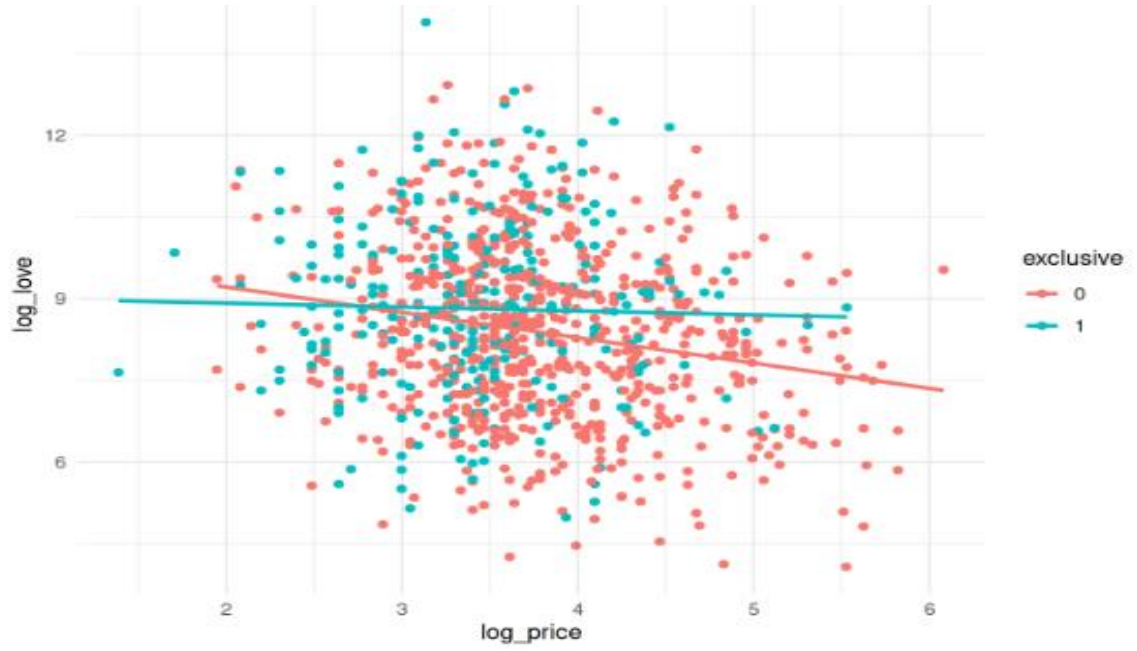
Appendix T

Interaction analysis for exclusive vs log price

The interaction test between exclusive vs log price predictors suggests no statistically significant interaction effect. The F-test yielded an F-value of 5.411, with a corresponding p-value of 0.02. We fail to reject the null hypothesis at a significance level of $\alpha = 0.01$, indicating no significant interaction effect between these two predictors on log love. Therefore, the regression lines for exclusive vs log price are parallel across different levels of these predictors.

Interaction plot for exclusive vs log price

```{r}
ggplot(data = sephoraData, aes(y = log_love, x = log_price, color = exclusive)) +
      geom_point() +
      geom_smooth(se = FALSE, method = "lm") +
      theme_minimal()
```



Analysis of variance

```{r}
inter_model1 <- lm(log_love ~ log_price*exclusive, data = sephoraData)

anova_model1 <- anova(inter_model1)
kbl(anova_model1) %>%
kable_classic_2(full_width = F)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
log_price	1	84.29	84.29	35.18	0.00
exclusive	1	17.85	17.85	7.45	0.01
Log price * exclusive	1	12.96	12.96	5.41	0.02
Residuals	996	2386.38	2.40	NA	NA

F-test Analysis

```{r}
F_start <- round(qf(.99,anova_model1$Df[3],anova_model1$Df[4]),3)
```

$$H_0 : \beta_1 = 0$$
$$H_A : \beta_1 \neq 0$$
$$\alpha = 0.05$$
$$\text{Reject if } F^* > F(0.99, 1, 996) = 6.66$$
$$F^* = 5.411$$
$$P_{value} = 0.02$$

From the ANOVA output, we have F∗ = 5.411, we reject H0 and conclude that the interaction terms shouldn't be dropped from the model. The p-value associated with this test is 0.02.