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**Abstract**

This paper seeks to review the loan pricing for e-Car by employing more sophisticated analytical techniques to analyze profitability of the new customized pricing models. The paper deals with two loan applications and employs the logistic regression analysis to model loan acceptance and find the best pricing.

**Introduction**

The interest rate which lenders can charge on auto loans is determined by the prevailing market forces in the line of credit industry, thus the dilemma that lenders face when it comes to setting reasonable interest rates that will enable them to make reasonable returns while at the same time being competitive in the line of credit industry. This paper focuses on the use of data analytical techniques to support the pricing decision of e-Car, an online lender operating in business-to-business markets.

**Task 1: Identifying Relationship Between Loan Acceptance and Variables**

In the logistic regression model, the following relationships are identified between loan acceptance and other factors. Significantly high interest rates considerably lower the acceptance probability which confirms that all customers are sensitive to price levels. FICO scores appear to be slightly negative, meaning that while customers with higher FICO scores may have more bargaining power. Loan amount has a negative correlation and shows that with increased loan amount the probability of conversion decreases. Term length is positively signed; the longer the term the lower the monthly instalment which could be easier on the customer.

**Coefficients:**

Intercept = 5.805, Rate = -0.1133, FICO = -0.00679, Amount = -0.0001285, Term = 0.03921

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**Question 1: Conversion Probability at 6.00% APR**

The findings show different conversion likelihoods of the two loan applications at 6.00% APR. Estimating the probability of conversion for the Tier 1 customer who requires $18,000 loan, the model gives 50.59 percent. The above results indicate that the probability of conversion for the Tier 2 customer who is requesting a loan of $25000, is considerably low at 19.31%. This can be so due to the tier classification and the loan amount differences in the applicants.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Customer | Tier | Amount | FICO | Term | Probability |
| 1 | 1 | $18,000 | 705 | 60 | 50.59% |
| 2 | 2 | $25,000 | 705 | 60 | 19.31% |

**Question 2: Probability Changes at Different APRs**

Comparing both customers, their conversion probabilities reduce with increasing rates albeit on different gradients. The conversion probability of the Tier 1 customer therefore reduces from 53.39% at 5.00% APR to 47.79% at 7.00% APR, hence the rate sensitivity is moderate. The Tier 2 customer follows the same trend although at lower probability rates: 21.12 % at 5.00% APR and 17.62% at 7.00% APR. This simply shows that both customers are sensitive to rate and the probability of acceptance from the Tier 2 customer is always lower than that of the Tier 1 customer across all the rate points.

|  |  |  |  |
| --- | --- | --- | --- |
| Customer | 5.00% APR | 6.00% APR | 7.00% APR |
| 1 | 53.39% | 50.59% | 47.79% |
| 2 | 21.12% | 19.31% | 17.62% |

A graph of a customer

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**Question 3: Optimal APR for Maximum Expected Profit**

In the optimization analysis it is ascertained that while the conversion probabilities are different, the customers both have the best APR of 8.00%. Specifically, the rate of $0.37 maximizes the expected profit at tier 1 of $1,308.02 for Customer 1, and the expected profit at tier 2 is $647.95, although not as high as tier 1. This interesting finding therefore indicates that even though the conversion probabilities differ by a wide margin, the rate point that optimises the likelihood of conversion while balancing the profit margins is the same.

|  |  |  |  |
| --- | --- | --- | --- |
| Customer | Optimal APR | Maximum Expected Profit | Market Rate |
| 1 | 8.00% | $1308.02 | 4.85% |
| 2 | 8.00% | $647.95 | 4.85% |

A graph with red and blue lines

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**Question 4: General APR Strategy for All Loan Applicants**

In order to optimize expected profit of e-Car with regards to all the loan applicants, e-Car should adopt a complex pricing model that would take into account numerous factors identified by the logistic regression analysis. Interest rates have a negative effect on conversion, and the result is -0.1123, while FICO scores have a negative though very small effect and the result is -0.007339. Loan amount has a negative impact on the conversion probability ( - 0.0001284) while term length has a positive impact (0.0392). Customer tier classification has a negative effect and this effect increases across higher tiers.

**Risk-Based Pricing:**

* Higher FICO scores warrant lower rates
* Consider risk-return trade-offs

**Amount-Based Pricing:**

* Largest coefficient impact (-157.78 z-value)
* Lower rates for larger loan amounts
* Volume-based pricing tiers

**Term Considerations:**

* Positive correlation with acceptance
* Adjust rates based on term length
* Balance term risk with conversion probability

**Tier-Based Strategy:**

* Different rate structures per tier
* Consider competitive positioning
* Risk-adjusted pricing by tier

**Task 2: APR Impact on Profit Analysis**

The evaluation of the APR influence on profit shows that pricing and profit are interconnected in a rather straight-forward manner. Higher rates of course reduce the likelihood of conversions, but this boosts the profit on each loan that goes through a successful conversion. The most efficient rate is therefore the one that best provides the right balance between these conflicting variables. The model concludes that the rate sensitivity of customers is not uniform and the optimal rate level is generally higher than expected because of the relative effects on margins rather than conversion rates.

**Conclusion**

This result will further show that the pricing of loans depends on a range of factors, meaning that there is an optimal loan price. From the graphs Conversion Probability vs Profit and No of Loans vs Profit it is evident that there is a trade-off between the two where the setting of a low rate increases the conversion rate but decreases the per loan profit and on the other extreme setting a high rate increases the potential profit but greatly reduces the conversion rate. However, the analysis goes further to indicate that the points of optimum are below market rate, thus disapproving our discovery of optimum rate of 8.00%.

Customer Segmentation appears as a significant factor, meaning that different customers require different optimal rates instead of a universal rate. This calls for suitable pricing policies that will address the issues of risk/return by segment. The competitive positioning is particularly critical and implies that e-Car should maintain rates close to the 4.85% industry rate for market advantage while doing so.

The findings for implementation strategy reinforce the need for complex data-based pricing tools with frequent review and revision opportunities. The constantly changing conditions of the market and diverse customer’s concerns call for a flexible pricing strategy.

**Recommendations:**

Based on these findings, e-Car should:

* Make use of price skimming according to the segments of customers
* Keep rates below the market competitive rate of 4.85%
* Adoption of data analytics in the enhancement of pricing techniques
* Discuss the idea of the real-time automatic dynamic pricing of products
* Set up standard check-ups for the rates of conversion and profitability