



# Value of American Marketing Association

---

Cheryl LeSaint  
Qingzhao Yu



# Outline

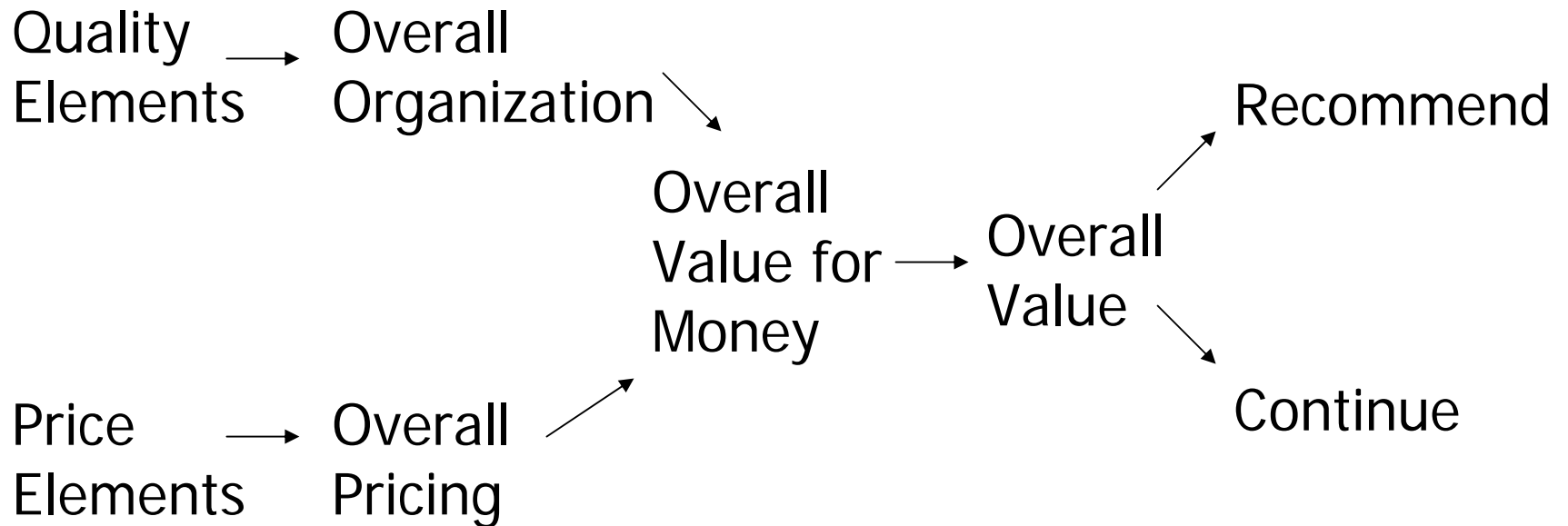
---

- Questions
- Exploratory Data Analysis
- Model
- Results
- Conclusions



# Questions

---





# Questions

---

- Focus on Continue (Q19) as response

“When it comes time to renew your AMA membership, what is the likelihood that you will renew AMA membership?”



# Questions

---

- Possible Predictors
  - Overall Value (Q7)
  - Overall Value for Money (Q17)
  - Quality Elements (Q10)
  - Overall Organization (Q9)
  - Price Elements (Q15b-q)
  - Overall Pricing (Q15a)



# Questions

---

- Overall Value (Q7)

