Analysis Model of Shopping Markets with Small Profit and Multi-Sale Based on Statistical Thought

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Abstract: Small profits and high sales refer to the strategy of expanding sales at low prices and low profits. For a commodity with flexible demand, when the price of the commodity falls, the increase in demand (and thus sales) is greater than the decrease in price, so the total revenue increases. This paper mainly analyses the sales situation of a shopping mall (the data are from the E question of the National University Mathematical Modeling Competition in 2019). It calculates the turnover, profit, profit margin and discount intensity of the 764 days, and explores the relationship between these factors. From the point of view of the market, this paper discusses how discounts affect the strategy of "small profits but high sales".

1. Introduction

It is a common phenomenon that stores discount commodities, which is in line with the management strategy of "small profits and more sales". "Small profits and more sales" is a strategy to expand sales by reducing the profit of the unit commodity to increase the sales volume, so that the merchants can get more profits. Question E of the National Mathematical Modeling Competition for College Students in 2019 provides sales flow records, discount information tables and commodity information tables of a shopping mall from November 30, 2016 to January 2, 2019. We will analyze the daily turnover, profit, profit margin and discount strength of the shopping mall. Through the changes of these indicators and the relationship between them, we will elaborate the "small profits but large sales" pairing. The impact of industry.

2. The calculation model of turnover, profit, profit margin and discount strength

After the validity screening and integration of all the data, the turnover, profit, profit margin and discount strength are defined respectively, and the calculation and analysis are carried out.

2.1 Definition

① Turnover:

$$\text{Turnover}=\sum \text{Actual price}\times \text{Quantity of sales}$$

② Profit

Since "small profits but high sales" ultimately consider the change of total profit, and the merchants pursue the increase of total profit, we calculated the profit of 764 days.

Profit = turnover - cost

③ Profit margin

The first step is to calculate the empirical profit margin of the store by using the price and cost of all discounted goods (assuming the discount price is the cost price because the data do not provide the real cost):

$$\text{Empirical profit margin}=\frac{\text{The sum of the marked prices of all discounted goods}}{\text{Total cost of all discounted goods}}-1$$

$$\approx 33.84\%$$

The second step is to use the empirical profit margin of 33.84% to calculate the cost of

non-discounted goods.

$$\text{Cost of Undiscounted Goods} = \frac{\text{Commodity Price}}{1 + 33.84\%}$$

Cost of discounted goods = Promotion real-time price (based on assumptions)

Thus, the cost of all non-discounted goods can be calculated.

The third step is to calculate the daily profit margin of the market.

$$\text{Profit margin} = \frac{\text{Total turnover}}{\text{total cost}} - 1$$

④ Discount strength

The strength of discount reflects the extent of commodity discount. The greater the strength, the cheaper the commodity is relative to the original price.

$$\text{Discount strength} = 1 - \sum \text{Commodity discounts} \times \text{Price weight}$$

Such a definition of the market discount strength, to meet: the lower the commodity discount (such as 1 discount), the greater the discount strength; the more the number of commodity discounts, the greater the discount strength; the more types of commodity discounts, the greater the discount strength. Free commodity discount strength is 1, non-discount commodity discount strength is 0. It needs to be explained that the defined daily discount strength of the mall is budgeted from the perspective of the mall. Because the discount has nothing to do with the actual quantity of sales, the discount strength should also have nothing to do with the actual quantity of sales, and it is the decision made in advance by the mall.
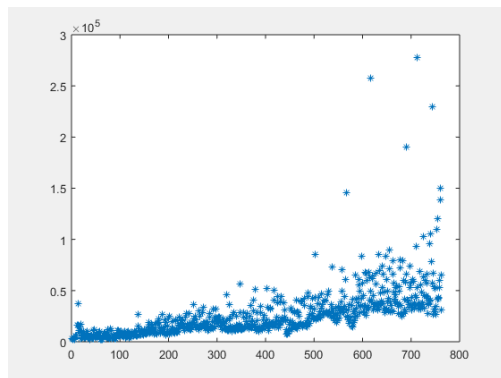
2.2 Computational results

