

Exercise 2.2.

Tomatoes Inc. (TI) produces tomato paste, ketchup, and salsa from four resources: labor, tomatoes, sugar, and spices. Each box of the tomato paste requires 0.5 labor hours, 1.0 crate of tomatoes, no sugar, and 0.25 can of spice. A ketchup box requires 0.8 labor hours, 0.5 crate of tomatoes, 0.5 sacks of sugar, and 1.0 can of spice. A salsa box requires 1.0 labor hour, 0.5 crate of tomatoes, 1.0 sack of sugar, and 3.0 cans of spice. The company is deciding production for the next three periods. It is restricted to using 200 hours of labor, 250 crates of tomatoes, 300 sacks of sugar, and 100 cans of spices in each period at regular rates. The company can, however, pay for additional resources at a cost of 2.0 per labor hour, 0.5 per tomato crate, 1.0 per sugar sack, and 1.0 per spice can. The regular production costs for each product are 1.0 for tomato paste, 1.5 for ketchup, and 2.5 for salsa. Demand is not known with certainty until after the products are made in each period. TI forecasts that in each period two possibilities are equally likely, corresponding to a good or bad economy. In the good case, 200 boxes of tomato paste, 40 boxes of ketchup, and 20 boxes of salsa can be sold. In the bad case, these values are reduced to 100, 30, and 5, respectively. Any surplus production is stored at costs of 0.5, 0.25, and 0.2 per box for tomato paste, ketchup, and salsa, respectively. TI also considers unmet demand important and assigns costs of 2.0, 3.0, and 6.0 per box for tomato paste, ketchup, and salsa, respectively, for any demand that is not met in each period.

Knowing this:

- Identify the known parameters
- Identify the uncertain parameters
- Identify the first-stage decisions
- Identify the second-stage decisions
- Formulate the stochastic optimization problem that minimizes the expected cost of the company and solve it
- Formulate the expected value problem and solve it
- Find the value of the stochastic solution (VSS)