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PROJECT NARRATIVE – INSPIRED DISCOVERIES

ABSTRACT

Direct Mail Marketing (DMM) is one of the modes used by various businesses in the United States (US) for advertising and securing business opportunities. Recently, the Direct Marketing Association (DMA) reported that direct mail marketing represented more than $686 billion in sales and that 80% of households read all or part of their mails. The DMM can be an effective tool for countless businesses as it can very flexible, highly targeted, individualized and cost effective.

Our study analyzes the effectiveness and efficiency of direct mail advertising pertaining to the real estate industry. The process of distributing mailers involves time, effort, and cost that we feel can be improved on by condensing the superfluous amount of resources that are required by mailing hundreds of thousands of mailers to make a profit. The DMA also states that the mailers are only successful if the recipient is interested in the types of mail they are receiving. This research work shows what kind of information can be placed on mailers to acquire the most favorable results, how to narrow demographics for optimal profit, and how to maximize success based on those demographics. The results will enable companies to reduce the number of mailers distributed and thus be more efficient. This research work includes a case study data from 190,000 nationally distributed mailers from a real estate mortgage bank.

DESCRIPTION OF EXISTING PRACTICES AND NEED FOR RESEARCH

We received data from a local mortgage bank that utilized direct mail marketing over a five year span. In their marketing process, direct mail was sent to approximately 195,000 home-owners in an attempt to help them refinance their current mortgage into a lower rate through a streamline program. Each mailer had a code on the back that could help the bank to find more information about the borrower in their computer system. This also allowed the bank to track the success rate of their direct mail marketing and compile data that would be useful in the future. Home-owners would call the number listed on the mailer and the bank operator would ask the home-owner to read the code so he/she could input the code into the system. Each mailer costs the bank $0.30 to create and mail, while each successful loan that closed brought in revenue of $500. Along with the profit of each loan, the effort, time, qualifications, and processes were equal.

The mailers that were sent out targeted specific demographics in order to increase the success rate of closing loans. The demographics involved were comprised of home-owners who owned FHA mortgages in single family dwellings; while also being in an age range of 40-59, having an estimated household income of $50,000-$100,000, an estimated home value of $200,000-$400,000, and being in the residence for a period of four to ten years. The length of residence was comprised of a minimum amount, four years, based on qualifications for the loan program, and a maximum amount, ten years, based on the assumption that homeowners with loans above

ten years would not like to refinance into another 30 year loan after being over a third of the way through their current loan. Furthermore, the mailers that were sent out were comprised of two different direct mailing types. The first mailer was comprised of the code, the bank's phone number, the name of the bank, and the reason the bank had sent the home-owner the mailer. The second mailer contained only the code and the phone number. Another component of our project incorporates geographical area. The mailers had no limitations regarding cities, states, or location which our study sought to find demographic regions that could produce a higher success rate of loans closed. The questions that we sought to answer were:

- Is there a difference in the marketing material that is placed on mailers in order to increase future profit?
- What factors can the bank target use to provide the most successful demographic location to send mailers?

Following part of this report will present a detailed description of the research work done to address the questions.

RESEARCH 1: COMPARING THE PROPORTION OF SUCCESS OF TWO DISTINCT MAILER TYPES

Based on these two questions, our group felt that we could effectively improve the type of mailer that was sent to home-owners and the area in which to send the mailers. We concluded that the first question would be solved using a Z-test for the difference between two proportions to evaluate the differences between two population proportions. Using the Confidence Interval Estimate will show the difference between the proportions if Z-test displays there is a difference.

