Vivian Ellis Two Way MANOVA

A two-way MANOVA will be performed using three metric purchase outcomes, customer satisfaction, likelihood of recommending HBAT, and likelihood of future purchases from HBAT as the dependent variables. The independent variables used includes customer type and firm size.

| **MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall Customer\_\*Firm\_size2 Effect H = Type III SSCP Matrix for Customer\_\*Firm\_size2 E = Error SSCP Matrix  S=2    M=0    N=95** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.87510986 | 4.41 | 6 | 384 | 0.0002 |
| **Pillai's Trace** | 0.12703448 | 4.36 | 6 | 386 | 0.0003 |
| **Hotelling-Lawley Trace** | 0.14026330 | 4.48 | 6 | 254.23 | 0.0002 |
| **Roy's Greatest Root** | 0.11981145 | 7.71 | 3 | 193 | <.0001 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |
| **NOTE: F Statistic for Wilks' Lambda is exact.** | | | | | |

Let, Ho: There is no interaction. With Wilks’ lambda = .8751, =4.41 and p-value=.0002. The null hypothesis is rejected and there exists and interaction. The MANOVA tests for the main effects are seen in the following tables. Where customer type: Wilks’ Lambda = 0.3885=38.68, and p-value = < .0001. Reject Ho, not all mean vectors are the same. For distribution: Wilks’ Lambda = 0.8132, =14.70, p-value <0.0001. Reject Ho, not all mean vectors are the same.

| **MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall Customer\_type200 Effect H = Type III SSCP Matrix for Customer\_type200 E = Error SSCP Matrix  S=2    M=0    N=95** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.38851354 | 38.68 | 6 | 384 | <.0001 |
| **Pillai's Trace** | 0.61186511 | 28.36 | 6 | 386 | <.0001 |
| **Hotelling-Lawley Trace** | 1.57293824 | 50.20 | 6 | 254.23 | <.0001 |
| **Roy's Greatest Root** | 1.57231839 | 101.15 | 3 | 193 | <.0001 |
| **NOTE: F Statistic for Roy's Greatest Root is an upper bound.** | | | | | |
| **NOTE: F Statistic for Wilks' Lambda is exact.** | | | | | |

| **MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall Firm\_size200 Effect H = Type III SSCP Matrix for Firm\_size200 E = Error SSCP Matrix  S=1    M=0.5    N=95** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Statistic** | **Value** | **F Value** | **Num DF** | **Den DF** | **Pr > F** |
| **Wilks' Lambda** | 0.81323506 | 14.70 | 3 | 192 | <.0001 |
| **Pillai's Trace** | 0.18676494 | 14.70 | 3 | 192 | <.0001 |
| **Hotelling-Lawley Trace** | 0.22965677 | 14.70 | 3 | 192 | <.0001 |
| **Roy's Greatest Root** | 0.22965677 | 14.70 | 3 | 192 | <.0001 |

The following graph shows that firm size group 1 means are higher than group 0 means and it appears that customer type group 3 mean is higher than group 1 mean.







Pairwise comparisons for dependent variable, satisfaction, and customer type. All three means are significantly different. Group 3 mean is the highest, then group 2, finally group 1 mean as seen below.

| **Least Squares Means for Effect Customer\_type200 t for H0: LSMean(i)=LSMean(j) / Pr > |t|  Dependent Variable: Satis200** | | | |
| --- | --- | --- | --- |
| **i/j** | **1** | **2** | **3** |
| **1** |  | -11.3891 <.0001 | -16.6351 <.0001 |
| **2** | 11.38911 <.0001 |  | -4.9291 <.0001 |
| **3** | 16.63515 <.0001 | 4.9291 <.0001 |  |



These comparisons are not needed since there are only two categories for future purchase. Group 1 has higher means than group 0; they are all significantly higher.

| **Firm\_size200** | **Future\_Purch200 LSMEAN** | **H0:LSMean1=LSMean2** | |
| --- | --- | --- | --- |
| **t Value** | **Pr > |t|** |
| **0** | 7.42501034 | -5.20 | <.0001 |
| **1** | 7.92679108 |  |  |





