Confederated pulp and paper essay sample



Executive Summary

The problem is to determine the optimal wood pile size to minimize costs for CPP. The key issue is that the number of days the river is frozen varies each year, and thus the amount of wood that will be needed in the stockpile for the winter will also vary. The solution is the optimal amount of wood that should be stockpiled in order to minimize the costs associated with both purchasing additional wood later and holding wood over to the next year.

Model

Decision: Pile size, and thus number of days of available wood, to stockpile. Objective: Optimize pile size to minimize costs associated with providing wood, given that the number of days the river is frozen is random.

Constraints: Weekly demand is 4800.

Assumptions:

- The \$2 stockpiling fee is paid at the same time that the \$8 shipping fee and \$23 variable cost are incurred.

-All logs cut have to go to stockpile, can't send directly to mill -Stockpiling fees given include time value of money

- Given relatively few historical data points, normal distribution is the most accurate way to estimate the number of days needed.

- Costs remain the same at different volume levels

- Cost of capital remains constant at 20%

Analysis

Using the provided data, we started by calculating the average and standard deviation of the number of days the river freezes. Using these figures, we created a normal distribution and then calculated the number of days frozen in our simulation, using the random number generator. We then multiplied the number of days frozen by the demand per day to calculate the number of cunits of wood needed in that year. Next, using our decision variable of " Cunits of wood" produced, we multiplied the variable costs per unit (cutting + shipping + stockpiling fee) by the amount produced to determine the costs associated with producing this amount of wood.

Next, using the amount of leftover wood, or amount of extra wood needed, we calculated the costs associated with purchasing extra wood, and with storing the wood for a year, along with next year's savings by having extra wood left over. We then calculated total costs, and found the average for our simulations of the total cost. With this average, we ran solver to minimize average costs with the appropriate amount of wood.

Conclusions

Answer (a): Given the historical data, a normal distribution can be used to reasonably simulate # of days of river freeze. The amount of wood required to keep the mill running is the number of freeze days x demand per day (686) as shown in the spreadsheet. (Actual answer varies for each simulation.) Answer (b): Shown in spreadsheet for simulations of different periods of time the river is frozen. Answer (c): When using our Normal distribution model, using Solver, we determined the optimal amount of wood to store was 112, 074. While estimate cannot be perfect because we relied on a fairly limited data set, we believe that the normal distribution is the most effective way to calculate these figures. Answer (d): The marginal cost of 1 unit of under production = 65 - 33 = 32. Marginal cost of 1 unit of overproduction = 33 - 33/1. 2 = 5. 5.

Optimal rate of overproduction = 32/37.5 = 85.333%Optimal rate of underproduction = 5.5/37.5 = 14.666%.

So our optimal production level should equal NORMINV(. 8533, 145, 14. 05) = 109, 458, which is about 159 days.

These figures match up nicely with our previous estimates, also based on a normal distribution.