

Superior Sales: Financial Compensation Analysis

Data Overview:

Provided the data sets depicting the county sales surge after the fire and superior sales preceding 48 months, our team has concluded that there is a significant case for financial compensation given the month's superior sales were closed. After analyzing Superior's sales over the last 48 months a pattern appeared every year during the month of August. The store would have the most number of sales for their entire year in that month of August which exponentially increases at the end of July and tapers off at the beginning of September. There was also a slight upward trend in the profitability of superior sales month by month. Regression models were run for both the county sales data and the superior sales data with period and months (not including August) as our independent variables.

Superior Sales (No Fire):

The regression model ran for periods and months for superior sales and had an adjusted r-squared value of 0.93 (93%) making the model a fairly accurate one. The predictions made using the equation derived from the model yielded a mean squared error of 0.02 (2% error). Once again accounting for a significant amount of the error in the datasheet. The predicted values for the following four months (assuming there had been no fire) are shown in the table below.

month	predicted profit (Millions)
May	2.23
June	4.5
July	3.11
August	4.52

The August after the fire was on track to be the highest-grossing August yet. The upward trend over the last 5 years had also shown the profits for each month were on average going to be increasing. Therefore, the months following the fire were on track to do the same. The total predicted loss for those four months comes out to \$14.4 million.

County Sales Analysis

The regression model ran for periods and months for the entire county's sales and had an adjusted r-squared value of 0.96 (96%) making this model even more accurate. The predictions made using the equation derived from this regression model yielded a mean squared error of \$7.6 million. Given the county, sales are in the hundreds of thousands this margin of error is considered not significant given the context. I included the predicted values for the county below (not including the data after the fire) so I could compare them to the actual sales given the surge.

month	predicted profit (millions)	actual profit (millions)	error
May	49.89	69	19.11
June	51.99	75	23.01
July	66.24	85.2	18.96
August	105.69	121.8	16.11
MSE			19.2975

The MSE for our 96% accurate model has now jumped from \$7.6 million to almost \$20 million in four months. Therefore, the profit surge for the four months after the fire was irregularly high-profit margins. The predicted values for the month of August for year five for both county and superior were on track to be the highest-grossing 4 months yet. Had the fire not occurred, this would have most likely been true for both county and superior sales. However, because the fire insurance relief was provided to the county boosting their highest-grossing August even higher while superior sales were closed.

Conclusion/Next Steps:

In the four months that Superior was closed after the fire, it was estimated they had lost \$14.4 million in that time. However, considering the models showed that the profit margins for the county surged irregularly high during this period Superior is eligible to be compensated for \$20 million in damages. Both models show a significant relationship between the month of August and the increasing profit margins by period. The disaster relief surge data acted as outliers in the set showing that the profit surge was not 100% correlated to the time of year, but also to the insurance relief surge. Therefore, Superior sales must be compensated for the irregularly large profit surge they could not participate in.