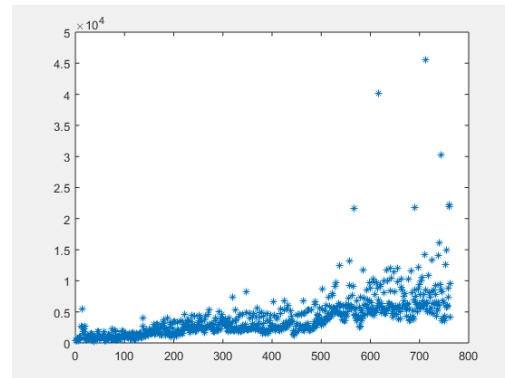Figure 1 Spot chart of turnover
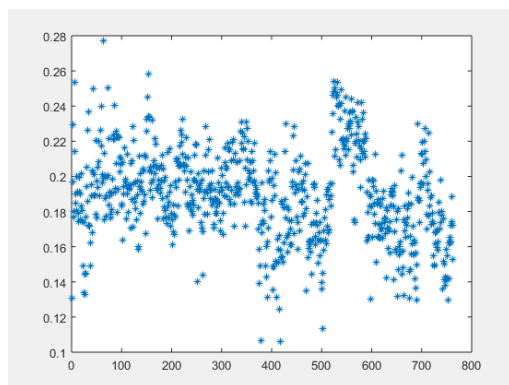

Figure 2 Spot Chart of Profit
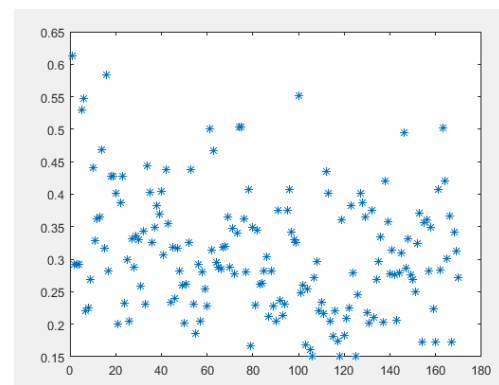

Figure 3 Spot chart of profit margin

Figure 4 Spot chart of discount strength

2.3 Analytical conclusions

① The characteristics of turnover data: From November 30, 2016 to January 2, 2019, the total sales amount was 19787777.86 yuan. As a whole, the daily turnover shows a steady growth trend, which is concentrated between 2000 and 80000 yuan. Several particularly high turnover (more than

100,000) occurred between November and December 2018, August 8, 2018 and October 20, 2018, and most of them were weekends. The annual turnover in 2018 increased by 195.48% compared with that in 2017. The same period of November-December, when the turnover was high, increased by 118.36% in 2017 and 262.89% in 2018.

② The characteristics of profit data: the total profit is 30388665.80 yuan. Daily profit as a whole shows a steady growth trend, concentrated in the range of 3000-15000 yuan. When turnover is high, profit is high.

③ The characteristics of profit margin data: the profit margin is concentrated between 15% and 26%, the profit in December 2016 and January 2017 is lower, and the profit in May, June, November and December 2018 is higher.

④ Data characteristics of discount intensity: weekend discount intensity is large, but peacetime discount intensity is small. In November 2017 and November 2018, the discount intensity is high, while in January 2018, the discount intensity is low. The minimum discount strength is 0.15 and the maximum discount strength is 0.61 in the time when discount records are available. When the discount is strong, the profit is generally higher and the turnover is higher, but the profit margin is not high.

3. A Model of the Relation between the Degree of Discount and the Sales, Profit and Profit Rate of Commodities

①A quadratic regression model of profit y and discount strength, ②a quadratic regression model of profit rate y and discount strength, ③and a quadratic regression model of turnover y and discount strength are established as follows.

③ $y = (2.5276 + 3.2021x - 3.5299x^2) \times 10^3$ ② $y = 0.1871 - 0.0189x + 0.0471x^2$

