BUAN 6337 - MARKETING PREDICTIVE ANALYTICS

PROJECT REPORT

MARKETING STRATEGY FOR

(Category: Frozen Pizza)

Group 4

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Introduction:

Tombstone is a brand of frozen pizza manufactured by Kraft Foods. It was introduced in 1962 and is now consumed nationwide.

Analysed the sales data of different brands of frozen pizzas across all states of Unites States at Grocery Stores with Demographics data of customers who bought them (Even though data is available for sales at drug stores, mass store our analysis was confined to Grocery stores because grocery stores contribute to nearly 80% of total Frozen pizza sales).

Objective:

Develop strong marketing strategies to increase revenue and market share of TOMBSTONE frozen pizza. This project contains the predictive and exploratory analysis performed with the goals to boost the units sold by TOMBSTONE and provide strategic insights to the marketing team

Our Strategy is built on following statistical analyses:
1) Descriptive Analysis
2) Panel Regression
3) Recency Frequency Monetary (RFM) Model
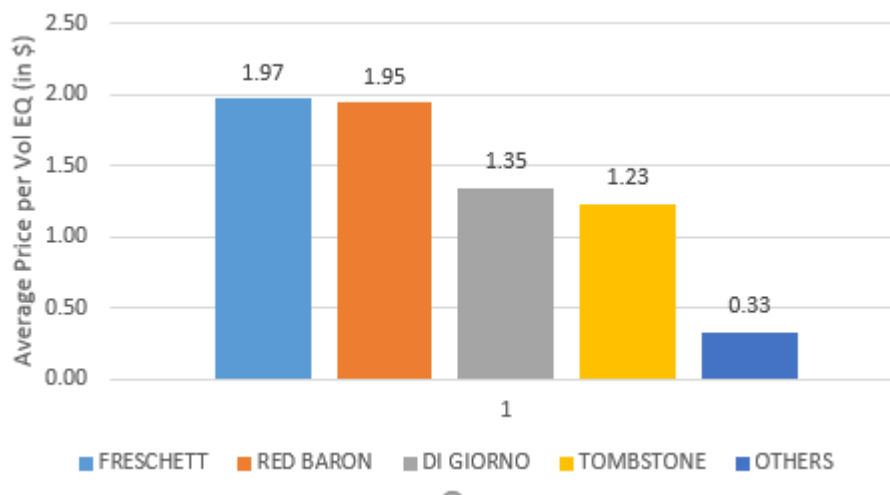4) Survival Analysis

Descriptive Analysis
Visualization of Market share of top Brands across US in terms of volume Sales
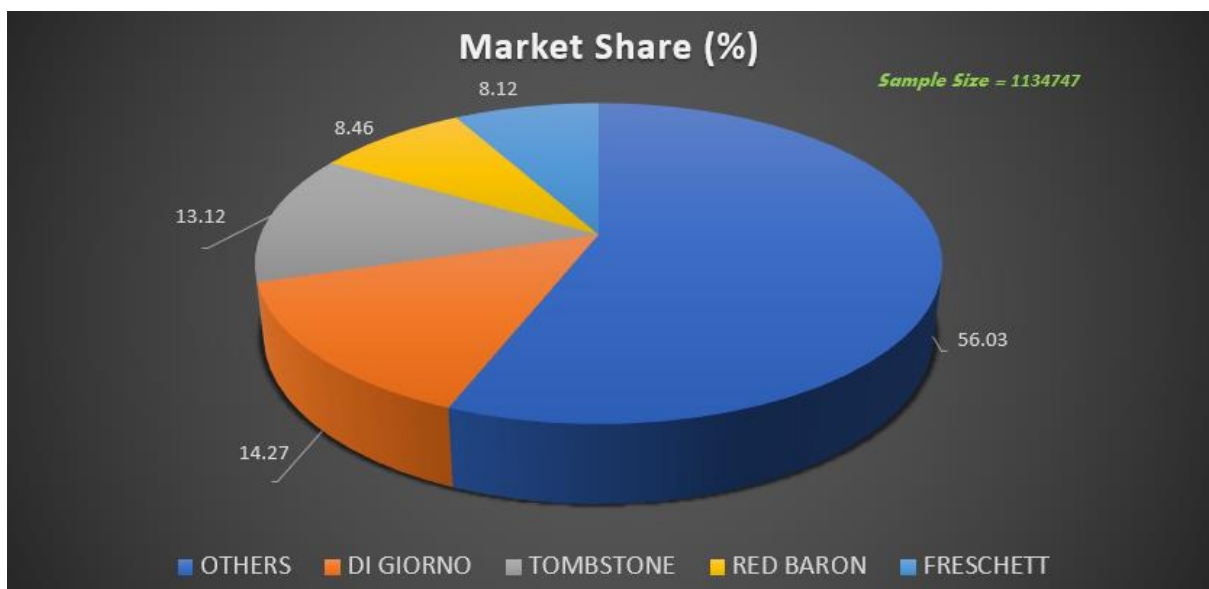
Insight: DIGIORNO & TOMBSTONE are the top competing brands as an individual in terms of volume sales.

