Logistic Regression

Example- Bank dataset

Target Variable "y" is in categorical format.

Summary ➔

age	balance	day	duration	campaign	pdays	previous
Min. :18.00	Min. : -8019	Min. : 1.00	Min. : 0.0	Min. : 1.000	Min. : -1.0	Min. : 0.0000
1st Qu.:33.00	1st Qu.: 72	1st Qu.: 8.00	1st Qu.: 103.0	1st Qu.: 1.000	1st Qu.: -1.0	1st Qu.: 0.0000
Median :39.00	Median : 448	Median :16.00	Median : 180.0	Median : 2.000	Median : -1.0	Median : 0.0000
Mean :40.94	Mean : 1362	Mean :15.81	Mean : 258.2	Mean : 2.764	Mean : 40.2	Mean : 0.5803
3rd Qu.:48.00	3rd Qu.: 1428	3rd Qu.:21.00	3rd Qu.: 319.0	3rd Qu.: 3.000	3rd Qu.: -1.0	3rd Qu.: 0.0000
Max. :95.00	Max. :102127	Max. :31.00	Max. :4918.0	Max. :63.000	Max. :871.0	Max. :275.0000

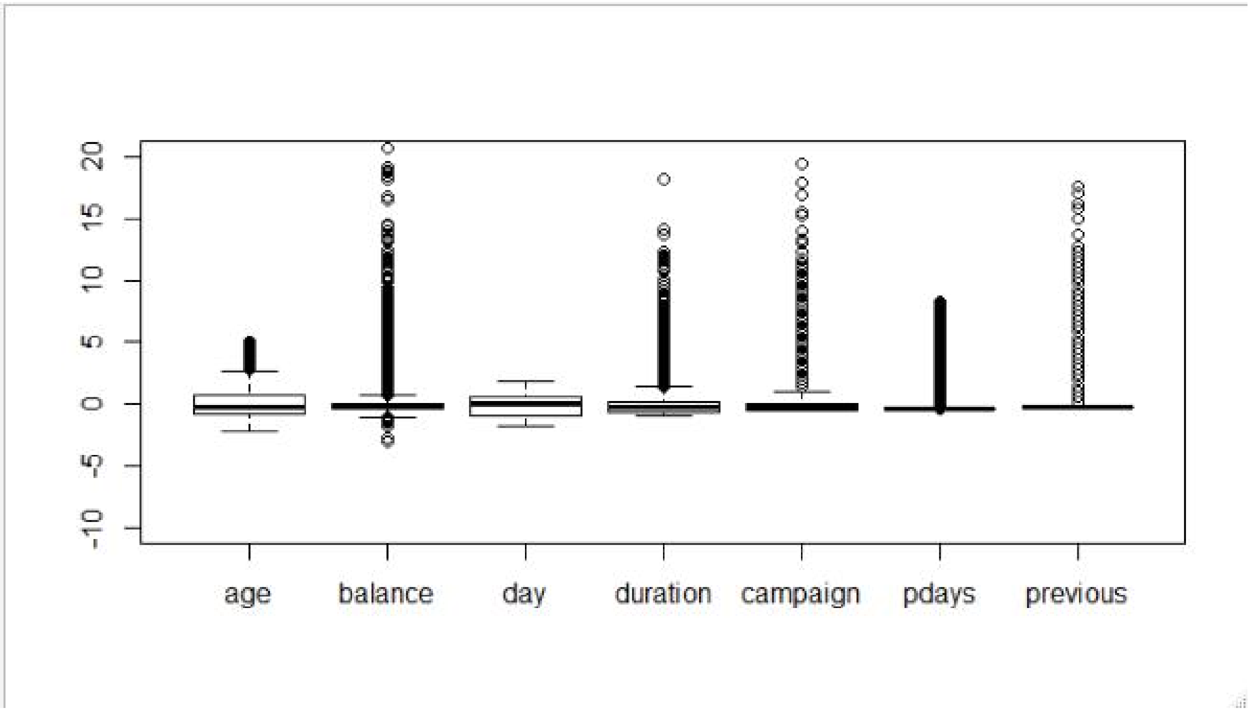
There is significant difference between mean and median of some variables in the dataset.

marital	education	default	housing	loan	contact	poutcome	y
divorced: 5207	primary : 6851	no :44396	no :20081	no :37967	cellular :29285	failure: 4901	no :39922
married :27214	secondary:23202	yes: 815	yes:25130	yes: 7244	telephone: 2906	other : 1840	yes: 5289
single :12790	tertiary :13301				unknown :13020	success: 1511	
	unknown : 1857					unknown:36959	

