Appendix

Figure 1: Multiple Linear Regression of Sat_Program against Sat_Petrol, Sat_Grocery and Sat_FastFood

lm(formula = Sat_Program ~ Sat_Petrol + Sat_Grocery + Sat_FastFood, data = customer)
Residuals:

Min	1Q	Median	3Q	Max
-6.22	-0.74	0.05	0.81	4.73

Coefficients:

	Estimate	Std. Error	t-value	p-value	significance
(Intercept)	**-2.07**	**0.26**	**-8.05**	**1.37e-15**	***
Sat_Petrol	**0.73**	**0.03**	**27.89**	**< 2e-16**	***
Sat_Grocery	**0.25**	**0.02**	**12.84**	**< 2e-16**	***
Sat_FastFood	**0.25**	**0.02**	**13.98**	**< 2e-16**	***

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Goodness of fit:

Multiple R^2	Adjusted R^2	F-statistic	DF	p-value
0.43	0.43	502.8	1991	< 2.2e-16

Figure 2: ANOVA test results of Sat_Program vs 3 merchants

Analysis of Variance Table
Response: Sat_Program

	Df	Sum Sq	Mean Sq	F-value	p-value	Significance
Sat_Petrol	1	1806.06	1806.06	1193.70	< 2.2e-16	***
Sat_Grocery	1	180.08	180.08	119.02	< 2.2e-16	***
Sat_FastFood	1	295.86	295.86	195.55	< 2.2e-16	***
Residuals	1991	3012.37	1.51			

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 3: Multiple Linear Regression of Sat_Program against Race and Gender

lm(formula = Sat_Program ~ factor(Gender) + factor(Race), data = customer)
Residuals:

Min	1Q	Median	3Q	Max
-6.37	-1.20	-0.12	0.88	2.89

Coefficients:

	Estimate	Std. Error	t-value	p-value	significance
(Intercept)	**7.20**	**0.12**	**59.24**	**< 2e-16**	***
Gender	**0.01**	**0.07**	**0.20**	**0.85**	
Race1	**0.16**	**0.13**	**1.25**	**0.21**	
Race2	**-0.09**	**0.13**	**-0.66**	**0.51**	

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Goodness of fit:

Multiple R^2	Adjusted R^2	F-statistic	DF	p-value
0.00496	0.00346	3.30	1991	0.01941

Figure 4: Multiple Linear Regression of Sat_Petrol against Sat_Grocery and Sat_FastFood

lm(formula = Sat_Petrol ~ Sat_Grocery + Sat_FastFood, data = customer)
Residuals:

Min	1Q	Median	3Q	Max
-5.46	-0.74	0.01	0.82	3.82

Coefficients:

	Estimate	Std. Error	t-value	p-value	significance
(Intercept)	**6.51**	**0.17**	**39.20**	**< 2e-16**	***
Sat_Grocery	**0.30**	**0.02**	**19.62**	**< 2e-16**	***
Sast_FastFood	**-0.06**	**0.02**	**-4.13**	**3.87e-05**	***

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Goodness of fit:

Multiple R^2	Adjusted R^2	F-statistic	DF	p-value
0.19	0.18	226.4	1992	< 2.2e-16

Figure 5: ANOVA results for Sat_Petrol against city variables

Analysis of Variance Table
Response: Sat_Petrol

	Df	Sum Sq	Mean Sq	F-value	p-value	Significance
CityA	1	50.78	50.78	38.35	7.16e-10	***
CityB	1	14.14	14.14	10.68	0.001101	**
CityC	1	20.90	20.90	15.79	7.34e-05	***
CityD	1	1.89	1.89	1.43	0.23	
CityE	1	13.13	13.13	9.92	0.001662	**
CityF	1	0.94	0.94	0.71	0.40	

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 6: Binary Logistic Regression for customers active in 2016

lm(formula = Act_16 ~ Sat_Program + Sat_FastFood + Sat_Petrol + Sat_Grocery + NetPromoter + Gender_F + Race1 + Race2 + Car + CCard + CityA + CityB + CityC + CityD + CityE + CityF, family = "binomial", data = customer)
Deviance Residuals:

Min	1Q	Median	3Q	Max
-3.01	0.00015	0.37	0.70	2.16

Coefficients:

	Estimate	Std. Error	z-value	p-value	significance
(Intercept)	**6.12**	**1694.55**	**0.004**	**0.9971**	
BirthYear	**0.0028**	**0.0084**	**0.33**	**0.74**	
Sat_Program	**-0.06**	**0.05**	**-1.13**	**0.26**	
Sast_FastFood	**0.38**	**0.05**	**7.20**	**6.18e-13**	***
Sat_Petrol	**0.71**	**0.08**	**9.30**	**< 2e-16**	***
Sat_Grocery	**-0.02**	**0.05**	**-0.34**	**0.73**	
NetPromoter	**0.27**	**0.04**	**7.44**	**9.96e-14**	***
Gender_F	**-0.63**	**0.16**	**-4.00**	**6.22e-05**	***
Race1	**0.46**	**0.20**	**2.29**	**0.02**	*
Race2	**0.25**	**0.21**	**1.23**	**0.22**	
Car	**0.33**	**0.13**	**2.48**	**0.01**	*
CCard	**0.32**	**0.13**	**2.41**	**0.02**	*

CityA	**-0.10**	**0.16**	**-0.61**	**0.54**	
CityB	**-0.06**	**0.23**	**-0.27**	**0.78**	
CityC	**-0.36**	**0.22**	**-1.66**	**0.10**	
CityD	**0.53**	**0.24**	**2.20**	**0.03**	*
CityE	**-0.06**	**0.26**	**-0.25**	**0.80**	
CityF	**0.18**	**0.27**	**0.69**	**0.49**	

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Goodness of fit:

llh	llhNull	G2	McFadden	r2ML	r2CU
-857.72	-1118.83	522.22	0.23	0.23	0.34

Figure 7: Correlation of Sat_Program against 3 merchants

Independent Variables	Sat_Program
Sat_Petrol	0.5840614
Sat_FastFood	0.1065004
Sat_Grocery	0.4137724

Figure 8: Multiple Linear Regression of Sat_Petrol against city variables

lm(formula = Sat_Petrol ~ CityA + CityB + CityC + CityD + CityE + CityF, data = customer)

Residuals:

Min	1Q	Median	3Q	Max
-5.19	-0.81	-0.10	0.90	2.19

Coefficients:

	Estimate	Std. Error	z-value	p-value	significance
(Intercept)	**8.10**	**0.05**	**172.92**	**< 2e-16**	***
CityA	**-0.29**	**0.07**	**-4.18**	**3.04e-05**	***
CityB	**0.31**	**0.09**	**3.43**	**0.00062**	***
CityC	**-0.27**	**0.09**	**-2.80**	**0.00518**	**
CityD	**0.18**	**0.10**	**1.89**	**0.05882**	
CityE	**0.34**	**0.11**	**3.25**	**0.00117**	**
CityF	**0.09**	**0.11**	**0.85**	**0.39846**	

Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Goodness of fit:

Multiple R^2	Adjusted R^2	F-statistic	DF	p-value
0.037	0.034	12.81	1988	3.02e-14

Figure 9: Recency, Frequency, Monetary (RFM) Scores of Customers

R(Recency)	R-Score
January-March, 2015(1-3)	1
April-June, 2015(4-6)	2
July-September, 2015(7-9)	3
October-November, 2015(10-11)	4
December, 2015(12)	5

F (Frequency)	F-Score
0-25	1
26-50	2
51-75	3
76-100	4
>100	5

M (Money)	M-Score
0-100	1
101-200	2
200-1000	3
1000-2000	4
>2000	5

Figure 10: Descriptive Statistics of RFM scores

	R-Score	F-Score	M-Score	FRM-Score
MIN	1	1	1	3
1st Qu.	3	1	1	6
MEAN	3.939348371	1.463157895	2.362406015	7.764912281
MEDIAN	4	1	3	8
3rd Qu.	5	2	3	10
MAX	5	5	5	15