Average price per volume equivalent of Top brands

Insight: FRESCHETT has the Highest Average price per volume equivalent and TOMBSTONE has the second lowest average price per volume equivalent that might be the reason for TOMBSTONE to lead the market as majority people tend to buy cheap products in the consumption goods segment.
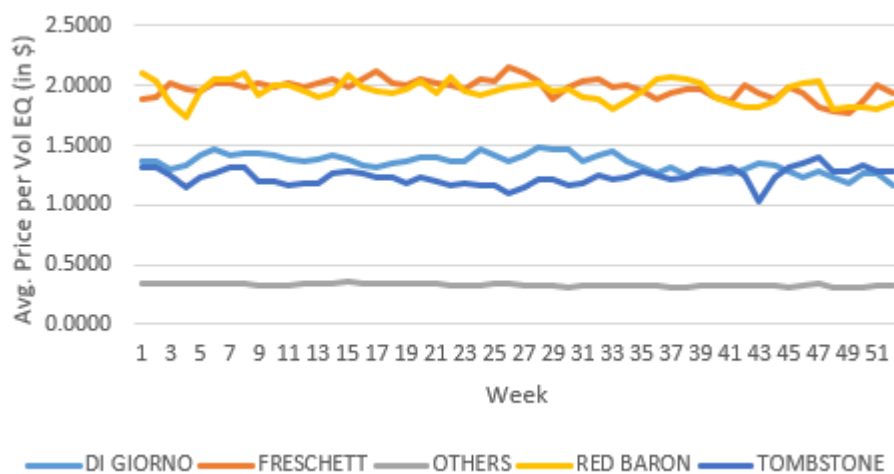
Where to Target

Analysed the TOMBSTONE sales data in stores at different locations. We have sorted out 5 locations based on sales data and calculated the market share of all the brands at these locations. The finding is as below.

Sample Size = 65536

OTHERS ■ TOMBSTONE ■ DI GIORNO ■ RED BARON ■ FRESCHETT

	CHICAGO	MILWAUKEE	MINNEAPOLIS /ST. PAUL	PEORIA/SPRIN GFLD.	ST. LOUIS
■ TOMBSTONE	0.702	0.540	0.484	0.745	0.679
■ RED BARON	1.997	1.534	1.350	1.924	1.572
■ OTHERS	0.252	0.165	0.107	0.248	0.186
■ FRESCHETT	1.994	1.564	1.298	2.228	1.983
■ DI GIORNO	1.258	0.994	0.868	1.386	1.186

Avg Price per Vol EQ (in $)

■ TOMBSTONE ■ RED BARON ■ OTHERS ■ FRESCHETT ■ DI GIORNO

Insight: TOMBSTONE has a strong market as an individual in above locations varying from (20% – 25%).

