



University of
Pittsburgh

Decision Making in Complex Environments

Assignment 3
U.S. Spirits Market Share

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Overview

The purpose of creating this project is to validate an Analytic Network Process (ANP) using a market share model that's then compared to actual data sources. This model will estimate the market share of distilled spirits in the United States. The **Alternatives** included in this model are:

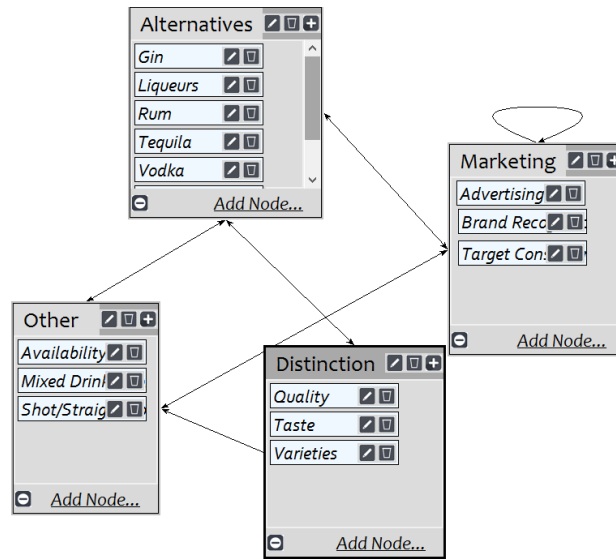
- Tequila
- Vodka
- Whisky
- Brandy
- Gin
- Rum
- Liquors

The Model

The market share model judged the Alternatives based on the following Criteria:

- Quality
- Taste
- Varieties
- Advertising
- Brand Recognition
- Target Consumers
- Availability
- Mixed-drink incorporation
- Straight/Shot Consumption

An overview of the model used in SuperDecisions can be see below:










Connections were made between the alternatives and each one of the criteria. There were also ties between criteria, such as the link between Availability and Brand Recognition. Each one of these connections was pair-wise compared to evaluate the market share of each.

Here is an example of the pairwise comparisons made for Taste:








Comparisons wrt "Taste" node in "Alternatives" cluster
Gin is moderately more important than Brandy

1.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Gin
2.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Liqueurs
3.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Rum
4.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Tequila
5.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Vodka
6.	Brandy	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey
7.	Gin	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Liqueurs
8.	Gin	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Rum
9.	Gin	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Tequila
10.	Gin	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Vodka
11.	Gin	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey
12.	Liqueurs	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Rum
13.	Liqueurs	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Tequila
14.	Liqueurs	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Vodka
15.	Liqueurs	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey
16.	Rum	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Tequila
17.	Rum	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Vodka
18.	Rum	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey
19.	Tequila	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Vodka
20.	Tequila	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey
21.	Vodka	>=9.5	9	8	7	6	5	4	3	2	2	3	4	5	6	7	8	9	>=9.5	No comp.	Whiskey

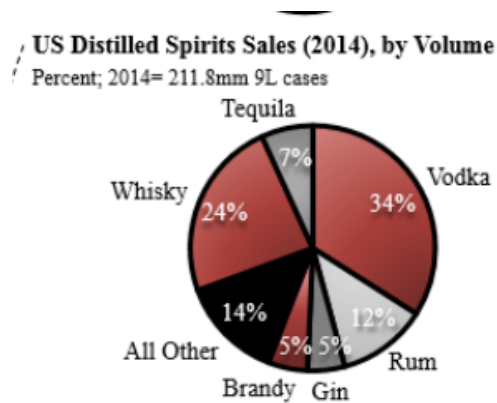
Inconsistency: 0.04722		
Brandy		0.03978
Gin		0.07654
Liqueurs		0.04677
Rum		0.14339
Tequila		0.13869
Vodka		0.31407
Whiskey		0.24076

The Results

After all of the pairwise comparisons were made, the model was synthesized to obtain the overall priorities for each alternative.

