

Joe Nelson

Northwind Traders

Effectiveness of the Discount Program

June 2020 / Mod3v2 / Hypothesis Testing

Periodic Review of Sales Discount Program

- ❖ Review sales from July 2012 through early May 2014
- ❖ Across all sales territories
- ❖ And including all of Northwind's exotic foodstuffs



Periodic Review of Sales Discount Program

- ❖ Employed a series of **hypothesis tests** to determine if there was a **significant relationship** between different groups, to answer the following questions:
- ❖ Does discount amount have a statistically significant effect on the quantity of a product in an order? If so, at what level(s) of discount?
- ❖ Do orders that include discounts generate more revenue than those without?
- ❖ Do customers who order discounted items have a statistically significant higher order rate than customers who do not order discounted items?
- ❖ Is there a statistically significant relationship between the employee and how often discounts are applied to orders?

Q.1: Does discount amount have a statistically significant effect on the quantity of a product in an order? If so, at what level(s) of discount?

- ❖ Discounts were applied at 1%, 2%, 3%, 4%, 5%, 6%, 10%, 15%, 20%, and 25%
- ❖ Only multiples of 5% were applied a significant number of times
- ❖ Compared orders with discounts and without, to see if there was a significant difference between the two groups
- ❖ Discount group averaged 27.1 items per order
- ❖ No-discount group averaged 21.7 items per order
- ❖ Was this difference due to chance?

Q.1: Does discount amount have a statistically significant effect on the quantity of a product in an order? If so, at what level(s) of discount?

- ❖ **Concluded:** Less than **1% chance** that the observed difference was due to chance.
- ❖ When examined individually, 5%, 15%, 20%, and 25% discount levels showed a **significant increase in quantity** over non-discounted orders.
- ❖ Items discounted 10% did not show a significant difference.
- ❖ Further investigation is needed to determine **why**.
- ❖ All discount levels showed the relative same effect (**relatively small**).

Q.2: Do orders that include discounts generate more revenue than those without?

- ❖ Considering the "relatively small" effect discounts have on quantity per order, we also explored whether discounts have an effect on revenue.
- ❖ Calculated **revenue** as $(\text{UnitPrice} * \text{Quantity Ordered} - \text{Discounts})$
- ❖ Compared revenue from orders with discounts applied and without.
- ❖ Average order with discounts applied was **\$1,702.35**;
- ❖ Average order without discounts applied was **\$1,375.33**.
- ❖ **Concluded**: this difference was statistically significant (not due to chance)

Q.3: Do customers who order discounted items have a higher order rate?

- ❖ Compared number of orders per customer when discounts were applied against when discounts were not applied.
- ❖ Average orders-per-customer for the discount group was 12.09.
- ❖ Average orders-per-customer for the no-discount group was 5.06.
- ❖ **Concluded:** this difference was statistically significant (not due to chance).
- ❖ This statistic does not imply causation, but merely reflects a correlation between discounts and increased orders per customer.

Q.4: Do all Northwind employees apply discounts equally to their orders?

- ❖ Given the increases in revenue and order rates, we wanted to determine if all salespersons were utilizing the discounts at the same rate.
- ❖ Nine employees handled 830 orders, 316 of which had discounts applied (38%)
- ❖ Applied 38% benchmark as expected level to each salesperson's total orders.
- ❖ Some variance, but not too much.



Q.4: Do all Northwind employees apply discounts equally to their orders?

- ❖ **Concluded:** we were **not** able to conclude that there's a significant relationship between the employee and the application of discounts
- ❖ This is a **good thing**: it suggests that the specific salesperson is **not correlated** to whether more or less discounts are applied.



Conclusions

- ❖ There is a **statistically significant relationship** between the application of discounts and quantity ordered, revenue, and order rates.
- ❖ Salespersons are applying the discounts at a **relatively constant rate**.
- ❖ **Further work**: our review is merely correlative; further exploration is necessary to determine the degree to which the discounts play a causative role.



Thank you!