LINEAR REGRESSION ANALYSIS

To understand the various factors affecting sales and price elasticity, linear regression was performed on full data set and sales data of TOMBSTONE. Sales amount in dollar was taken as dependent variable

Full Dataset				TOMBSTONE			
Variable	Parameter Estimate	Standard Error	Pr > |t|	Variable	Parameter Estimate	Standard Error	Pr > |t|
Intercept	18.95385	0.06742	<.0001	Intercept	19.18942	0.25294	<.0001
PRICE_WT	7.64712	0.05506	<.0001	PRICE_WT	2.90814	0.13353	<.0001
fA	34.6408	0.20683	<.0001	fA	32.72621	0.54845	<.0001
fAP	37.7356	0.51921	<.0001	fAP	60.5755	1.38807	<.0001
fB	21.94923	0.22942	<.0001	fB	23.94833	0.70211	<.0001
fC	9.89757	0.64086	<.0001	fC	11.28107	2.2728	<.0001
dminor	81.25387	0.33985	<.0001	dminor	83.92257	0.96592	<.0001
dmajor	53.20874	0.22281	<.0001	dmajor	53.77658	0.67916	<.0001
PR	2.21162	0.11975	<.0001	PR	0.74676	0.38237	0.0508

- **Change in Price per vol EQ has less impact on TOMBSTONE when compared to overall market:** We observe that an increase in the price/Vol EQ by $1 increases the total sales by $7.6 whereas increasing price/vol EQ by 1 cent for TOMBSTONE increases the total sales of our brand by $2.98 for each transaction.

- **A+ Ads have more impact on sales of TOMBSTONE when compared to the total sales of the other brands**: The presence of A+ Ad (feature fAP) increases the total sales for TOMBSTONE from $37**.**7 which is for overall market sales to $60.5. Thus, it indicates that we need to continue to do more of A+ ads in feature which is more cost effective when compared to larger ad features.

- **When compared to the total sales for other brands, the effect of small aisle display is more for TOMBSTONE:** Small aisle displays generates as much sales ($83) for our brand when compared to the sales of other brands which is $81. Thus, we channel the marketing budget in small aisle displays.

- **Price Reduction Flag has lesser effect on TOMBSTONE when compared to the effect of price reduction flag for overall sales:** When compared to no price reduction in a week, sales for TOMBSTONE is affected by $0.74. Whereas for overall sales gets affected by $2.2 when there is price reduction.

Regression (Panel Regression)

In the fast-moving consumer good section, one of the major drivers of sales is price. Not only does the product's own price impact sales but the price of the substitutes also have a big impact as this is a very price sensitive market – the consumers do not have any preference for a product.

METHODOLOGY

- PROC PANEL functions to account for Panel Data
- A Hausman Test was conducted to test if there is endogeneity. The P-value was < 0.0001 which is below the 5% significance level. Hence, we concluded that the fixed effects model is better. Also, intuitively it can be said that there is a simultaneous effect between quantity demanded and price which gives rise to endogeneity and hence FE is a better model as Random Effects does not have the capability to account for the problem of endogeneity
- Volume Equivalent sales was used as the dependent variable to show the change in sales when the price of the own product or the substitute's product changes

The PANEL Procedure
Wansbeek and Kapteyn Variance Components (RanOne)

Dependent Variable: Tot_VolTOMBSTONE

Model Description	
Estimation Method	RanOne
Number of Cross Sections	1449
Time Series Length	52

Fit Statistics			
SSE	141224461.4	DFE	68091
MSE	2074.0547	Root MSE	45.5418
R-Square	0.1912		

Variance Component Estimates	
Variance Component for Cross Sections	905.3228
Variance Component for Error	2076.25

Hausman Test for Random Effects			
Coefficients	DF	m Value	Pr > m
8	8	424.56	<.0001

TOMBSTONE:
From the panel regression output, it's clear that from the available alternatives that sales are not price elastic (own & cross).

- We can consider cross price effect of "OTHERS" on TOMBSTONE. We may say that TOMBSTONE sales are affected positively if average weighted price on OTHERS go up by 1 unit.

