Making Business Decisions: The Furniture Fire Case

Description

A wholesale furniture retailer stores in-stock items at a large warehouse located in Tampa, Florida. Early in the year, a fire destroyed the warehouse and all the furniture in it. After determining the fire was an accident, the retailer sought to recover costs by submitting a claim to its insurance company. As is typical in a fire insurance policy of this type, the furniture retailer must provide the insurance company with an estimate of “lost” profit for the destroyed items. Retailers calculate profit margin in percentage form using the gross profit factor (GPF). By definition, the GPF for a single sold item is the ratio of the profit to the item’s selling price measured as a percentage, that is:

Item GPF = (Profit/Sales price) x 100%

Of interest to both the retailer and the insurance company is the average GPF for all of the items in the warehouse. Because these furniture pieces were all destroyed, their eventual selling prices and profit values are obviously unknown. Consequently, the average GPF for all the warehouse items is unknown.

One way to estimate the mean GPF of the destroyed items is to use the mean GPF of similar, recently sold items. The retailer sold 3,005 furniture items in the year prior to the fire and kept paper invoices on all sales. Rather than calculate the mean GPF for all 3,005 items (the data were not computerized), the retailer sampled a total of 253 of the invoices and computed the mean GPF for these items. The 253 items were obtained by first selecting a sample of 134 items and then augmenting this sample with a second sample of 119 items. The mean GPFs for the two subsamples were calculated to be 50.6% and 51.0%, respectively, yielding an overall average GPF of 50.8%. This average GPF can be applied to the costs of the furniture items destroyed in the fire to obtain an estimate of the “lost” profit.

According to experienced claims adjusters at the insurance company, the GPF for sale items of the type destroyed in the fire rarely exceeds 48%. Consequently, the estimate of 50.8% appeared to be unusually high. (A 1% increase in GPF for items of this type equates to, approximately, an additional $16,000 in profit.) When the insurance company questioned the retailer on this issue, the retailer responded, "Our estimate was based on selecting two independent, random samples from the population of 3,005 invoices. Because the samples were selected randomly and the total sample size is large, the mean GPF estimate of 50.8% is valid...”

A dispute arose between the furniture retailer and the insurance company, and a lawsuit was filed. In one portion of the suit, the insurance company accused the retailer of fraudulently representing its sampling methodology. Rather than selecting the samples randomly, the retailer was accused of selecting an unusual number of "high profit” items from the population in order to increase the average GPF of the overall sample. To support its claim of fraud, the insurance company hired a CPA firm to independently assess the retailer's gross profit factor. Through the discovery process, the CPA firm legally obtained the paper invoices for the entire

population of 3,005 items sold and input the information into a computer. The selling price, profit, profit margin, and month sold for these 3,005 furniture items are stored in the FIRE file described below.

Objective

Your objective in this case is to use these data to determine the likelihood of fraud. Is it likely that a random sample of 253 items selected from the population of 3,005 items would yield a mean GPF of at least 50.8%? or, is it likely that two independent, random samples of size 134 and 119 would yield mean GPFs of at least 50.6% and 51.0%, respectively? (These were the questions posed to a statistician retained by the CPA firm.)

Use the ideas of probability and sampling distributions to guide your analysis. Prepare a professional document that presents the results of your analysis and gives your opinion regarding fraud. Be sure to describe the assumptions and methodology used to arrive at your findings.

Variable	Type	Description
MONTH	QL	Month in which item was sold in 1991
INVOICE	QN	Invoice number
SALES	QN	Sales price of item in dollars
PROFIT	QN	Profit amount of item in dollars
MARGIN	QN	Profit margin of item = (Profit/Sales) x 100%

Source: McClave, J. T., Benson, P. G., & Sincich, T. (2022). *Statistics for Business and Economics*. Pearson.