Figure 11: Customers with the highest RFM scores (15 points)

	A	B	C	D	E	F	G	H	I	
1	MemberID	Total SalesAmt	Last day	Purchase Times	Last Purchase MONTH	R(Recency)	F (Frequency)	M (Money)	Total RFMScore	R
2	10172519455	28243.06	2015/12/30	243	12	5	5	5	15	
3	10173159205	10808.55	2015/12/28	139	12	5	5	5	15	
4	10173322855	10705.75	2015/12/23	139	12	5	5	5	15	
5	10173998455	23642.95	2015/12/28	378	12	5	5	5	15	
6	10176477805	3975.32	2015/12/31	107	12	5	5	5	15	
7	11249539555	2350.16	2015/12/24	108	12	5	5	5	15	
8	11250732655	2041.87	2015/12/31	117	12	5	5	5	15	
9	11250866155	7394.81	2015/12/31	220	12	5	5	5	15	
10	11253707905	5130.53	2015/12/29	149	12	5	5	5	15	
11	11254145605	3188.02	2015/12/30	142	12	5	5	5	15	
12	11263879405	4397.96	2015/12/28	114	12	5	5	5	15	
13	11267456755	2658.84	2015/12/31	230	12	5	5	5	15	
14	11277927355	2546.66	2015/12/31	216	12	5	5	5	15	
15	11278394155	28300	2015/12/31	283	12	5	5	5	15	
16	11282767105	3778.15	2015/12/31	275	12	5	5	5	15	
17	11286420355	4402.7	2015/12/31	193	12	5	5	5	15	
18	11299664605	3219.52	2015/12/25	132	12	5	5	5	15	
19	11313296605	20874.18	2015/12/30	506	12	5	5	5	15	
20	11752046455	2376.62	2015/12/31	224	12	5	5	5	15	
21	11752369255	12663.93	2015/12/30	136	12	5	5	5	15	
22	11755510705	3766.28	2015/12/26	134	12	5	5	5	15	
23	11761623205	3897.31	2015/12/29	144	12	5	5	5	15	
24	10008415255	2370.04	2015/11/12	113	11	4	5	5	14	

Figure 12:Descriptive Statistics of Customer Lifetime Value (CLV)

	MIN	1st Qu.	MEAN	MEDIAN	3rd Qu.	MAX
CLV	3.54	175.66	1650.01	589.23	1856.62	81362.5