From the above information default and y categories are not balanced.

job	month
blue-collar:9732	may :13766
management :9458	jul : 6895
technician :7597	aug : 6247
admin. :5171	jun : 5341
services :4154	nov : 3970
retired :2264	apr : 2932
(Other) :6835	(Other): 6060

Box Plot ➔



Splitting of data into train and test

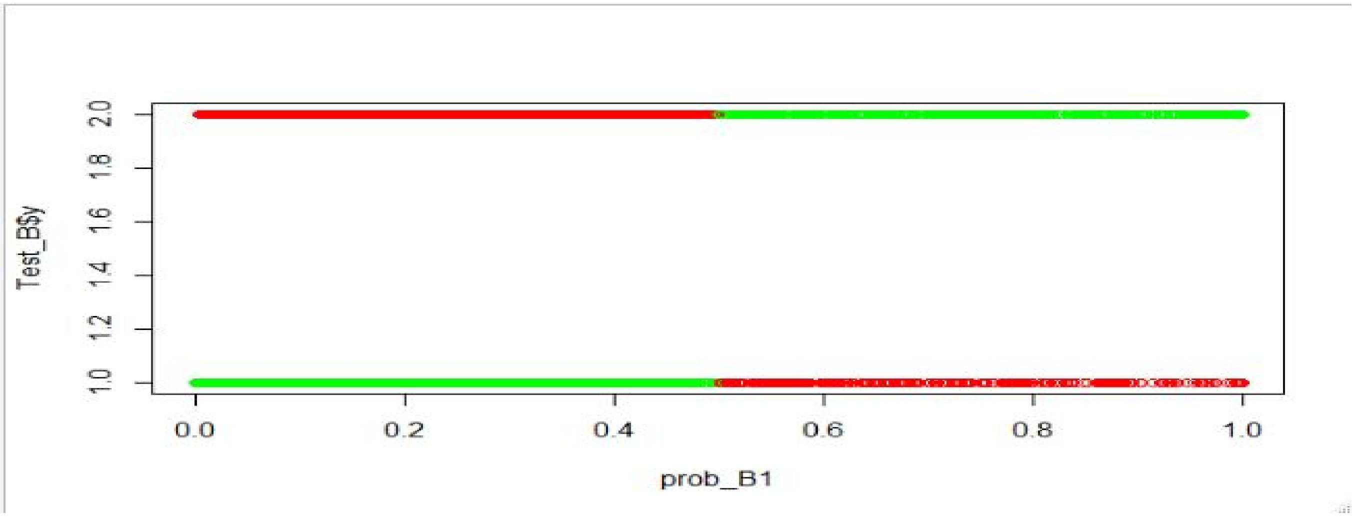
Train = 31648 & Test = 13563

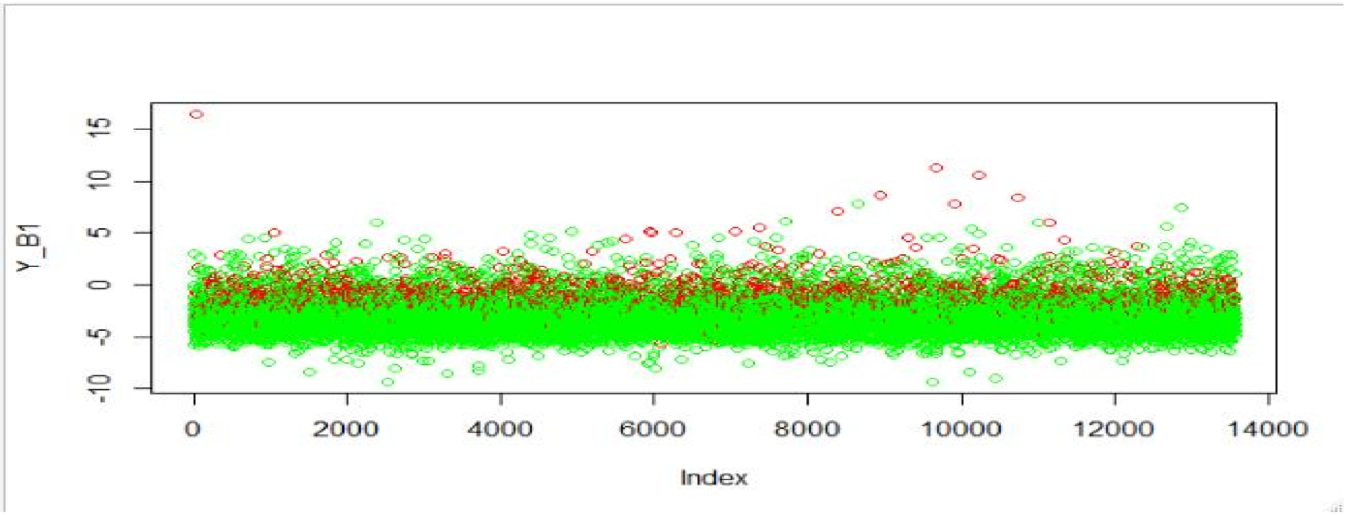
Model-1 Building ➔

```
glm(formula = y ~ ., family = binomial(link = "logit"), data = Train_B)
```