Our first test used a hypothesis that stated:

- $H_0: \pi_1 = \pi_2$

  - "The success rate for mailers with more information and mailers with less information loans are equal"

- $H_1: \pi_1 \neq \pi_2$

  - "The success rate for mailers with more information and mailers with less information loans are equal"

Data and Analysis

The data that we obtained was:

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Mailer Information			
	More Info	**Less Info**	**Totals**
Disbursed	85,000	105,000	**190,000**
Closed	588	642	**1,230**
% Closed	0.6918%	0.6114%	**0.6474%**

Our decision rule in the hypothesis test was:

- At the 5% significance level, reject H_0 if $Z_{STAT} < -Z_{CRITICAL}$ or if $Z_{STAT} > Z_{CRITICAL}$, otherwise do not reject H_0.

The assumptions that we made during the test were:

- The variables being tested are independent.

- The variances are equal.

- If the population distribution is fairly symmetric, the sampling distribution of the mean is approximately normal for samples as small as five.

- Central Limit Theorem shows a normal distribution since $n \leq 30$

- The Z_{STAT} test statistic approximately follows a standardized normal distribution when:

  - $n_1\pi_1 \geq 5$ and $n_1(1 - \pi_1) = 5$

  - $n_2\pi_2 \geq 5$ and $n_2(1 - \pi_2) = 5$

Results

And our results were:

- $Z_{STAT} = 2.171$ 　　　　　　(where $\alpha = 0.05$)

- $Z_{CRITICAL} = \pm 1.96$ p-value $= 0.0229$
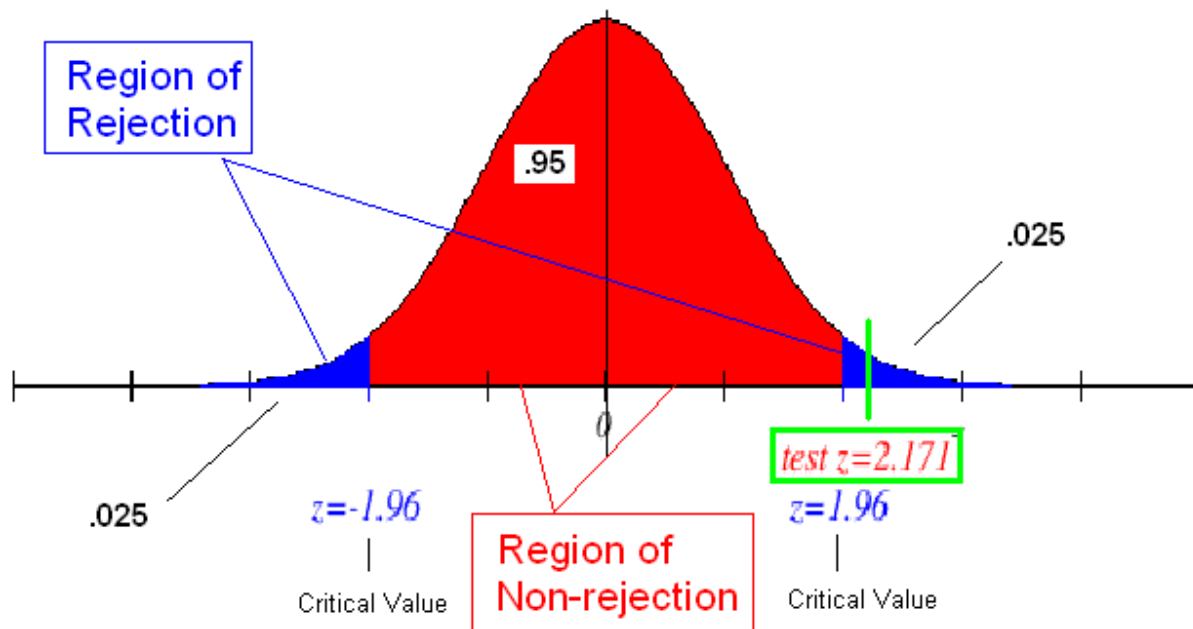
- Using a 0.05 level of significance, since $Z_{STAT} > Z_{CRITICAL}$ and p-value $< \alpha$, we would reject H_0.