- Displays, Features and Price Reduction Flags by TOMBSTONE have huge positive impact on its Volume Equivalent sales. Most importantly, the combined effect (DF_CC) of major display, medium size feature and Price Reduction Flag is considerable which emphasizes that a price reduction and promotion have a major impact on sales.
- If TOMBSTONE increases weighted medium size features by 1%, its Volume equivalent sales would increase by 24.45 units
- If TOMBSTONE increases weighted major displays by 1%, its Volume equivalent sales would increase by 85.59 units
- If TOMBSTONE increases weighted Price Reduction flags by 1%, its Volume equivalent sales would increase by 10.21 units
- IF TOMBSTONE increases weighted Price Reduction flags by 1% and weighted major displays by 1% and weighted medium size features by 1% simultaneously, its Volume equivalent sales would decrease by 9.72 units
  - ❖ From the below panel result it is evident that TOMBSTONE customers tend to prefer different features among the product and inclined towards advertisements (Display) and price reduction flag has it's own impact

Parameter Estimates						
Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	-13.2064	8.0421	-1.64	0.1006	Intercept
PRICE_WGTTOMBSTONE	1	-0.17843	0.1328	-1.34	0.1791	
PRICE_WGTDI_GIORNO	1	0.03728	0.1425	0.26	0.7936	
PRICE_WGTRED_BARON	1	0.157599	0.1119	1.41	0.1589	
PRICE_WGTFRESCHETT	1	0.010786	0.1037	0.10	0.9171	
PRICE_WGTOTHERS	1	0.591836	0.2573	2.30	0.0214	
fA_wgtTOMBSTONE	1	45.81156	0.8842	51.81	<.0001	
fAP_wgtTOMBSTONE	1	67.77593	2.4625	27.52	<.0001	
fB_wgtTOMBSTONE	1	24.45516	1.1029	22.17	<.0001	
fC_wgtTOMBSTONE	1	0.7433	3.5996	0.21	0.8364	
dminor_wgtTOMBSTONE	1	85.59928	1.7387	49.23	<.0001	
dmajor_wgtTOMBSTONE	1	51.19611	1.1363	45.05	<.0001	
PR_wgtTOMBSTONE	1	10.21192	0.6340	16.11	<.0001	
DF_CC	1	-9.72582	3.5933	-2.71	0.0068	

Di GIORNO

The other giant in this market is **Di GIORNO** which competes very closely with TOMBSTONE. These two have strong impact on market share as individual brands. Now let's look at how our competitor's sales are affected

F Test for No Fixed Effects			
Num DF	Den DF	F Value	Pr > F
1448	66639	14.39	<.0001

Parameter Estimates						
Variable	DF	Estimate	Standard Error	t Value	Pr > |t|	Label
Intercept	1	13.94385	5.1036	2.73	0.0063	Intercept
PRICE_WGTTOMBSTONE	1	0.100905	0.0839	1.20	0.2292	
PRICE_WGTDI_GIORNO	1	1.020283	0.0907	11.25	<.0001	
PRICE_WGTRED_BARON	1	-0.02486	0.0710	-0.35	0.7263	
PRICE_WGTFRESCHETT	1	0.128646	0.0658	1.95	0.0506	
PRICE_WGTOTHERS	1	-0.00919	0.1633	-0.06	0.9551	
fA_wgtDI_GIORNO	1	30.17062	0.6700	45.03	<.0001	
fAP_wgtDI_GIORNO	1	21.59141	2.0112	10.74	<.0001	
fB_wgtDI_GIORNO	1	21.3714	0.7316	29.21	<.0001	
fC_wgtDI_GIORNO	1	5.182697	2.6586	1.95	0.0512	
dminor_wgtDI_GIORNO	1	51.73122	1.2306	42.04	<.0001	
dmajor_wgtDI_GIORNO	1	38.79139	0.7221	53.72	<.0001	
PR_wgtDI_GIORNO	1	12.22055	0.4367	27.98	<.0001	

- **Own Price Effect:** 1 unit increase in average weighted price of **Di Giorno** will increase its volume equivalent Sales by around 1 unit.

Own Price Elasticity for Di Giorno: (1.020) *(3.03 / 23.128) = 0.1336

- **Cross Price Effect:** A 1 unit increase in average weighted price of FRESCHETT increases the volume equivalent Sales of **Di Giorno** by around 0.128 units

Cross price elasticity = (0.128) * 2.77 / 23.128 = 0.015

This shows that **Di Giorno customers** are price elastic**.**

- Displays, Features and Price Reduction Flags by **Di Giorno** have significant impact on its volume equivalent Sales

Recommendation:

- TOMBSTONE must focus on increasing major displays, Price Reduction flags, medium & large size features Ads for its products to witness very high sales growth.