Figure 13:CLV customer score histogram

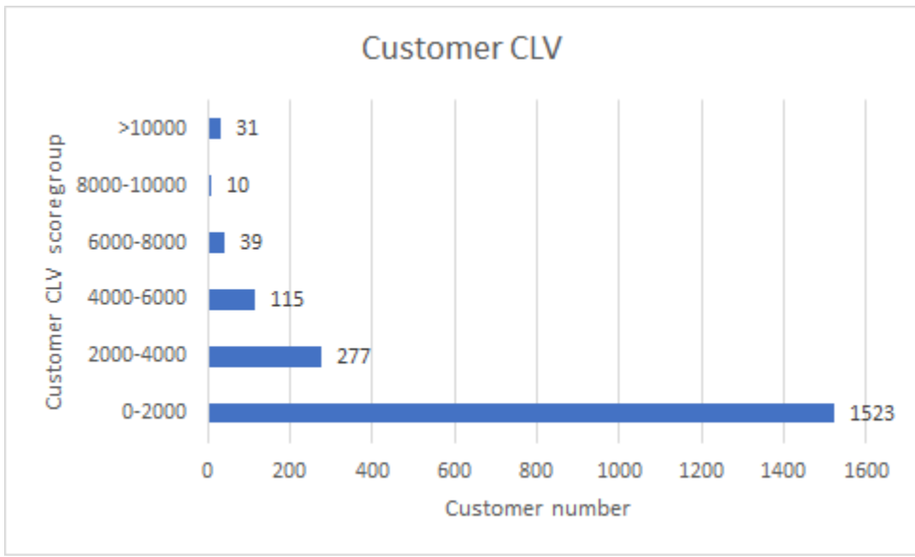

Figure 14 :The list of 31 customer with score more than 10000

	A	B	C	D	E	F	G
1	Curtomer ID	Revenue	Cost	Acquisition Co	Discount rate	Retention rate	CLV
2	11278394155	28300	0	0	0.15	0.75	81362.5
3	10172519455	28243.06	0	0	0.15	0.75	81198.7975
4	10173998455	23642.95	0	0	0.15	0.75	67973.48125
5	11313296605	20874.18	0	0	0.15	0.75	60013.2675
6	11311168555	15509.9	0	0	0.15	0.75	44590.9625
7	11752369255	12663.93	0	0	0.15	0.75	36408.79875
8	11805149155	11486.32	0	0	0.15	0.75	33023.17
9	10173159205	10808.55	0	0	0.15	0.75	31074.58125
10	10173322855	10705.75	0	0	0.15	0.75	30779.03125
11	10117037005	9727.12	0	0	0.15	0.75	27965.47
12	11732353405	9125	0	0	0.15	0.75	26234.375
13	10172617555	8828.21	0	0	0.15	0.75	25381.10375
14	10172621005	7873.14	0	0	0.15	0.75	22635.2775
15	11250866155	7394.81	0	0	0.15	0.75	21260.07875
16	11264032855	6600.48	0	0	0.15	0.75	18976.38
17	11253707905	5130.53	0	0	0.15	0.75	14750.27375
18	11754332005	4673.99	0	0	0.15	0.75	13437.72125
19	10054307455	4548.11	0	0	0.15	0.75	13075.81625
20	11286420355	4402.7	0	0	0.15	0.75	12657.7625
21	11263879405	4397.96	0	0	0.15	0.75	12644.135
22	10153390405	4138.2	0	0	0.15	0.75	11897.325
23	10173325555	3977.03	0	0	0.15	0.75	11433.96125
24	10176477805	3975.32	0	0	0.15	0.75	11429.045
25	11761623205	3897.31	0	0	0.15	0.75	11204.76625
26	11250036355	3871.71	0	0	0.15	0.75	11131.16625
27	11282767105	3778.15	0	0	0.15	0.75	10862.18125
28	11755510705	3766.28	0	0	0.15	0.75	10828.055
29	11311486105	3732.45	0	0	0.15	0.75	10730.79375
30	11755996855	3732.19	0	0	0.15	0.75	10730.04625
31	10141493455	3713.75	0	0	0.15	0.75	10677.03125
32	11263394455	3497.17	0	0	0.15	0.75	10054.36375

