Statistics

Memo Survey of cardholders for estimating mean value of credit card expenditure The achieve the targeted results of the survey with an estimate that would be between $10 lower or higher to the true mean, with a confidence level of 98%, at least 13, 530 (approximated to 13, 500) cardholders would have to be sampled. As indicated the survey would cost $5 per sample, therefore the total cost of the survey to this standard of accuracy would amount to $67, 500. With the planned budget of $10, 000, only 2, 000 cardholders out of the total number of cardholders can be sampled. If the confidence level is to remain 98%, the estimate given could have an error of (+ or -) $26.

Else, it will have to have an error of (+ or -) $10 with a reduced confidence level of only 67%. This shows that the estimate that could be obtained within the existing budget is not be sufficient to prepare accurate revenue forecasts. For fairly accurate revenue forecasts, accuracy in the survey of $10 error and a confidence level of 95% can be considered as adequate. For this, a minimum of 9, 600 cardholders would have to be sampled. Therefore it is recommended to increase the budget to $48, 000 that would give the above confidence level and error. If this is not feasible, refer to the below table which lists all other possible ways forward. The next best alternative would be to upgrade the budget by $5, 000 and gain a survey result with an error of (+ or -) $15 and a confidence level of 90%.

Error (+ or -)

Confidence level

No. Sampled

Total cost

$10

98%

13, 500

$67, 500

$10

98%

2, 000

$10, 000

$26

67%

2, 000

$10, 000

$10

95%

9, 600

$48, 000

$10

90%

6, 800

$34, 000

$15

90%

3, 000

$15, 000

Calculations

Assuming that the true mean value of the total number of the card holders of Piggy bank is 🕴 and the standard deviation is given as $ 500.

Sample should contain n card holders to give an estimated mean value that would lie between (μ – 10) and (μ+10) with a confidence level of 98%.

The amount each cardholder spends in a month can be considered as a normal distribution.

X ~ N(μ , σ2)

Mean of the sample also is a normal distribution

X ~ N(μ , σ2 /n)

It is given that the standard deviation is $ 500. Therefore σ = 500

By transforming this to standard normal distribution

X ~ N(μ , 5002 /n)

Z = (X-μ) / (σ/√n) ~ N(0, 12)

If the confidence level expected is 98%, 98% of the distribution must lie between Z=–2. 3263 and Z=+ 2. 3263 of the standard normal curve. (From the table Percentage points of the normal distribution. for p = 0. 01, z= 2. 3263) p= (100-98/100)/2

In other words for a confidence level of 98% (for the sample mean lying within a limit of (+ or-) $10 with a probability of 0. 98)

(–2. 3263) < Z