RFM Analysis:

We performed RFM analysis on the dataset to segment our customers based on RFM scores and to identify those customers who are most loyal, who are more responsive to marketing campaigns and who are at risk of leaving the brand. The panel data for grocery stores was combined with the product data to identify the brands chosen by different panellists. We choose only those panellists who purchased our brand "TOMBSTONE". Based on the RFM scores we have segmented our customers into 10 categories based on the following criteria.

Customer segment	Recent Rank	Frequency & Monetary Rank
Champion	4-5	4-5
Loyal customers	2-5	3-5
Potential loyal	3-5	1-3
Recent customers	4-5	0-1
Promising	3-4	0-1
Customers needing Attention	2-3	2-3
About to sleep	2-3	0-2
At risk	0-2	2-5
Hibernating	1-2	4-5
Lost	0-2	0-2

Visualization of Customer segments based on RFM and their percentage of total customers

Customer Segmentation
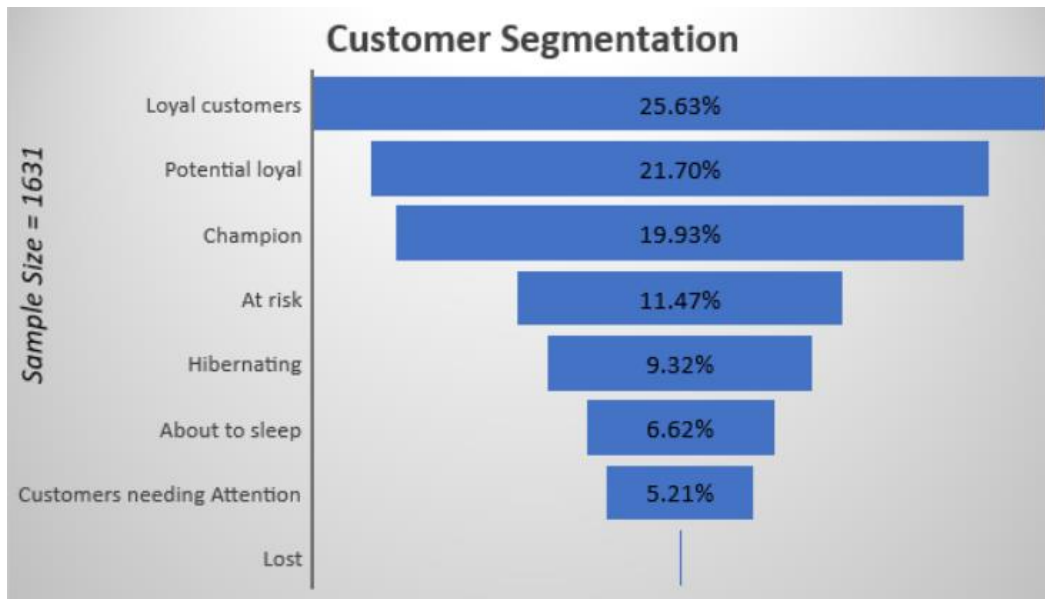
Sheet 1
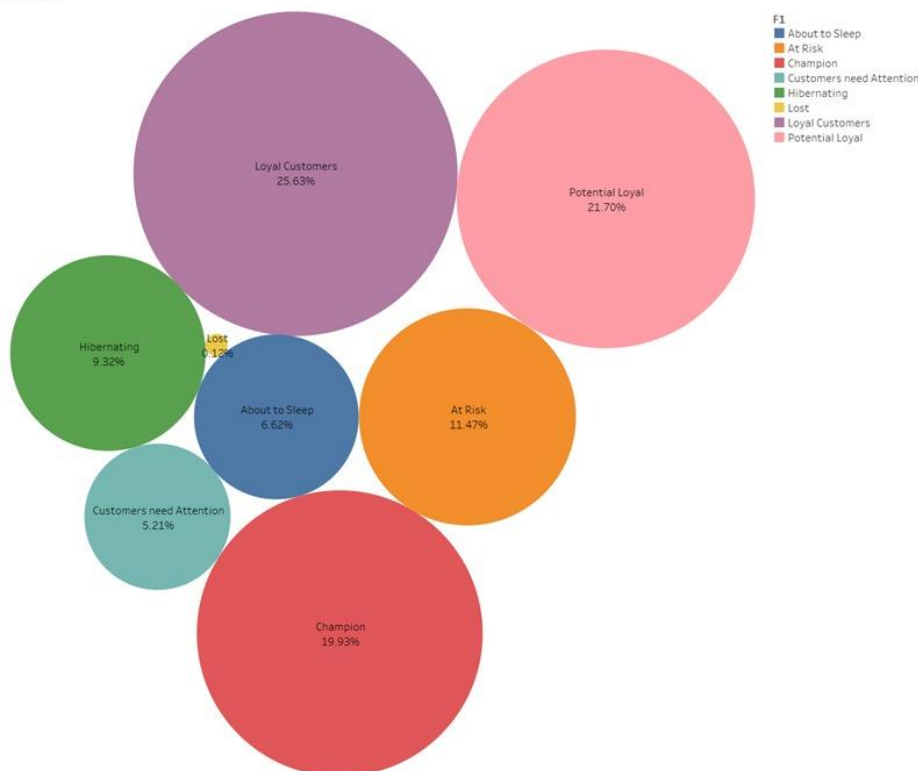
F1 and sum of F2. Color shows details about F1. Size shows sum of F2. The marks are labeled by F1 and sum of F2. The view is filtered on sum of F2, which keeps all values.

