Review Notes for Test

(02/10/2004)

■ Formulation of LP Problem

► Pick a possible problem that a business might have to solve, and formulate a LP model to solve it with following terms;
- Objective Function
- Decision variables
- Constraints

► What kinds of information does the firm get from such a formulation and what type of data might they need?

■ Assumptions of LP

- Objective Function Appropriateness
- Decision variable Appropriateness
- Constraint Appropriateness
- Proportionality
- Additivity
- Divisibility
- Certainty

■ Violation of the LP Assumptions

- State a case where each of the LP assumptions might be violatde in a specific LP problem (Transportation, Feeding, Portfolio, Integer Programming, etc.)

■ Predictive setting vs. Prescriptive setting

■ Read and Interpret LP results

► Key questions
  1) Where are the results?
  2) What are the values?
  3) What is the interpretation of each item in a business decision making?

- Objective function value
  - Final value under target cell on answer report

- The max or min value a firm can get given the parameters and resource constraints

- Decision Variable
  - final value column under adjustable cells on answer report
  - The decision variable values that max or min its objective function value—how much of each variable to employ

- Shadow price
  - Lagrange multiplier column on sensitivity report
  - The change in the objective function value when one unit of resource is changed. Economic meaning is marginal value of the resource.

- Reduced Cost
  - Reduced gradient column on sensitivity report
  - Reduced cost is the reduction in objective function value when one unit of a decision variable that is not in the solution is forced into solution.

- Non zero / Zero variables
  - Explain in terms of Decision variable / Reduced cost

- Binding / Non-binding constraints
  - Explain in terms of Shadow price / Slack

■ Basic LP Problems

1) Transportation
2) Diet / Feed Mix / Blending
3) Joint Product
4) Dissassembly

■ Portfolio Selection: Including risk in LP problem

- When do we need to incorporate risk in LP problem?
  - We face a situation in which parameters are not certain or risky *(Violate the assumption of certainty)*
  - But we assume that we have historical probability distribution of parameters and that this is relevant to future decisions

- Why do we need to incorporate risk in LP problem?
  - Generate a plan which is robust in face of the uncertainty yielding a good solution across the set of possible events, not the best solution necessarily in any possible events

- E-V Model example – tradeoff of expected value and variance
- What does RAP alteration yield

■ Integer Programming

- When do we need Integer programming?
  - Decision variables are integer or binary
    (Violate the assumption of divisibility)
  - Lumpy Investments and fixed costs
  - Logical Conditions

- How can we handle the indivisibility problems in Excel?
  - Put constraints on decision variable: integer or binary