AIC: 15017

Plot of wrong prediction(Red) v/s actual prediction (Green)

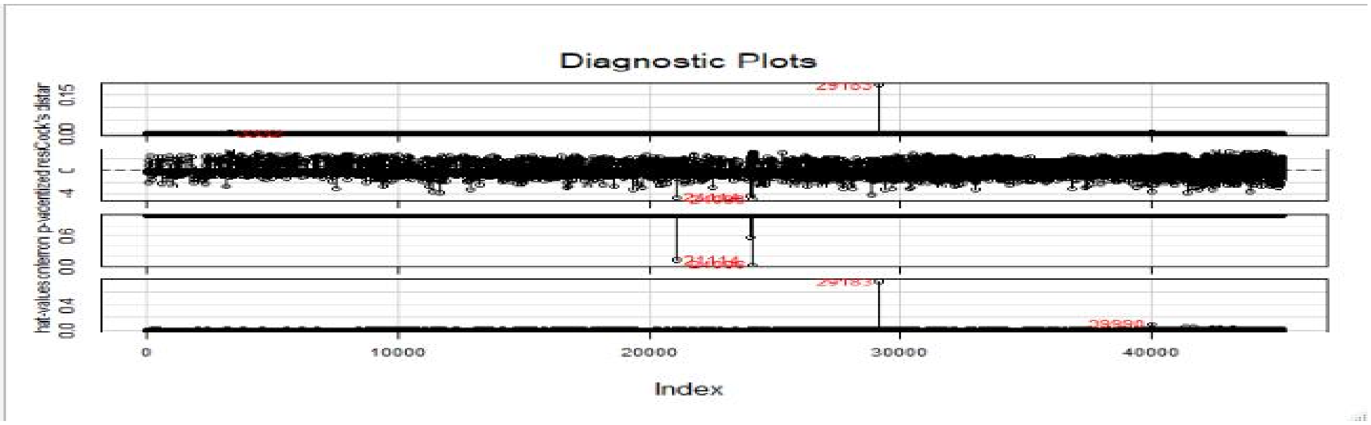




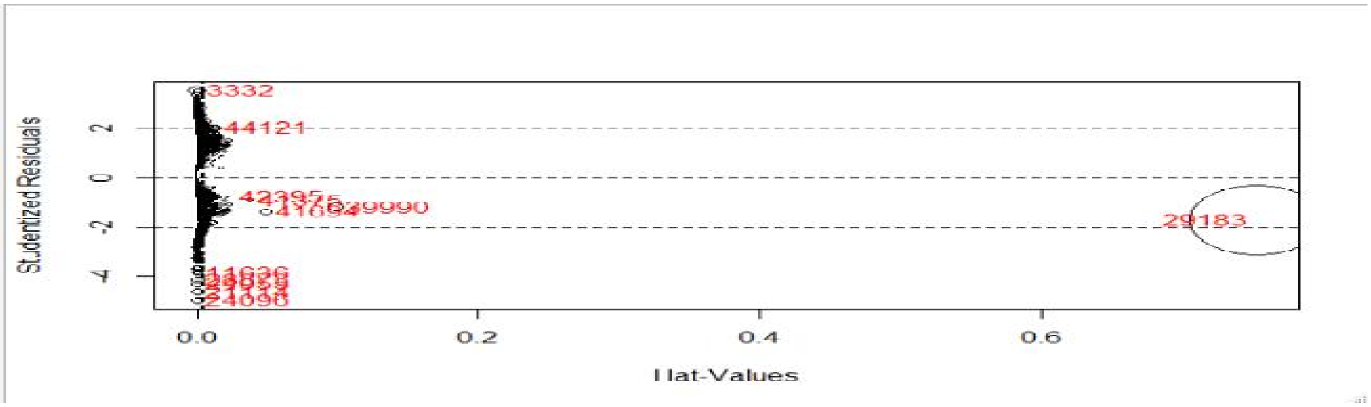
Confusion Matrix →

```
          no    yes
FALSE 11660   1065
TRUE    287    551
```

