

# Lp analysis: product mix problem

Business



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LP Analysis – Product Mix Problem: 2 products, 2 constraints I Observations about initial solution: 1. Max OF = \$15, 263. 16 2. Optimal Soln:  $X_1 = 2894.74$   $X_2 = 263.16$  3.

$X_1$  is more than 10 times  $X_2$  4. Profit:  $X_1 = \$5.00$  &  $X_2 = \$3.00$ , profit margin of IPODs is 166% larger than DVD's not 10 times. 5.

Conventional approach: product mix is dependent on profit margins. II Observations about constraints 1. LHS = RHS for both constraints, no leftover resources. 2. Limitation on resources constrains expansion of product mix and greater profitability. .

These are referred to as Binding constraints, i. e. no leftover resources 4. SLACK – leftover or unused resource (or capacity) for M. P. net profit = SP – MP In general (without market info): since SP testing ; SP assembly, use available funds to hire testers since they are much more (3 times) profitable.

Principle: If Slack or Surplus = 0, Then the SP ; 0. No leftover resource exist so additional resources can be converted into products which will generate additional profits, sp ; 0. If Slack or Surplus ; 0, Then SP = 0. Since there are idle resources (leftovers), additional resources will also be idle, no new products and profit remains unchanged, sp = 0. Question 2: How much additional resources should be acquired? Acquire additional resources as long as SP remains unchanged, or as long as Slack = 0 Use LP to determine range.

This is referred to as Right Hand Side Ranging – RHS ranging. RHS ranging Definition: Range over which RHS changes while the SP does not change.

More resources lead to increased production, but mix is still determined by profitability. Revelation #1 Notice as resource availability changes, product mix changes in ways contradictory to when profit margins are used to determine product mix. Question 4: conventional wisdom 1. Product mix changes as profit margins of products change.

2. Production levels of a product change proportionally to profit margins – increase in profit margin causes increase in production levels for that product. 3. Concentrate production on products that are most profitable. 4. Continue producing products as long as they are profitable.

5. Product mix determination is mainly based on profitability. 6. Sale of one extra unit generates revenues equivalent to the profit margin for that product. 7. As demand increases, produce more of the product.

Perform objective function coefficient (profit margins for product mix problem) ranging: Range over which OF coefficients change while the optimal solution (product mix) does not change. 1. Product mix changes abruptly not proportionally as profit margins change. 2. For a particular product, larger profit margins do not lead to larger production levels. .

Just because a product is profitable does not mean that it should be produced. 4. Higher levels of overall profitability can be achieved by producing more of a less profitable product. 5. Profit margins and resource availability have a direct effect on product mix. 6.

The sale of one additional unit of a product generates revenues equivalent to that product's "intrinsic value" or shadow price, not its profit margin. 7.

Increased demand is no reason to increase production unless additional resources are available.