Case Study: VisaRuPay Credit Card Company

Due: Nov 7, 2019

VisaRuPay is a consumer credit card company that has a large number of customers (or accounts). These customers charge some of their purchases on their VisaRuPay cards. The charges made in one month are due by the end of the next month. If a customer fails to make the minimum payment in a given month, the company flags the account as delinquent. The company keeps track of the payment history of each customer so that it can identify customers who are likely to default on their obligations and not pay their debt to the company.

A customer is said to be in state (or delinquency stage) k if he or she has missed making the minimum payment for the last k consecutive months. A customer in state k has four possible futures: make a minimum payment (or more) and move to stage 0, make no payment (or less than the minimum payment) and move to stage $k+1$, default by declaring bankruptcy, thus moving to stage D, or the company can cancel the customer's card and terminate the account, in which case the customer moves to stage C. Currently the company has a simple policy: it terminates an account as soon as it misses seven minimum payments in a row and writes off the remaining outstanding balance on that account as a loss.

Let p_k be the probability that a customer in state k fails to make the minimum payment in the current period and thus moves to state $k+1$. Let q_k be the probability that a customer in state k declares bankruptcy in the current period and thus moves to state D. Also, let b_k be the average outstanding balance of a customer in state k.

From its experience with its customers over the years, the company has estimated the parameters above for $0 \leq k \leq 6$ as given in Table 1. Note that the company has no data for $k > 6$ since it terminates an account as soon as it misses the seventh payment in a row.

Table 1: Data for VisaRuPay account holders

k	0	1	2	3	4	5	6
p_k	.033	.048	.090	.165	.212	.287	.329
q_k	.030	.021	.037	.052	.075	.135	.182
b_k	1243.78	2090.33	2615.16	3073.13	3502.99	3905.77	4280.26

1. Build stochastic models using Discrete Time Markov Chains to help the management of VisaRuPay analyze the performance of this policy in a rational way. Assume that the state of an account changes in a Markov fashion and when a customer account is terminated or the customer declares bankruptcy, it simply replaces that account with an active one, so that the number of accounts does not change.

2. Analyze the current policy (P_c), which terminates an account as soon as it misses the seventh minimum payment in a row by assuming expected annual loss due to bankruptcies and account closures as performance measure.

3. Now VisaRuPay has been approached by a debt collection agency, SPI. If a customer declares bankruptcy, VisaRuPay loses the entire outstanding balance as before. However, if a customer does not declare bankruptcy, the company can decide to terminate the account and

turn it over to the SPI company. If VisaRuPay decides to do this, SPI pays VisaRuPay 75% of the current outstanding balance on that account. When an account is turned over to SPI, it collects the outstanding balance on the account from the account holder by (barely) legal means. VisaRuPay also has to pay SPI an annual retainer fee of $50,000 for this service. VisaRuPay management wants to decide if they should hire SPI and, if they do, when they should turn over an account to them. Suppose that VisaRuPay has 14 million accounts. (Hint: Think of six such policy options, denoted by P_m ($2 \leq m \leq 7$). Under Pm, VisaRuPay turns over an account to SPI as soon as it misses m minimum payments in a row.)

4. Suppose VisaRuPay has decided not to employ the services of SPI . However, this has generated discussion within the company about whether it should terminate accounts earlier. Let Tm ($1 \leq m \leq 7$) be the policy of terminating the account as soon as it misses m payments in a row. Which policy should VisaRuPay follow?

5. Consider the current policy Pc. One of the managers wants to see if it would help to alert the customers of their impending account termination in a more dire form by a phone call when the customer has missed six minimum payments in a row. This will cost a dollar per call. The manager estimates that this will decrease the missed payment probability from the current $Pc = 0.329$ to 0.250. Is this policy cost-effective?

6. The company has observed over the past year that the downturn in the economy has increased the bankruptcy rate by 50%. In this changed environment, should VisaRuPay engage the services of SPI? When should it turn over the accounts to SPI?

7. VisaRuPay has been approached by another collection agency, which is willing to work with no annual service contract fee. However, it pays only 60% of the outstanding balance of of any account turned over to them. Is this option better than hiring SPI?