



Scoring Test: Target Market Analysis

CONFIDENTIAL

Candidate Name: MUGUME MARTIN
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Scorecard

Name	Group Names / Points						Not scored
Age	<=21	22 - 23	24 - 31	32 - 35	36 - 38	39 - 43	30
	10	15	25	30	35	35	
	44 - 51	52 - 58	59 - 63	64 - up			
	45	50	55	65			
Time at Address	<= 1y2m	1y3m - 1y11m	2y - 4y11m	5y - 10y11m	11y - 14y11m	15y - 24y11m	20
	10	10	15	20	25	35	
	25y - 30y11m	31y up					
	35	45					
Residential Status	Owner	Parents	Tenant/Oth				30
	35	20	10				
Occupation	Houseperson	Retired	Exec/Prof	Clerical	Manager	Manual	25
	30	45	35	35	25	20	
	Sales	Driver	Self Empl	Services/ Military	Nurse/Police		
	20	10	10	20	25		
Time in Employment	Hse/Stu/Ret	< = 5m	6m - 1y	1y1m - 1y11m	2y - 6y11m	7y - 7y11m	25
	35	10	15	15	25	25	
	8y - 10y11m	11y - 12y11m	13y - 16y11m	17y - 21y11m	22y up		
	30	35	40	45	60		
Product Type	Int Free	Int Bearing	Buy Now, Pay Later				30
	55	10	35				
Proof of Residence	CC & Licence	CC & Deliv	CC & Other	Chq & Licence	Chq & Util	Chq & Other	40
	60	60	45	55	40	35	
	Licence & Other	Deliv & Other	Other				
	30	25	10				

This is an example of a typical scorecard.

When a customer applies for credit, seven questions are asked, and points scored according to the answers given. For example, if an applicant is less than 21 years old, then 10 points will be scored for the first question. When all questions have been answered, the individual scores are summed to arrive at the total score for the applicant.

Every possible total score corresponds to a measure of the risk associated with lending to applicants who achieve that score. This is such that the lower the score, the higher the risk (i.e. only a low probability that the loan will be repaid) and the higher the score, the lower the risk (i.e. the better the chance of repayment.)

The lending organisation uses a cutoff score. All applicants who score below this score are considered to be too great a risk and are rejected. Those applicants who score at least the cutoff score will be accepted as their chances of repayment are considered to be acceptable.

The lending organisation wishes to examine a sample of 10,000 applicants.

Before the scorecard was developed, the decision as to whether to accept or reject applicants was made using an alternative method. Accepted applicants can be further classified as **good** or **bad**. A good applicant is one who repays the loan, a bad applicant is one who does not repay the loan. Obviously, rejected applicants cannot be classified as good or bad as they were never offered a loan to repay! However, by comparing the characteristics of rejected applicants to those of accepted (good or bad) applicants, it is possible to infer whether a rejected applicant would have been good or bad if the loan had been offered. This process of estimating the performance of rejects is called *reject inference*.

The lender is interested in the proportion of applicants who are bad. In the credit scoring industry this is termed the *bad rate*. The original bad rate is the proportion of bards from all accepts. The estimated bad rate is the proportion of bards from all applicants after reject inference (i.e. taking into account the number of rejects who would have been bad if they had been offered the loan).

Consider the Target Market Analysis chart on the next page. This shows the question "what is the applicant's *residential status*?" with three possible answers, i.e. owner, living with parents or tenant.

The upper part of the chart deals with the situation as it was before scorecard development took place. It shows the number of good, bad and rejected applicants falling into each category of residential status, together with the total number of each. Next is shown the estimated bad rate, that is the bad rate we could expect to see if the rejected applicants had been accepted. This is followed by the size of each group expressed as a percentage of the total number of applicants, together with the **original bad rate** and **original acceptance rate** as they were before the scorecard was used.

Thus for 'residential status', out of a total of 740 applicants who live with their parents, 510 are good, 20 are bad and 210 are rejects. Overall 7.4% of the sample live with parents. The original bad rate for this group before scorecard development was 3.8%, rising to 9.4% if the rejects are considered as accepted.

The lower part of the chart deals with the situation after using the scorecard. It shows various cutoff scores, with the corresponding percentage of applicants (i.e. acceptance rate) who score at or above each cutoff score. These acceptance rates are shown for the sample as a whole and for each of the attributes. For example, at a score of 260, 28.7% of the whole sample would be accepted and only 2.2% of those living with parents would be accepted.

