Toy Horse Conjoint Analysis

Xinran Xu

Key Insights & Recommendation

- All segments of customers prefer **low price** products

- Model based on Cluster Analysis at **k=3**

- A Priori Segmentation based on **Age, Gender**

  Interact with 4 Attributes: **Price, Size, Motion, Style**

- Suggestion for new product line: **Product 4, 16**

Product 4: 26'' Racing Bouncing Horse priced at $119.99

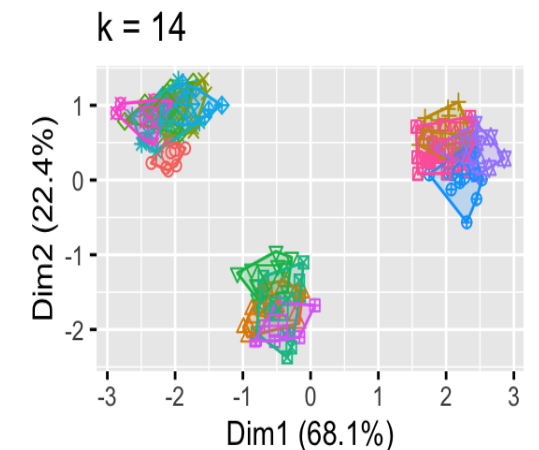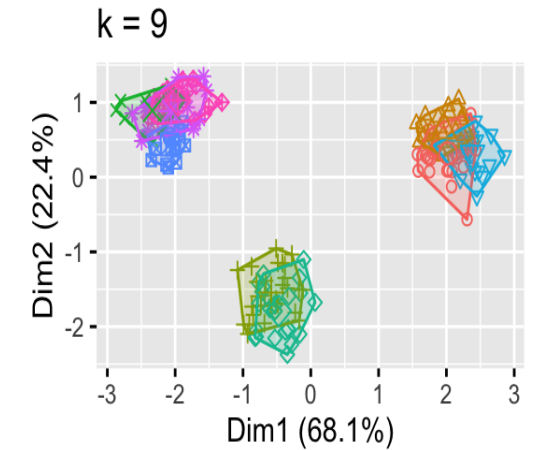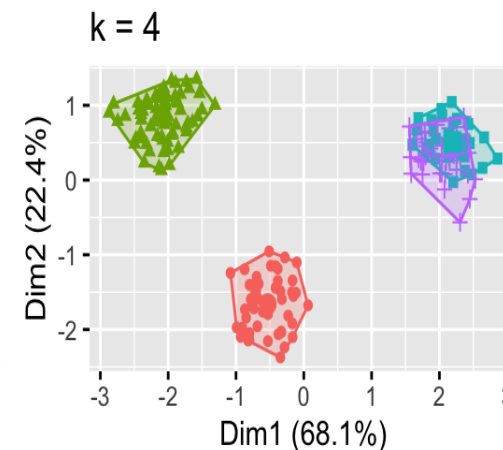**Product 16:** 26'' Glamour Rocking Horse priced at $119.99

