

## Case Study 2: Conley Fisheries, Inc.<sup>i</sup>

Clint Conley, president of Conley Fisheries, Inc., operates a fleet of 50 cod fishing boats out of Newburyport, Massachusetts. Every weekday of the year, each boat leaves early in the morning, fishes for most of the day, and completes its catch by mid-afternoon. The boat then has a number of ports where it can sell its daily catch. The price of codfish at some ports is very uncertain and can change quite a bit even on a daily basis. Also, the price of codfish tends to be different at the ports. Furthermore, some ports have only limited demand for codfish, and so if a boat arrives relatively late compared to other fishing boats, the catch of fish cannot be sold and must be disposed in ocean waters.

To keep Conley's Fisheries' problem simple enough to analyze with ease, assume that Conley Fisheries only operates one boat, and that the daily operating expenses of the boat are \$10,000 per day. Also assume that the boat is always able to catch all of the fish it can hold, which is 3,500 kg of codfish.

Assume that the Conley Fisheries' boat can bring its catch to either the port in Gloucester or the port in Rockport. Gloucester is a major port for codfish with a well-established market. The price of codfish in Gloucester is \$3.25 /kg. This price has been stable for some time. The price of codfish in Rockport tends to be a bit higher than in Gloucester, but has a lot of variability. Clint has estimated that the daily price of codfish in Rockport is Normally distributed with a mean of \$3.65/kg with a standard deviation of \$0.20/kg.

The port in Gloucester has a very large market for codfish, and so Conley Fisheries never has a problem selling their codfish in Gloucester. In contrast, the port in Rockport is much smaller, and sometimes the boat is unable to sell part or all of its daily catch. Based on past history, Clint has estimated that the demand for codfish in Rockport that he faces when his boat arrives at the port in Rockport obeys the discrete probability distribution depicted in Table 1.

Table 1: Probability Distribution of Demand

<b>Demand (kg)</b>	<b>Probability</b>
<b>0</b>	0.02
<b>1,000</b>	0.03
<b>2,000</b>	0.05
<b>3,000</b>	0.08
<b>4,000</b>	0.33
<b>5,000</b>	0.29
<b>6,000</b>	0.20

It is assumed that the price of codfish in Rockport and the demand for codfish in Rockport faced by Conley Fisheries are independent of one another. Therefore, there is no correlation between the daily price of codfish and the daily demand in Rockport faced by Conley Fisheries.

At the start of any given day, the decision Clint Conley faces is which port to use for selling his daily catch. The price of codfish that the catch might command in Rockport is only known if and when the boat docks at the port. After the boat docks at one of the two ports, it must sell its catch at that port or not at all, since it takes too much time to pilot the boat out of one port and power it all the way to the other port.

## Conley's Decision Problem

Clint Conley is just as anxious as any other business person to earn a profit. For this reason, he wonders if the smart strategy might be to sell his daily catch in Rockport. After all, the expected price of codfish is higher at Rockport, and although the standard deviation of the price is high, and hence there is greater risk with this strategy, he is not averse to taking chances when they make good sense. However, it also might be true that the smart strategy could be to sell the codfish in Gloucester, since in Gloucester there is ample demand for his daily catch whereas in Rockport there is the possibility that he might not sell all of his catch (and so potentially lose valuable revenue). It is not clear to him which strategy is best.

## Questions

1. What are the daily earnings if Clint chooses to sell his daily catch of codfish in Gloucester?
2. Simulate the earnings when selling in Rockport for a sample of 200 days in an Excel Spreadsheet with the following columns: Random number 1, Demand in Rockport, Random number 2, price in Rockport, Quantity Sold, Daily Earnings. (Using ConleyFishery\_Template.xlsx will make part 3 easier.)
  - a. How can you generate realizations of demand at Rockport?
  - b. How can you generate realizations of price at Rockport?
  - c. How can you obtain daily earnings from your answers to a. and b.?
3. What is the shape of the probability distribution of daily earnings from using Rockport?
4. On any given day, what is the probability that Conley Fisheries would earn more money from using Rockport instead of Gloucester?
5. On any given day, what is the probability that Conley Fisheries will lose money if they use Rockport?
6. What are the expected daily earnings from using Rockport?
7. What would you advise Clint to do?

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<sup>i</sup> From Bertsimas and Freund (2004): Data, Models, and Decisions: The Fundamentals of Management Science