Conclusion

There is an evidence to conclude that the two flyer types are significantly different with respect to successful loans closed. A greater proportion of mailers with more information successfully closed loans than mailers with limited information.

And our Confidence Interval Estimate stated that:

- Confidence Interval Estimate at 95% CI → $0.00007342 \leq (\pi_1 - \pi_2) \leq 0.001533$

In other words, if we were to send out 100,000 new mailers with more information as opposed to limited information, we are 95% confident that we would successfully close between 7 and 153 more loans. This would equal a profit of between \$3,500 and \$76,500.

RESEARCH 2: IDENTIFYING FACTORS AFFECTING LOAN COLSURE AND ESTIMATING THE BENEFITS

This question involved obtaining data from loans disbursed and loans closed for a highly populated area in which we could use zip codes to determine what demographics would correlate to success rate. We chose to use data from 11 different zip codes in the Washington D.C. area

because of the high quantity of loans disbursed and closed in that geographical location. We used a multiple regression analysis to find the demographics that we could utilize.

Data and Analysis

Next, we started with information obtained from the Washington D.C. area zip codes of:

- 20001
- 20002
- 20003
- 20010

- 20011
- 20012
- 20017
- 20018

- 20019
- 20020
- 20032

The multiple regression analysis would allow us to eliminate four zip codes in order to focus the loans disbursed into optimal locations. We found 14 different demographics from the zip codes which were:

- Home Values
- Average Gross Income
- Median Gross Income
- Percent of Home-Owners
- Loans Originated within 4-10 years
- Percent of Households within Certain Incomes
- Population

- Households with Mortgages
- Median Age
- Housing Units with 4 or Less Units
- Owner Occupied Units
- Race
- Gender
- Average Household Size

Then, we determined that there were four key demographic factors that were crucial to the success of our loans. Those factors were:

- Home Values ($200,000-$250,000; $250,000-$300,000; $300,000-$400,000)
- Percent of Households within Incomes ($75,000-$99,999)
- Percent of Home-Owners
- Loans Originated within 4-10 years

Results

Using these key demographics, we found that there was an extremely strong correlation of 0.87 based the demographic factors and the percent of successful loans closed from the loans disbursed to those zip codes at a 95% confidence level. After that, we used the coefficients of the multiple regression analysis to determine our equation:

$Y = -0.0783 + 0.536X_1 + 0.037X_2 + 0.1.47E\text{-}6X_3 + 2.95E\text{-}5X_4 + -0.00013X_5 + 5.88E\text{-}5X_6$

Where:

- X_1 = Percent of Households with Income between $75,000-$99,999

- X_2 = Percent of Homeowners
- X_3 = Number of Loans Originated within 4-10 years
- X_4 = Number of Homes with Values between $200,000-$250,000
- X_5 = Number of Homes with Values between $250,000-$300,000
- X_6 = Number of Homes with Values between $300,000-$400,000

After administering the equation to each zip code, we eliminated the following zip codes:

- 20002
- 20012
- 20020
- 20032

Our results showed us that:

	Loans Disbursed	Loans Closed	Percent of Successful Loans
All Zip Codes	7245	63	0.8696%
Adjusted Zip Codes	4633	47	1.0145%

Conclusion

It is evident from the results that if the bank implements the outcomes, we the bank can reduce to cost of sending the mailers but at the same time it can increase the efficiency of the mailers up to 15%.

OVERALL CONCLUSION

In conclusion, using the Z-test for the difference of two proportions and the multiple regression analysis, we determined that we could increase the success rate of our loans, amount of loans closed, and the profit margin. Our study showed that we could improve our results for future direct mail marketing by using mailers with more information and using key demographics to show optimal locations to send the mailers to. The significance of our study displayed that, with 95% confidence, **our proposed changes to the direct mail marketing would yield an additional $183,500** per 100,000 flyers. This study can be used to provide banks with optimal locations and marketing aspects to increase productivity and efficiency in the future.