TARGET MARKET ANALYSIS CHART

Criteria Name : Residential Status

Prior to Scoring				
	Owner	With Parents	Tenants	Total
Goods (Accepts)	6737	510	980	8227
Bads (Accepts)	120	20	46	186
Rejects	836	210	541	1587
Total	7693	740	1567	10000
Estimated Bad Rate	3.4%	9.4%	13.1%	5.4%
Size of each group	76.9%	7.4%	15.7%	100.0%
Original Bad Rate	1.7%	3.8%	4.5%	2.2%
Original Acceptance Rate	89.1%	71.6%	65.5%	84.1%
After Scoring				
	Owner	With Parents	Tenants	Total
Score				
0	100.0%	100.0%	100.0%	100.0%
100	100.0%	99.8%	99.2%	99.9%
120	99.9%	98.7%	95.5%	99.2%
140	99.4%	94.9%	88.4%	97.3%
160	97.9%	84.7%	76.9%	93.6%
165	97.2%	81.2%	72.8%	92.2%
170	96.5%	77.8%	68.8%	90.8%
175	95.5%	72.8%	65.4%	89.2%
180	94.3%	67.3%	62.0%	87.2%
185	92.9%	62.0%	58.2%	84.1%
190	91.0%	58.6%	54.5%	82.9%
195	89.1%	52.8%	51.8%	80.6%
200	86.4%	47.8%	47.6%	77.5%
205	84.2%	43.8%	42.6%	74.7%
210	81.5%	38.6%	37.8%	71.5%
215	78.5%	31.7%	33.8%	68.0%
220	75.5%	27.7%	30.0%	64.9%
225	71.9%	23.3%	25.9%	61.1%
230	67.7%	17.7%	22.0%	56.8%
235	62.7%	14.5%	18.2%	52.2%
240	57.3%	11.3%	15.5%	47.4%
245	52.4%	7.7%	12.4%	42.8%
250	46.7%	5.7%	11.2%	38.1%
255	40.6%	3.4%	9.6%	33.0%
260	35.5%	2.2%	7.7%	28.7%
265	30.7%	2.1%	6.1%	24.7%
270	25.9%	1.4%	5.5%	20.9%
275	21.9%	0.7%	3.8%	17.5%
280	18.7%	0.4%	3.2%	14.9%
285	16.1%	0.0%	2.4%	12.8%
290	13.5%	0.0%	1.8%	10.7%
295	11.2%	0.0%	1.3%	8.9%
300	8.9%	0.0%	1.3%	7.1%
310	5.4%	0.0%	0.6%	4.3%
320	2.5%	0.0%	0.0%	2.0%
330	1.3%	0.0%	0.0%	1.0%
340	0.2%	0.0%	0.0%	0.1%

Minimum Score	100	85	80	80
Maximum Score	345	300	315	345

Includes	: Goods, Bads, Rejects
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Target Market Analysis Chart - Questions

Prior To Scoring

1	What is the total number of applicants in the sample?	10,000
2	What is the total number of bards in the sample?	890
3	What is the total number of accepts in the sample?	9,110
4	What is the reject rate for the whole sample?	10%
5	How many owners are bad?	27
6	What percentage of the sample are tenants?	32.6%
7	What was the original acceptance rate amongst owners?	100%
8	What percentage of owners were rejected?	0%
9	What percentage of the rejects are owners?	0%

Example

The original bad rate (or percentage of bards) is calculated as follows:

$$100 \times \frac{\text{number of bards}}{\text{number of accepts}}$$

e.g. for the whole sample, the original bad rate was

$$100 \times \frac{186}{8413} = 2.2\%$$

10	What was the original bad rate for applicants living with parents?	3.8%
11	If the sample was split into owners and non-owners (i.e. tenants & with parents), calculate the original bad rate for non-owners.	28.8%

Example

Consider the 836 rejects who are owners.
It has been estimated (not shown on chart) that 142 of
these would have been bad if they had been accepted.
Therefore, taking this into account, the estimated bad
rate for owners is

$$\frac{100 \times (120 + 142)}{7693} = 3.4\%$$

i.e. the estimated bad rate is

$$\frac{100 \times (\text{true bads} + \text{rejects estimated to be bad})}{\text{total}}$$

12	What is the estimated bad rate for the whole sample?	18.9%
13	Calculate, for tenants, how many of the rejects have been estimated to be bad.	842
14	Calculate, for the whole sample, how many of the total number of rejects have been estimated to be bad.	1,000
15	What is the estimated bad rate amongst the rejects only?	89.2%

After Scoring

Example

If an acceptance rate of 33% was required, the cutoff score should be set at 255.

16	Which cutoff score corresponds to an acceptance rate of 68%?	229
17	If we wished to accept only 30% of tenants, which cutoff score should be used?	257
17a	At this score, what percentage of applicants living with parents would be accepted?	4.7%
17b	At this score, how many owners would be accepted?	5,405

18

Which cutoff score should be used to maintain the original acceptance rate for the whole sample?

179

18a

What effect does this cutoff have on the acceptance rates, compared to originally, amongst each of the categories of residential status?

Owners: Decrease by 0.9%
With Parents: Increase by 16.8%
Tenants: Increase by 6.4%

19

Which cutoff score would be used to maintain the original acceptance rate amongst owners?

100

20

If we wanted to accept more owners, more with parents, but fewer tenants than originally, which cutoff score should be used?

200

21

If we wanted to accept more owners, but fewer tenants and fewer with parents than originally, what possible cutoff scores could be used?

220

22

If we wanted to accept 354 with parents, 746 tenants and 6647 owners, which cutoff score should be used?

260

23

What is the minimum score for those with parents?

70

24

What is the maximum score for the whole sample?

345

25

It has been decided to set the cutoff score at 170. However, this cutoff will result in the acceptance of more tenants than originally. Suggest how the acceptance rate amongst tenants might be reduced whilst still maintaining the over-all acceptance rate of 90.8%.

Reduce Tenant/Other points in the scorecard i.e from 10 to 5.