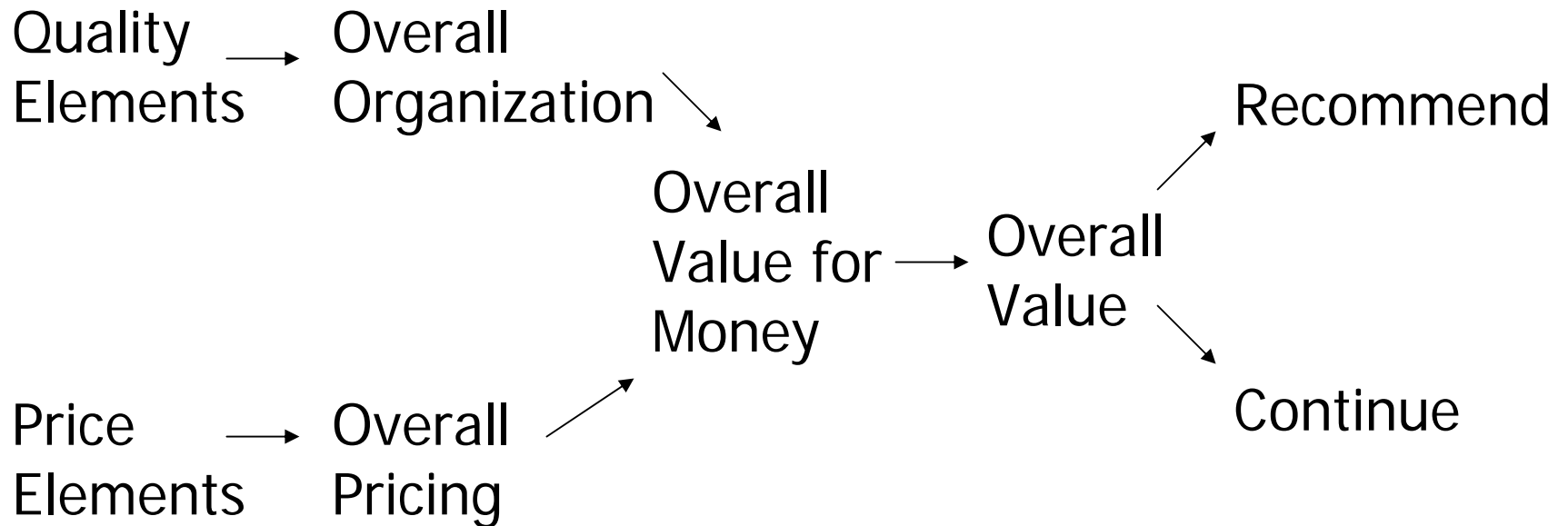
“Top of mind, thinking about everything the AMA offers, how valuable would you say AMA membership is for you personally?”
- Overall Value for Money (Q17)

“Thinking about all the offerings of the AMA, and all the costs associated with them, how would you rate AMA’s overall value for money?”



# Questions

---





# Exploratory Data Analysis

---

- Considered only 400 observations, kept remaining 106 as validation data set
- Correlations:
  - Continue, Overall Value for Money: 0.4533
  - Continue, Overall Value: 0.4737





# Model

---

- Removed all missing observations
- Built models for Continue paired with Overall Value for Money (Model 1), Overall Value (Model 2), and both (Model 3)