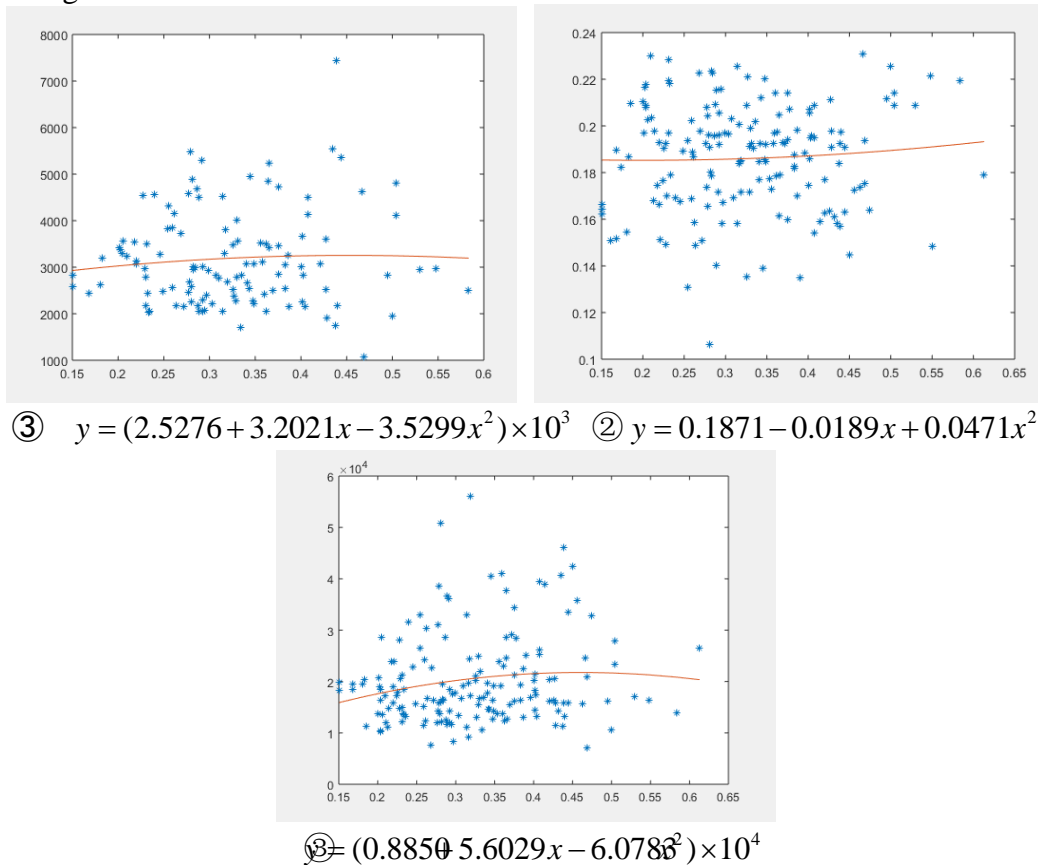③ $y = (0.8850 + 5.6029x - 6.0788x^2) \times 10^4$

Figure 5 Results

The results showed that:

Profit on discount strength is an open-down parabola, discount strength is too small or too large is not optimal. As can be seen from the chart, the discount strength is between 0.25 and 0.45, which is more profitable.

The turnover situation is similar to the profit situation. The discount intensity should not be too low or too high. The optimal range can be found. The discount intensity is between 0.25 and 0.45, that is, between 50% discount and 75% discount for commodities, which has higher turnover.

With the increase of discount intensity, the profit margin of discounted commodities should decrease, but as a result of "small profits but more sales", the sales volume will increase, so the total profit will rise, so the figures show a slight upward trend.

4. Summary

After calculating turnover, profit margin, profit and discount strength, the analysis shows that:

① Under the management strategy of "small profits but more sales", the turnover of the shopping mall increases substantially every year, and the growth is also faster in the same period. In November and December 2018, the turnover and profit of the shopping mall are relatively high, and the turnover and profit of the weekend are relatively high. This is related to the discount activities carried out by the shopping mall. Businessmen can adopt the strategy of "small profits but more sales" in this period to obtain more profits.

② The greater the discount, the lower the profit margin, but the turnover and total profit can be increased, which is the real success of the strategy of "small profits and more sales". The calculation results show that the discount intensity of the shopping mall is large at weekends and small at ordinary times. In November 2017 and November 2018, the discount intensity is high, while in January 2018, the discount intensity is low. When discounts are strong, profits are generally higher and turnover is higher.

③ Analyzing the regression model, we find that the turnover and profit increase first and then decrease with the discount intensity. When the discount intensity reaches the range of 0.25-0.45, the turnover and profit are higher.

④ Discussing the relationship between the discount strength of three kinds of commodities (daily allotment/refrigeration, grain and oil by-products, daily chemicals) which contribute the most to the turnover, profit and profit margin, we find that the discount strength of daily allotment/refrigeration is between 0.2 and 0.3, the discount strength of grain and oil by-products is between 0.28 and 0.42, and the discount strength of daily chemicals is between 0.32 and 0.44, the profit margin is high.

References

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