Cluster Plots

Optimal Num of Cluster : **k = 3**
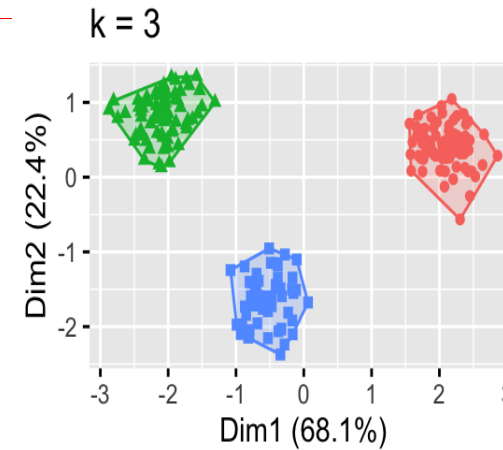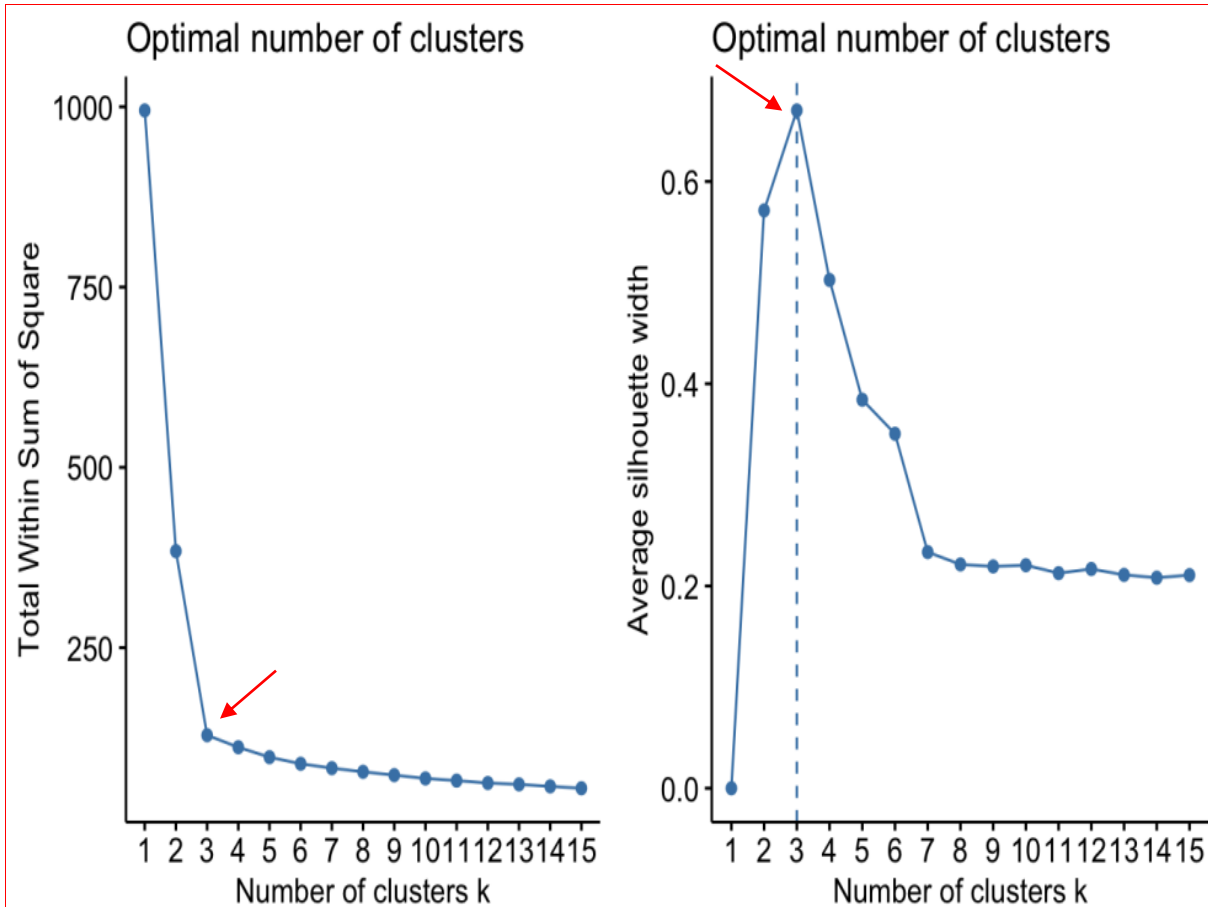
K = 3 looks reasonable

K = 4, 9, 14: Clusters have a lot of overlap

Cluster Analysis with k=3
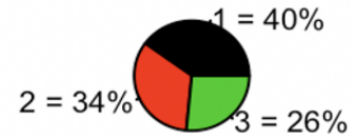
Cluster Insights:
- Black: 26'' Racing Bouncing Horse at $119.99
- Red: 26'' Rocking Glamour Horse at $119.99
- Green: 18'' Rocking Glamour Horse at $119.99