# Model

---

- Multinomial-Logistic Model

$$X_{i\bullet} \sim \text{Multinomial}(p_{i\bullet}, n_i)$$

$$p_{ij} = \frac{\phi_{ij}}{\sum \phi_{ij}}$$

$$\phi_{ij} = e^{\alpha_j + \beta_{ij}}$$



# Model

---

- BUGS
- 10,000 simulated values
- Non-informative Priors for alpha & beta



# Results – Model 1

Obs/Exp	Continue (Q19)						
Q17	1	2	3	4	5	6	7
1	<b>2</b> / 1.361	<b>1</b> / 0.818	<b>5</b> / 4.875	<b>3</b> / 3.055	<b>3</b> / 3.172	<b>2</b> / 2.390	<b>6</b> / 6.329
2	<b>0</b> / 0.150	<b>0</b> / 0.055	<b>2</b> / 1.967	<b>3</b> / 2.947	<b>2</b> / 1.973	<b>6</b> / 5.947	<b>3</b> / 2.960
3	<b>0</b> / 0.229	<b>1</b> / 0.958	<b>1</b> / 0.991	<b>2</b> / 1.974	<b>4</b> / 3.984	<b>10</b> / 9.955	<b>12</b> / 11.91
4	<b>0</b> / 0.152	<b>0</b> / 0.055	<b>2</b> / 1.987	<b>4</b> / 3.925	<b>3</b> / 2.965	<b>4</b> / 3.927	<b>13</b> / 12.99
5	<b>0</b> / 0.061	<b>0</b> / 0.042	<b>0</b> / 0.053	<b>0</b> / 0.052	<b>3</b> / 2.910	<b>2</b> / 1.947	<b>19</b> / 18.94
6	<b>0</b> / 0.095	<b>0</b> / 0.048	<b>0</b> / 0.061	<b>1</b> / 0.962	<b>1</b> / 0.959	<b>3</b> / 2.961	<b>15</b> / 14.92
7	<b>0</b> / 0.020	<b>0</b> / 0.032	<b>0</b> / 0.039	<b>0</b> / 0.386	<b>0</b> / 0.034	<b>1</b> / 0.913	<b>2</b> / 1.923

$$G^2 = 30.40, \quad P - value = 0.7317$$



# Results – Model 1

Probability for Continue given Overall Value for Money

%	Continue (Q19)						
Q17	1	2	3	4	5	6	7
1	6.19	3.72	22.16	13.89	14.42	10.86	28.77
2	0.94	0.35	12.29	18.42	12.33	37.17	18.50
3	0.76	3.17	3.31	6.58	13.28	33.18	39.69
4	0.58	0.21	7.64	15.09	11.41	15.10	49.96
5	0.25	0.17	0.22	0.22	12.12	8.11	78.90
6	0.47	0.24	0.31	4.81	4.79	14.80	74.58
7	0.68	1.07	1.30	1.29	1.13	30.42	64.12



# Results – Model 2

Obs/Exp	Continue (Q19)						
Q7	1	2	3	4	5	6	7
1	<b>0</b> / 0.008	<b>0</b> / 0.004	<b>1</b> / 0.803	<b>0</b> / 0.079	<b>1</b> / 0.785	<b>0</b> / 0.206	<b>2</b> / 2.048
2	<b>2</b> / 1.850	<b>2</b> / 1.921	<b>4</b> / 4.025	<b>5</b> / 5.031	<b>1</b> / 1.106	<b>4</b> / 4.017	<b>6</b> / 5.965
3	<b>0</b> / 0.045	<b>0</b> / 0.019	<b>2</b> / 1.982	<b>2</b> / 1.952	<b>3</b> / 3.038	<b>5</b> / 4.957	<b>5</b> / 5.002
4	<b>0</b> / 0.033	<b>0</b> / 0.017	<b>3</b> / 2.986	<b>3</b> / 2.928	<b>3</b> / 3.008	<b>11</b> / 10.97	<b>8</b> / 8.071
5	<b>0</b> / 0.033	<b>0</b> / 0.018	<b>0</b> / 0.076	<b>3</b> / 2.941	<b>6</b> / 6.019	<b>6</b> / 5.917	<b>28</b> / 27.94
6	<b>0</b> / 0.027	<b>0</b> / 0.012	<b>0</b> / 0.076	<b>0</b> / 0.039	<b>2</b> / 1.994	<b>2</b> / 1.891	<b>15</b> / 15.04
7	<b>0</b> / 0.004	<b>0</b> / 0.009	<b>0</b> / 0.052	<b>0</b> / 0.029	<b>0</b> / 0.050	<b>0</b> / 0.039	<b>7</b> / 6.940

$$G^2 = 24.74, \quad P - \text{value} = 0.9217$$



# Results – Model 2

## Probability for Continue given Overall Value

%	Continue (Q19)						
Q7	1	2	3	4	5	6	7
1	0.41	92.49	2.24	1.66	1.67	1.34	0.19
2	0.19	96.03	0.95	0.86	0.88	0.62	0.47
3	8.03	40.25	19.80	29.86	0.76	0.76	0.52
4	0.61	38.70	15.01	22.52	22.62	0.30	0.22
5	4.90	6.91	18.99	18.80	37.62	12.46	0.31
6	0.74	14.35	17.70	39.19	21.13	6.75	0.14
7	2.88	8.40	7.05	11.37	39.35	21.18	9.78