Insights:

1.) We have 21.7 % of Potential loyal customers which is a good sign as there are more chances that we can convert them to champions and loyalists.

2.) We have 25.63% of Loyal customers, 19.93% champions, 21.70% potential loyal customers, all together 67.26% of total customers who bought TOMBSTONE are loyal and most likely to buy it again.

3.) We have 6.62% of our customers who are about to leave our brand.

4.) Only 0.12% of customers left for other brands

Recommendations:

a.) We have 9.32% customer in hibernation mode, for them, we need to run an aggressive promotional campaign to win them over again.

b.) Must convert Potential Loyalist customers to champions through reward programs for their loyalty.

Logistic Regression (Multinomial Logistic Regression)

Multinomial Logistic regression was conducted to analyse the brand preference across various demographics.

Key findings from the multinomial logistic regression are as follows:

1) **Overall Brand Preference:**

Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > |t|
br2	1	2.2636	0.3379	6.70	<.0001
br3	1	0.8612	0.4012	2.15	0.0318
br4	1	-0.4246	0.4572	-0.93	0.3530
br5	1	3.4979	0.3148	11.11	<.0001

From the above it is seen that the order of brand preference at an overall level excluding the impact of customer income, family size and other demographics is as follows:
OTHER Brands > TOMBSTONE > RED BARON > FRESCHETT = DI GIORNO

2) **Effect of customer income on brand preference:**

inc2	1	-0.0305	0.0121	-2.51	0.0120
inc3	1	-0.0626	0.0147	-4.26	<.0001
inc4	1	-0.003784	0.0164	-0.23	0.8174
inc5	1	-0.0725	0.0111	-6.53	<.0001

High income customers prefer TOMBSTONE & RED BARON.

3) **Effect of Family Size on brand preference:**

Family_Size2	1	0.1452	0.0268	5.42	<.0001
Family_Size3	1	0.1640	0.0312	5.26	<.0001
Family_Size4	1	0.0390	0.0354	1.10	0.2696
Family_Size5	1	0.1678	0.0248	6.77	<.0001

Large Families prefer TOMBSTONE & RED BARON.

4) **Effect of Age on brand preference:**

|					
Age_grp_M2	1	-0.2152	0.0348	-6.19	<.0001
Age_grp_M3	1	-0.2455	0.0396	-6.20	<.0001
Age_grp_M4	1	-0.1004	0.0449	-2.24	0.0252
Age_grp_M5	1	-0.1894	0.0323	-5.86	<.0001

Higher age people prefer = DI GIORNO, younger age people prefer TOMBSTONE, RED BARON

Survival Analysis

We considered 20 weeks of data into a bucket and an compared with sales in the next 20-week bucket to compare the customer frequency to determine the churn rate.