Figure 15: Cluster Dendrogram of FGP Program customer data

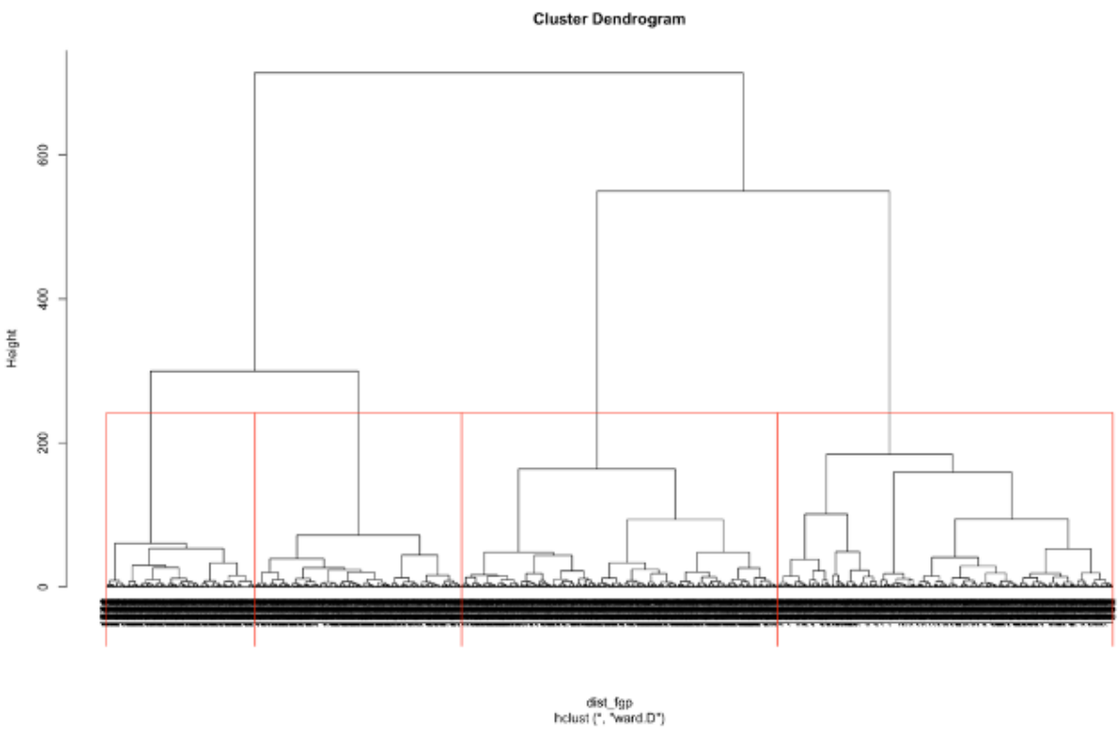

Figure 16: Cluster Analysis of 4 segments containing member ID and average birth year

Row Labels	Count of MemberID	Average of BirthYear
Segment 1	665	1983.892802
Segment 2	626	1976.42404
Segment 3	410	1978.345588
Segment 4	294	1973.453608
Grand Total	**1995**	**1978.882624**

Figure 17: Cluster Analysis of 4 segments containing sum of city variables

Row Labels	Sum of CityA	Sum of CityB	Sum of CityC	Sum of CityD	Sum of CityE	Sum of CityF
Segment 1	236	55	84	47	28	29
Segment 2	138	60	58	57	51	46
Segment 3	104	60	37	50	31	26
Segment 4	36	40	16	33	38	31
Grand Total	**514**	**215**	**195**	**187**	**148**	**132**

Figure 18: Cluster Analysis of 4 segments containing average of satisfaction programs, the 3 merchant chains and net promoter

Row Labels	Average of Sat_Program	Average of Sat_FastFood	Average of Sat_Petrol	Average of Sat_Grocery	Average of NetPromoter
Segment 1	7.257142857	8.70075188	7.479699248	6.102255639	7.142857143
Segment 2	5.924920128	6.07028754	7.53514377	6.276357827	3.591054313
Segment 3	7.843902439	6.987804878	8.631707317	7.317073171	5.648780488
Segment 4	9.31292517	6.476190476	9.816326531	8.5	8.629251701
Grand Total	**7.262656642**	**7.195488722**	**8.078195489**	**6.759899749**	**5.940350877**

Figure 19: Correlation test between NetPromoter and Sat_Program, Sat_FastFood, Sat_Petrol and Sat_Grocery

	NetPromoter	*Sat_Program*	*Sat_FastFood*	*Sat_Petrol*	*Sat_Grocery*
NetPromoter	1				
Sat_Program	0.5027966	1			
Sat_FastFood	0.40110266	0.10650043	1		
Sat_Petrol	0.38601585	0.5840614	-0.1667654	1	
Sat_Grocery	0.20473074	0.41377237	-0.201464	0.42219268	1

Figure 20: Regression: the most important independent variable affecting Net Promotion

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-9.101739	0.43657124	-20.848233	1.7945E-87	-9.9579233	-8.2455546	-9.9579233	-8.2455546
Sat_FastFood	0.83008416	0.03012665	27.5531508	7.47E-142	0.77100109	0.88916723	0.77100109	0.88916723
Sat_Petrol	0.94067542	0.04423322	21.2662649	1.3194E-90	0.85392716	1.02742368	0.85392716	1.02742368
Sat_Grocery	0.21749859	0.03278716	6.63365171	4.2069E-11	0.15319785	0.28179933	0.15319785	0.28179933