Here are the overall synthesized priorities for the alternatives. You synthesized from the network Main Network: LIQUOR_MARKET_SHARE.sdmod: ratings				
Name	Graphic	Ideals	Normals	Raw
Brandy		0.224553	0.066235	0.029686
Gin		0.255851	0.075467	0.033824
Liqueurs		0.268368	0.079159	0.035479
Rum		0.397711	0.117311	0.052578
Tequila		0.580210	0.171141	0.076704
Vodka		1.000000	0.294964	0.132201
Whiskey		0.663550	0.195724	0.087722

These results were compared to the actual Market Share Data obtained from **ParkStreet.com** by calculating the Compatibility Index



<http://www.parkstreet.com/wp-content/uploads/US-Market-Universe-of-Wines-Spirits1.png>

SAATY COMPATIBILITY INDEX FOR 7 ALTERNATIVES (N=7)

RESULTS	
Number of Alternatives	7
Sum of Matrix	59.50819183
Compatibility Index	1.214452894

Actual values before normalization

0.05	← copy to this column the initial actual values
0.05	
0.14	
0.12	
0.07	
0.34	
0.24	

Normalized Actual values

0.04950	to normalize the values we sum them and then divide each value by the sum we found
0.04950	
0.13861	
0.11881	
0.08931	
0.33663	
0.23762	

Results from SuperDecisions

Name	Ideal	Normal	Raw	← copy here the results from SuperDec
Brandy		0.066235		
Gin		0.075467		
Liqueurs		0.079159		
Rum		0.117311		
Tequila		0.171141		
Vodka		0.294964		
Whisky		0.195724		

Pairwise Comparison Matrix from Actual Data

	Brandy	Gin	Liqueurs	Rum	Tequila	Vodka	Whisky
Brandy	1	1.00000	0.35714	0.41667	0.71429	0.14706	0.20833
Gin	1	1.00000	0.35714	0.41667	0.71429	0.14706	0.20833
Liqueurs	2.8	2.80000	1.00000	1.16667	2	0.41176	0.58333
Rum	2.4	2.40000	0.85714	1	1.71429	0.35294	0.50000
Tequila	1.4	1.40000	0.50000	0.58333	1	0.20588	0.29167
Vodka	6.8	6.80000	2.42857	2.83333	4.857142857	1	1.41667
Whisky	4.8	4.80000	1.71429	2.00000	3.428571429	0.705882	1

Transpose of Comparison Matrix from Estimated Data

	Brandy	Gin	Liqueurs	Rum	Tequila	Vodka	Whisky
Brandy	1	1.13938	1.19512	1.77113	2.58385	4.45330	2.95499
Gin	0.8776684	1	1.04892	1.55447	2.26776	3.90852	2.59350
Liqueurs	0.8367337	0.95336	1	1.48197	2.16199	3.72622	2.47254
Rum	0.5646103	0.64331	0.67478	1	1.45887	2.51438	1.66842
Tequila	0.3870201	0.44096	0.46254	0.685464	1	1.72351	1.14364
Vodka	0.2245528	0.25585	0.26837	0.397713	0.58021	1	0.66355
Whisky	0.3384102	0.38558	0.40444	0.59937	0.87440	1.507041	1

Result of Hadamard (Cell-wise) Multiplication of Previous Two Matrices

	Brandy	Gin	Liqueurs	Rum	Tequila	Vodka	Whisky
Brandy	1	1.1393825	0.42683	0.73797	1.84560	0.65490	0.61562
Gin	0.87767	1	0.37462	0.64769	1.61983	0.57478	0.54031
Liqueurs	2.34285	2.66941	1	1.728961	4.32398	1.53433	1.44232
Rum	1.35506	1.54394	0.578382005	1	2.50091	0.88743	0.83421
Tequila	0.54183	0.61735	0.231268369	0.399854	1	0.35484	0.33356
Vodka	1.52696	1.73979	0.65175	1.12685	2.81816	1	0.94003
Whisky	1.62437	1.85078	0.69333	1.19874	2.99794	1.06379	1

Cell sum of previous matrix	59.50819183
Number of Alternatives	7
Saaty Compatibility Index = Sum/n**2	1.214452894

Conclusion

The market share model resulted in a compatibility index that was relatively close to one. Vodka was the clear favorite in both the model and the actual data. Tequila was much more heavily favored by the model, which could be explained by my preference for it. Brandy and Gin were very compatible. Overall, the model did a sufficient job of estimating the market share of spirits in the US.