CLUSPLOT(toClust)
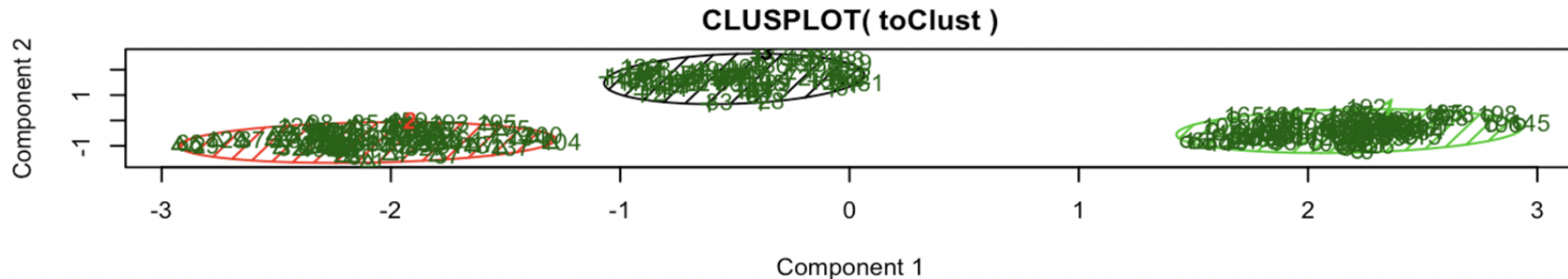
These two components explain 75.88 % of the point variability.

Cluster Means
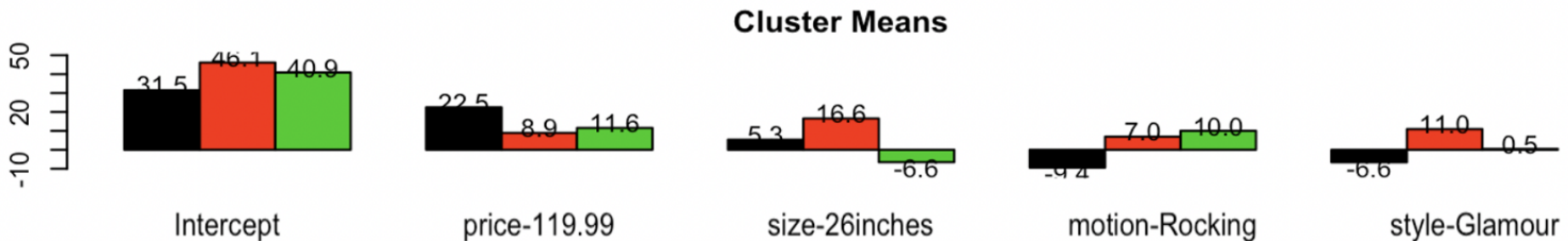
A Priori Segmentation

- **Variables**: Gender , Age

Segment	Intercept	Price - $119.99	Size - 26 inches	Motion - Rocking	Style - Glamour
Male	36.57	16.86	3.85	-0.76	-1.89
Female	40.87	13.51	7.76	2.91	3.73
2 Years Old	39.55	14.41	3.85	2.80	1.19
3-4 Years Old	38.25	15.67	8.02	-0.32	1.10

Ideal Product for Segments:

- **Male** – 26'' Racing Bouncing Horse priced at $119.99.
- **Female** – 26'' Glamour Rocking Horse priced at $119.99

- **2 Year Old Children** – 26'' Glamour Rocking Horse priced at $119.99
- **3-4 Year Old Children** – 26'' Glamour Bouncing Horse priced at $119.99

Market Simulation Under Scenarios

Assumption:

- Currently, our competitor launched a product priced at $139.99.

- In order to gain market share, competitor will lower price to $119.99

- Competitor would switch from Profile 7 to Profile 8

Current Market:

- Product line with Profile 5 & Profile 13.