# Model – Model 3

---

- Multinomial-Logistic Model

$$X_{ij\bullet} \sim \text{Multinomial}(p_{ij\bullet}, n_{ij})$$

$$p_{ijk} = \frac{\phi_{ijk}}{\sum \phi_{ijk}}$$

$$\phi_{ijk} = e^{\alpha_k + \beta_{ik} + \gamma_{jk}}$$





## Results – Model 3

---

- Continue (Q19) with Overall Value (Q7) and Overall Value for Money (Q17)
  - $G^2 = 125.5$ ,  $P\text{-value} = 0.99$



# Results – Model 3

Logit (log)	Overall Value for Money (Q17)						
	1	2	3	4	5	6	7
$\pi_2/\pi_1$	-0.47	-6.86	0.65	1.75	1.13	2.79	1.01
$\pi_3/\pi_1$	-0.98	1.82	-2.11	-0.35	-0.36	1.28	0.69
$\pi_4/\pi_1$	0.82	-5.27	0.18	1.60	0.07	1.17	1.42
$\pi_5/\pi_1$	1.26	-0.90	-5.92	-5.74	3.04	3.59	4.67
$\pi_6/\pi_1$	-0.14	-2.02	-6.53	2.34	0.29	3.25	2.79
$\pi_7/\pi_1$	1.32	-0.65	-2.69	-4.11	-4.90	6.36	4.68



## Results – Model 3

Logit (log)	Overall Value for Money (Q17)						
	1	2	3	4	5	6	7
$\pi_6 / \pi_1$	-0.14	-2.02	-6.53	2.34	0.29	3.25	2.79

The estimated odds of a selection of 6 instead of 1 for Continue (Q19) is relatively higher when Overall Value for Money (Q17) is answered 4 or above and relatively lower when Q17 is answered 1, 2, or 3.



# Results – Model 3

Logit (log)	Overall Value (Q7)						
	1	2	3	4	5	6	7
$\pi_2/\pi_1$	-2.84	0.91	1.85	1.92	0.24	4.28	-6.35
$\pi_3/\pi_1$	-2.31	-0.72	2.35	2.45	2.05	3.29	-7.11
$\pi_4/\pi_1$	-2.03	-2.62	1.42	2.41	2.56	5.06	-6.79
$\pi_5/\pi_1$	-3.66	-11.2	0.48	1.91	2.83	6.01	3.67
$\pi_6/\pi_1$	-2.46	-10.9	-0.07	-0.31	1.87	6.00	5.96
$\pi_7/\pi_1$	0.55	-6.45	-4.49	-4.81	7.26	-2.97	10.92



## Results – Model 3

Logit (log)	Overall Value (Q7)						
	1	2	3	4	5	6	7
$\pi_6 / \pi_1$	-2.46	-10.9	-0.07	-0.31	1.87	6.00	5.96

The estimated odds of a selection of 6 instead of 1 for Continue (Q19) is relatively higher when Overall Value (Q7) is answered 5, 6, or 7 and relatively lower when Q7 is answered 4 or below.



# Results – Validation Data Set

---

- Predict Continue (Q19) from Overall Value (Q7)
  - $G^2 = 213.6697$
- Predict Continue (Q19) from Overall Value for Money (Q17)
  - $G^2 = 34.0819$
- Predict Continue (Q19) from Q7 & Q17
  - $G^2 = 209.1658$



# Conclusions

---

- Overall Value is a better fit for Continue than Overall Value for Money
- Best fit is when Continue is paired with both Overall Value and Overall Value for Money are included in model
- Best prediction is when Continue is paired with Overall Value for Money