Inferential Statistics Test

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The following analysis attempts to determine if a statistical significant linear relationship exsists between the international stores amount and the annual international sales revenue for the Phoenix Mart company, during the years 1995 through 1998.

The following data was collected from a report titled “Taking Wal-Mart Global: Lessons From Retailing's Giant” (Govindarajan, Gupta, 2002). The data collected for the given years is summarized in the following table:

|  |  |  |
| --- | --- | --- |
| **Year** | **Number of International Stores** | **International Sales (Billions)** |
| 1995 | 226 | 1.511 |
| 1996 | 276 | 3.712 |
| 1997 | 314 | 5.002 |
| 1998 | 601 | 7.517 |

The following scatterplot shows the relationship between the two variables, along with a trend line representing the best-fit linear model, the linear regression equation for that model, and the coefficient of determination value.

At first glance, the data do not appear to be strictly linear. In fact, the plotted points seem to follow more closely a quadratic or higher order model. However, with the limited data available, it is difficult to be sure. Should the following hypothesis test confirm there is no significant linear relations between the variables, the next step would be to investigate the fit of a quadratic model.

The slope of the trend line is positive, and the coefficient of correlation is r= √0.85055 = 0.9223. The following hypothesis test will assess the significance of this coefficient.

**Hypotheses**

Null Hypotheses: Ho: p = 0

Alternative Hypotheses: Ha: P not = 0

**Critical Values**

The significance testing of the relationship coefficient uses a test statistic with n -2 degrees of freedom.

With n = 4, the amount of degrees of freedom for testing is 4 – 2 = 2.

With a = 0.05 and 2 degrees of freedom, the critical values are t critical *=*

*-*4.303 and t critical = 4.303.

The null hypothesis will be rejected if for t < -4.303 or t > 4.303.

**Test statistic**



The corresponding p-value is 0.0777.

**Decisions**

Because the test statistic of 3.3749 lies between both critical values, the decision is fail to reject the null hypothesis.

Alternatively, because p-value 0.0777 is larger than the level of significance (0.05), fail to reject the null hypothesis is the decision.

**Conclusion**

There is inadequate evidence at the 0.05 level of significance to substantiate a claim that there is a statistical significant linear relationship between the number of international stores and the annual international sales for Phoenix Mart.

As expected, based on the scatterplot and trendline above, the evidence collected does not support the claim that there is a linear relationship between the two variables. It is possible that additional data points would support such a claim, and it is also possible that some other model, such as a quadratic model, will be a better fit to the available data.

Phoenix Mart should consider investing in further analysis of the issue as it seems likely that increasing the number of international stores would provide a mechanism for increasing annual sales although there could be other mitigating market factors that work against this expectation.

References

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