Efficiency → 0.900317

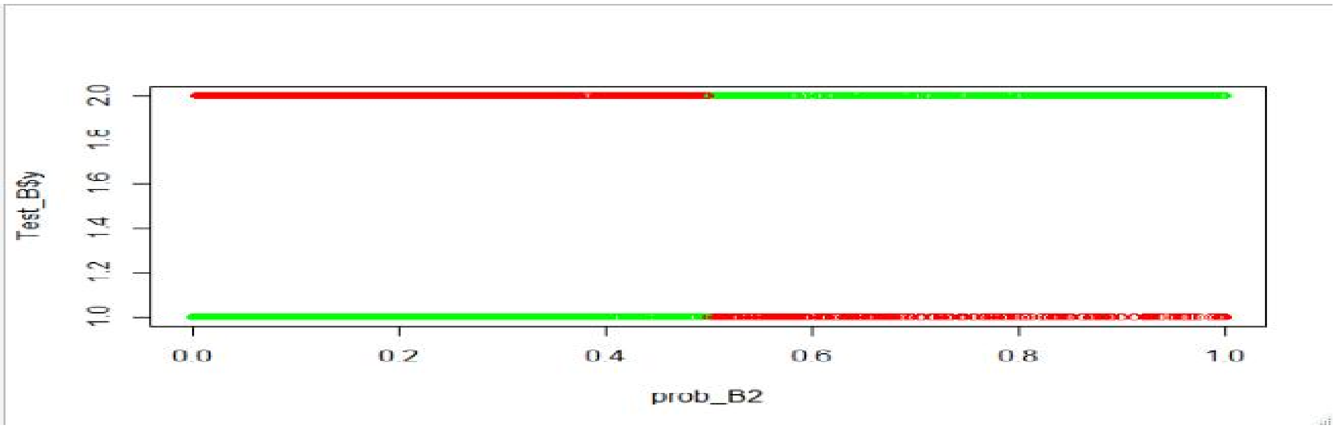


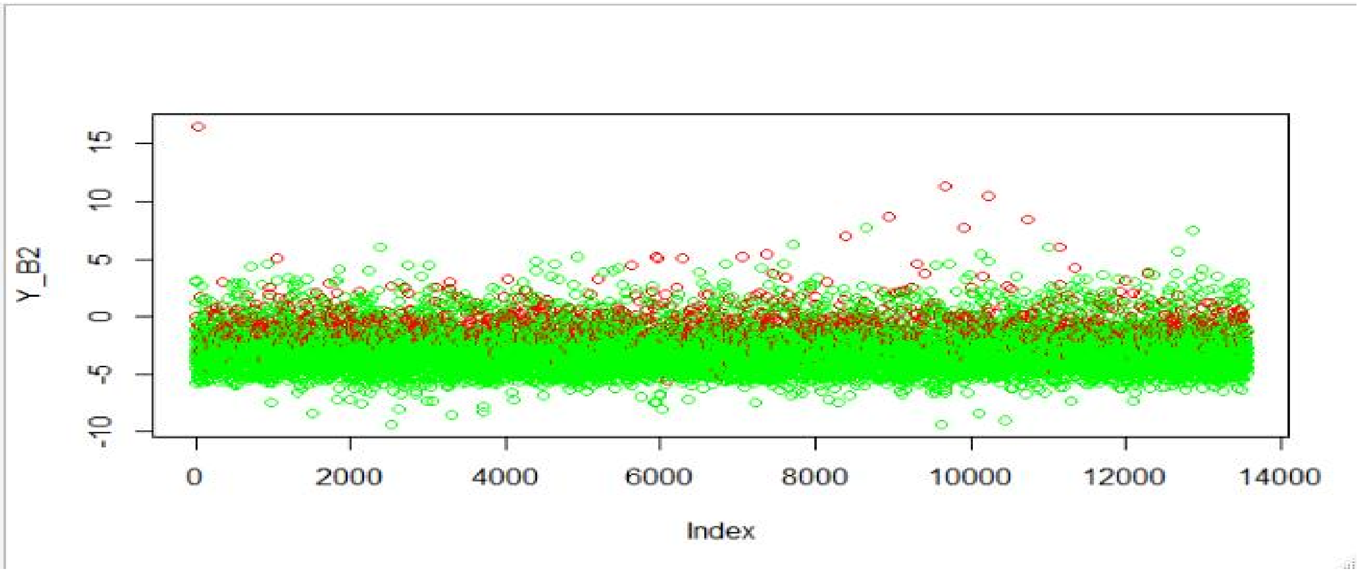
Influence Plot



Model-2 Building ➔

```
model_B2 <- glm(y~.,data = Train_B[-influence_B1,-c(1,14,5)],family = "binomi
al")
AIC: 15010
```



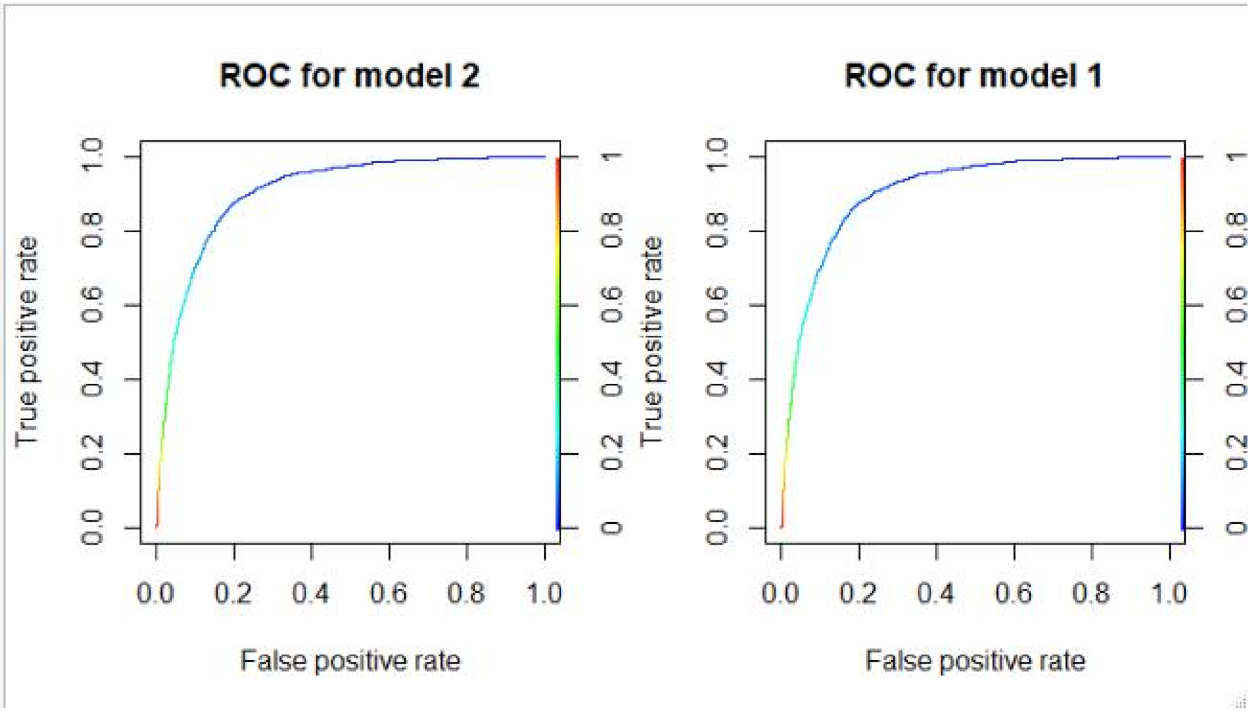


Confusion Matrix ➔

```
         no    yes
  FALSE 11659  1067
  TRUE    288   549
```

Efficiency ➔ 0.9000958

Comparison between Model-1 and Model-2 ➔



Model No	AIC	Efficiency	F1 Scores
Model-1	15017	0.900317	0.945201
Model-2	15010	0.9000958	0.9452817

From the above information we can infer that there is no significant difference between Model-1 and Model-2. But we have considered many insignificant variables in Model-1 and only significant variables in Model-2.

So our Model-2 is final model as best model.