Use the *Crystal Ball* distribution fitting procedure to find the best-fitting distribution for these data. Use the Anderson–Darling statistic to rank the fit.

16. Suppose that a 30-year-old MBA graduate takes a job with a company that provides a 401k retirement plan and would like to retire at age 60. The company matches a portion of the employee's contributions based on the organization's financial performance. Assume that the employee's starting salary is $50,000, that he or she contributes 6% per year to the plan, and that the employer makes a matching contribution of 50%. Further assume that the employee's salary is expected to increase 3% per year, and that the investment will return 5% per year.
    a. Build a spreadsheet model to compute the retirement balance at the end of each year and the final amount at retirement. What assumptions did you make in the formulas you used to calculate the return on investment each year? Provide at least one alternative approach to calculating the return on investment for each year. Which approach is the most realistic?
    b. Recognizing that neither the salary increase nor the investment return will be constant each year, what modifications must you make to the model to incorporate this more realistic assumption?

CASE

An Inventory Management Decision Model

Inventories represent a considerable investment for every organization; thus, it is important that they be managed well. Excess inventories can indicate poor financial and operational management. On the other hand, not having inventory when it is needed can also result in business failure. The two basic inventory decisions that managers face are *how much* to order or produce for additional inventory, and *when* to order or produce it to minimize total inventory cost, which consists of the cost of holding inventory and the cost of ordering it from the supplier.

Holding costs, or *carrying costs*, represent costs associated with maintaining inventory. These costs include interest incurred or the opportunity cost of having capital tied up in inventories; storage costs such as insurance, taxes, rental fees, utilities, and other maintenance costs of storage space; warehousing or storage operation costs, including handling, recordkeeping, information processing, and actual physical inventory expenses; and costs associated with deterioration, shrinkage, obsolescence, and damage. Total holding costs are dependent on how many items are stored and for how long they are stored. Therefore, holding costs are expressed in terms of *dollars associated with carrying one unit of inventory for one unit of time.*

Ordering costs represent costs associated with replenishing inventories. These costs are not dependent on how many items are ordered at a time, but on the number of orders that are prepared. Ordering costs include overhead, clerical work, data processing, and other expenses that are incurred in searching for supply sources, as well as costs associated with purchasing, expediting, transporting, receiving, and inspecting. It is typical to assume that the ordering cost is constant and is expressed in terms of *dollars per order.*

For a manufacturing company that you are consulting for, managers are unsure about making inventory decisions associated with a key engine component. The annual demand is estimated to be 15,000 units and is assumed to be constant throughout the year. Each unit costs $80. The company's accounting department estimates that its opportunity cost for holding this item in stock for one year is 18% of the unit value. Each order placed with the supplier costs $220. The company's policy is to place a fixed order for Q units whenever the inventory level reaches a predetermined reorder point that provides sufficient stock to meet demand until the supplier's order can be shipped and received.

As a consultant, your task is to develop and implement a decision model to help them arrive at the best decision. As a guide, consider the following:

1. Define the data, uncontrollable inputs, and decision variables that influence total inventory cost.
2. Develop mathematical functions that compute the annual ordering cost and annual holding cost based on average inventory held throughout the year in order to arrive at a model for total cost.
3. Implement your model on a spreadsheet.
4. Use data tables to find an approximate order quantity that results in the smallest total cost.
5. Use *Solver* to verify your result.
6. Conduct what-if analyses to study the sensitivity of total cost to changes in the model parameters.
7. Explain your results and analysis in a memo to the vice president of operations.