Current Market	5	13	7
Market Share	0.22	0.21	0.57
Price	111.99	111.99	139.99
Marginal Cost	33	33	41
Profit of Each Product	69511.2	66351.6	225697.2
Profit of Firm	95862.8		

Market Simulation Under Scenario

Scenario2	5	13	4	16	8	profitability
Market Share	0.02	0.025	0.355	0.43	0.17	0.34392066
Price	111.99	111.99	95.99	95.99		
Marginal Cost	33	33	29	41		
Profit of Each Product	6319.2	7899	95125.8	94582.8		
Profit of Firm	110593.467					

Scenario4	13	4	16	8		profitability
Market Share	0.035	0.355	0.44	0.17		0.40393469
Price	111.99	95.99	95.99			
Marginal Cost	33	29	41			
Profit of Each Product	11058.6	95125.8	96782.4			
Profit of Firm	129633.467					

- Based on A Priori Segmentation, we target at **male** and **female** customer: **Profile 4 & 16**.

- Because of low market share and cannibalizaiton in Profile 5, we drop it.

Market Simulation Under Scenario

Scenario7	4	16	8		profitability
Market Share	0.355	0.465	0.18		0.45759933
Price	95.99	95.99			
Marginal Cost	29	41			
Profit of Each Product	95125.8	102281.4			
Profit of Firm	144073.867				

Scenario8	4	14	16	8	profitability
Market Share	0.355	0.22	0.34	0.085	0.41370259
Price	95.99	95.99	95.99		
Marginal Cost	29	33	41		
Profit of Each Product	95125.8	55431.2	74786.4		
Profit of Firm	145343.4				

- In order to gain more market share, we drop both existing products and only launch new product lines.
- Based on Cluster Analysis, we add **Profile 14** into scenario
- Scenario with **Profile 4, 16** is the BEST choice with highest profitability.

Appendix

```
Call:
lm(formula = ratings ~ (price + size + motion + style):age, data = ChildAttr)

Residuals:
    Min      1Q  Median      3Q     Max
-47.606 -13.679  -1.305  12.770  46.668

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  47.6062     0.4676 101.803  < 2e-16 ***
price:age    11.5636     0.9720  11.896  < 2e-16 ***
size:age      5.0567     0.9746   5.189 2.30e-07 ***
motion:age   -4.6606     0.9079  -5.133 3.08e-07 ***
style:age    -3.2358     0.9079  -3.564 0.000372 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 17.65 on 2395 degrees of freedom
  (800 observations deleted due to missingness)
Multiple R-squared:  0.0957,    Adjusted R-squared:  0.09418
F-statistic: 63.36 on 4 and 2395 DF,  p-value: < 2.2e-16
```

Appendix

```
Call:
lm(formula = ratings ~ (price + size + motion + style):gender,
    data = ChildAttr)

Residuals:
    Min      1Q  Median      3Q     Max
-45.016 -13.541   1.567  12.215  45.095

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    43.5724     0.4600  94.725  < 2e-16 ***
price:gender   12.3222     0.9049  13.617  < 2e-16 ***
size:gender     6.8987     0.9061   7.614  3.8e-14 ***
motion:gender   1.6545     0.8458   1.956  0.05058 .
style:gender    2.4747     0.8458   2.926  0.00347 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 16.94 on 2395 degrees of freedom
  (800 observations deleted due to missingness)
Multiple R-squared:  0.1665,    Adjusted R-squared:  0.1652
F-statistic: 119.6 on 4 and 2395 DF,  p-value: < 2.2e-16
```

