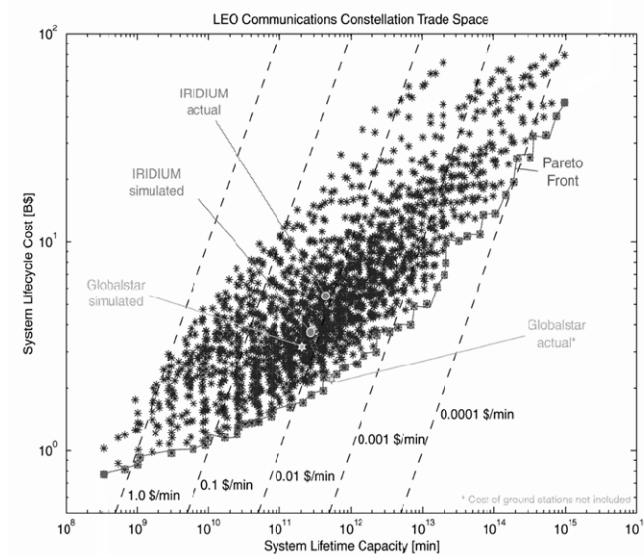
Valuation issues-- criteria

- **Many types -- none best for all cases**
 - * **Net Present value** -- no measure of scale
 - * **Benefit/ Cost** -- sensitive to recurring costs
 - * **Cost / Effectiveness** -- no notion of value
 - * **Internal Rate of Return** -- ambiguity, does not reflect actual time value of money
 - * **Pay-Back Period** -- omits later returns
- **Choose according to situation (if allowed)**
- **In practice, people may use several criteria**

Modeling of Production Possibilities

- **Basic Concept: Production Function**
 - * locus of technical efficiency
 - * defined in terms of technology only
- **Characteristics**
 - * marginal products, marginal rates of substitution
 - * isoquants -- loci of equal production
 - * returns to scale (\neq economies of scale!)
 - * convexity of feasible region? Know when!
- **Generally defined by systems models that define possibilities (e.g.: satellite systems)**

Trade Space



Optimization -- Marginal Analysis

- Economic efficiency merges technical opportunities (Prod. Fcn) and Values (Costs)
- For continuous functions, convex feasible region in domain of isoquants
 - * Optimum if all MP/MC equal (same 'bang for buck')
 - * Expansion path is locus of resources combinations that define optimal designs
 - * Cost function: $\text{Cost} = f(\text{Optimum Production})$
 - * Economies of Scale (\neq increasing returns to scale)
- Good Concepts, often not applicable in detail

Optimization -- Dealing with Constraints

- **Equality Constraints:**
 - * Lagrangean Equation
 - * Lagrangean multipliers = shadow prices

Recognition of Risk

- **Psychologically**
 - * Resistance to acceptance of this basic fact
- **Descriptively: Forecast “always wrong”**
 - * Reasons: “surprises”, “trend-breakers”
 - * Examples: technical, market, political
- **Theoretically: Forecasts => “house of cards”**
 - * Data range
 - * Drivers of phenomenon (independent variables)
 - * Form of these variables
 - * Equation for model

Contribution of Flexibility

- **Designers can implement flexible plans**
 - * **Defer investments (lowers present costs)**
 - * **Skip investments (if never needed)**
 - * **Build larger to increase NPV (if opportunities)**
 - * **... at cost of lost economies of scale**
- **System expansion cases: Garage ; satellite**
 - * **Take-aways:**
 - * **Traditional design to specs gives wrong answer**
 - * **Uncertainty leads to different values**
 - * **Flexibility shifts VARG to right**

Analysis under Uncertainty

- **Primitive Models**
 - * **sensitivity to irrelevant alternatives, states**
 - * **sensitivity to basis of normalization**
- **Decision Analysis**
 - * **Organization of Tree**
 - * **Analysis**
- **Results**
 - * **≠ those on Average forecasts (flaw of averages)**
 - * **Middle road, that provides flexibility to respond**
 - * **Second best choices, flexibility costs**

Value of Information

- **Extra information has value**
 - * Value taken as improvement over base case
 - * Is compared to cost of getting information
- **Value of Perfect Information**
 - * Purely hypothetical / Easy to calculate
 - * Provides easy upper bound
- **Value of Sample information**
 - * Bayes' Theorem
 - * Repeated calculations ; likelihood ratios
 - * Worthwhile in important choices

Best Wishes!

**Test will be on material covered
Know it, and you will do well**

**The teachers' objective is that you all
learn material and do excellently!**

We hope you'll make us look good!