After Creating the RFM scores, checked for the correlation between R, F, M values

Quartile Estimates				
	Point	95% Confidence Interval		
Percent	Estimate	Transform	[Lower	Upper)
75	20.0000	LOGLOG	.	.
50	19.0000	LOGLOG	19.0000	20.0000
25	13.0000	LOGLOG	.	.

Product-Limit Survival Estimate
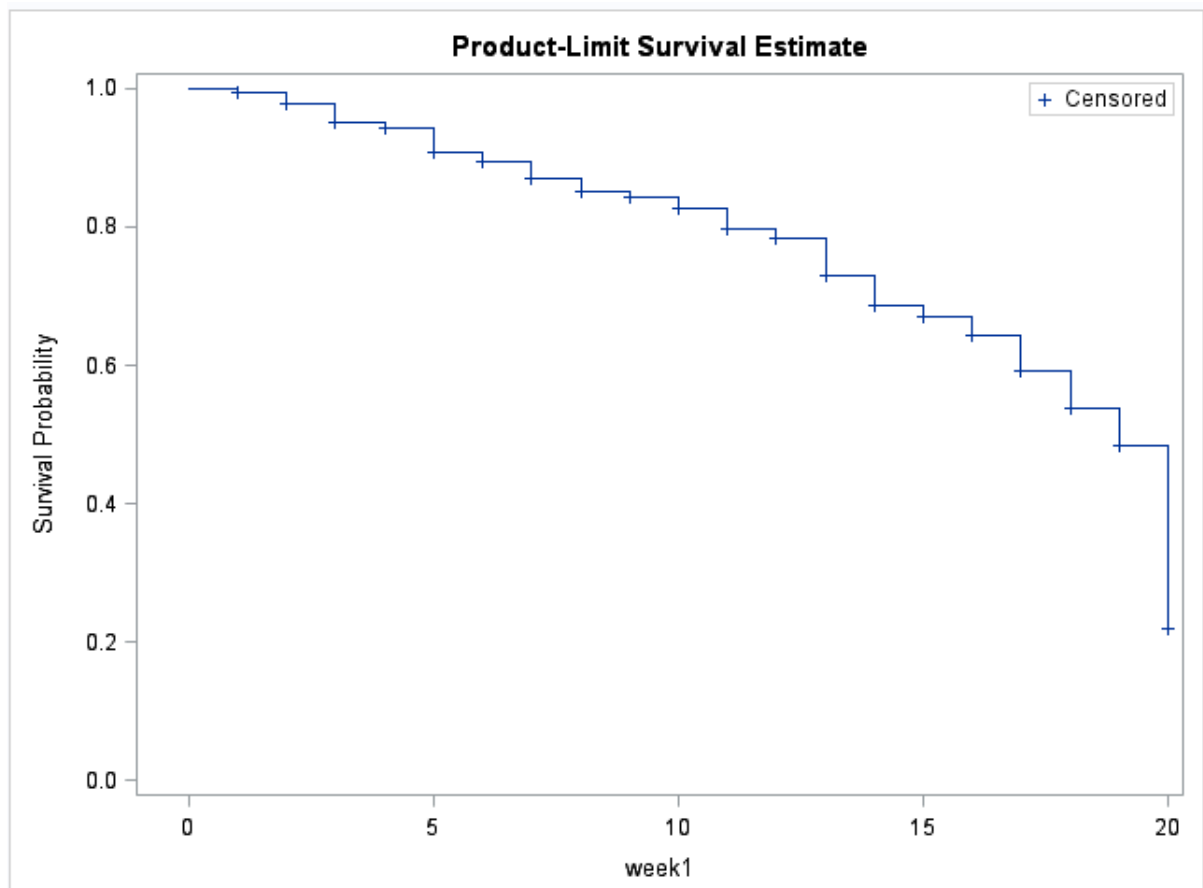
We performed survival analysis to target our customers better and reduce churn

Insights:

- If a customer is inactive for 13 weeks, then there is 25% chance that he would churn
- If a customer is inactive for 19 weeks, then there is 50% chance that he would churn
- If a customer is inactive for 20 weeks, then there is 75% chance that he would churn

Recommendations:

For TOMBSTONE to retain its customer base, it is recommended to

- Send a personal come back mail to the customer who is inactive for 13 weeks
- Send a special coupon to the customer who is inactive for 19 weeks