Appendix

```
Call:
lm(formula = ratings ~ price + size + motion + style, data = gender_0)

Residuals:
    Min      1Q  Median      3Q     Max
-33.917 -10.607  -2.351   7.762  47.017

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  36.5668     0.9821  37.233  < 2e-16 ***
price        16.8573     0.9203  18.318  < 2e-16 ***
size          3.8509     0.8811   4.371 1.36e-05 ***
motion       -0.7601     0.8811  -0.863   0.3885
style        -1.8895     0.8811  -2.145   0.0322 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 14.41 on 1099 degrees of freedom
  (368 observations deleted due to missingness)
Multiple R-squared:  0.2862,    Adjusted R-squared:  0.2836
F-statistic: 110.2 on 4 and 1099 DF,  p-value: < 2.2e-16
```

Appendix

```
Call:
lm(formula = ratings ~ price + size + motion + style, data = gender_1)

Residuals:
    Min      1Q  Median      3Q     Max
-45.675 -13.646   2.716  12.948  36.175

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  40.8701     1.0580  38.630  < 2e-16 ***
price        13.5086     0.9914  13.626  < 2e-16 ***
size          7.7555     0.9492   8.171 7.24e-16 ***
motion        2.9068     0.9492   3.062  0.00224 **
style         3.7270     0.9492   3.927 9.07e-05 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 16.82 on 1291 degrees of freedom
  (432 observations deleted due to missingness)
Multiple R-squared:  0.1902,    Adjusted R-squared:  0.1877
F-statistic: 75.82 on 4 and 1291 DF,  p-value: < 2.2e-16
```

Appendix

```
Call:
lm(formula = ratings ~ price + size + motion + style, data = age_2yr)

Residuals:
    Min      1Q  Median      3Q     Max
-43.528 -11.312  -0.598   9.857  43.040

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  39.5462     1.0164  38.909  < 2e-16 ***
price        14.4133     0.9524  15.134  < 2e-16 ***
size          3.8532     0.9118   4.226 2.57e-05 ***
motion        2.7950     0.9118   3.065  0.00222 **
style         1.1867     0.9118   1.301  0.19338
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 15.47 on 1183 degrees of freedom
  (396 observations deleted due to missingness)
Multiple R-squared:  0.1912,    Adjusted R-squared:  0.1884
F-statistic:  69.9 on 4 and 1183 DF,  p-value: < 2.2e-16
```

Appendix

```
Call:
lm(formula = ratings ~ price + size + motion + style, data = age_3.4yr)

Residuals:
    Min      1Q  Median      3Q     Max
-37.465 -14.368  -2.484  15.008  44.386

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  38.2480     1.1400  33.549  < 2e-16 ***
price        15.6721     1.0683  14.671  < 2e-16 ***
size          8.0239     1.0228   7.845 9.47e-15 ***
motion       -0.3238     1.0228  -0.317    0.752
style         1.1010     1.0228   1.076    0.282
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 17.53 on 1207 degrees of freedom
  (404 observations deleted due to missingness)
Multiple R-squared:  0.2185,    Adjusted R-squared:  0.2159
F-statistic: 84.37 on 4 and 1207 DF,  p-value: < 2.2e-16
```

Appendix

Scenario1	5	13	4	8		profitability
Market Share	0.03	0.045	0.415	0.51		0.35365187
Price	111.99	111.99	95.99			
Marginal Cost	33	33	29			
Profit of Each Product	9478.8	14218.2	111203.4			
Profit of Firm	68233.7333					

Scenario3	13	4	8			profitability
Market Share	0.065	0.415	0.52			0.45141554
Price	111.99	95.99				
Marginal Cost	33	29				
Profit of Each Product	20537.4	111203.4				
Profit of Firm	85074.1333					

Appendix

Scenario5	5	4	8			profitability
Market Share	0.04	0.415	0.545			0.43537374
Price	111.99	95.99				
Marginal Cost	33	29				
Profit of Each Product	12638.4	111203.4				
Profit of Firm	77175.1333					

Scenario6	5	4	16	8		profitability
Market Share	0.02	0.355	0.45	0.175		0.39960656
Price	111.99	95.99	95.99			
Marginal Cost	33	29	41			
Profit of Each Product	6319.2	95125.8	98982			
Profit of Firm	127093.667					