Statical data in a business

Science, Statistics

Introduction This paper will involve use of Bayes' theorem to establish the cost of defective products that are produced by the two plants of a detergent producing company, one located in Florida and the other one in Texas. Bayes theorem, therefore, will be used to make decision in scenarios whereby the outcome of different events is not known with certainty (Davis, 1978).

Data methods and analysis

A detergent manufacturing company has two plants, one in Florida and the other one in Texas. The type of detergent manufactured from both plants is homogenous. The Florida facility makes 40% of the company's total detergent output and the Texas facility makes 60%. A central depot is set up, where all the detergent that is manufactured by the two plants is sent and mixed together. Following a careful investigation, the production manager established that 10% of the detergent manufactured in Florida and 5% of the detergent manufactured in Texas is faulty and hence cannot be used. It is also known that when the company sells faulty products, its goodwill is tainted and the cost of replacing the faulty product is high. The production manager finds it prudent to allocate these costs reasonably between the two production facilities. This allocation requires knowledge of the probability that a particular production line will produce faulty detergent. In particular, the production manager should seek answers to the following questions:

1. What is the probability that the detergent was produced at a Florida production plant, when the detergent is also faulty?

2. What is the probability that detergent was produced at Texas production plant, when the detergent is also faulty?

To find the solution to this problem, a probability function is constructed, whereby, F stands for the event that a unit of detergent is faulty. In other words, the production manager is aware of the following?

P (Florida/F) =?

P (Texas) /F) =?

Now, Bayes' Theorem can be used to solve these probabilities, as follow:

It is known that event F (fault detergent) can occur from either Florida of Texas. Therefore:

P (F) = P (Florida and Faulty) + P (Texas and Faulty)

P (F) = P (Florida) P (F| Florida) + P (Texas) P (F| Texas)

It is by now known that 40% of the detergent is produced by Florida plant and 60% from Texas. As such, P (Florida) = 0. 40 and P (Texas) = 0. 6. Using Bayes' Theorem, the following probability from each production line is presented:

P (F| Florida) = 0. 10 and P (F| Texas) = 0. 05

0. 57

0. 429

These probabilities imply that 57. 14% of the faulty cost should be assigned to the Florida plant and 42. 86% assigned to the Texas plant. It is notable that P (F) represents the probability of the faulty detergent. This probability can be represented as follows:

P (F) = P (Florida) P (F| Florida) + P (Texas) P (F| Texas)

= (0. 40) (0. 10) + (0. 60) (0. 05)

= 0. 03 + 0. 04

= 0. 07

This means that 7% of the total detergent made by the company faulty.

Conclusion

The production manager has applied Bayes' theorem to craft a fair method of allocation cost that is associated with production of defective products between the two production facilities (Peebles, 1993). Although the production manager was not certain of the exact cost that comes from each plant, the probabilities have been formed devoid of bias. Therefore, the company will be more decisive when allocating these costs between the two plants. Similarly, this method has made it possible to establish that 7% of the products made from both plants are defective, and this can be used to make decisions related to quality.

References

Davis, W. W. (1978). Bayesian Analysis of the Linear Model Subject to Linear Inequality Constraints. Journal of the American Statistical Association, 73, 573-579.

Peebles, P. Z. (1993). Probability, Random Variables, and Random Signal Principles, 3rd ed. New York: McGraw-Hill, Inc.