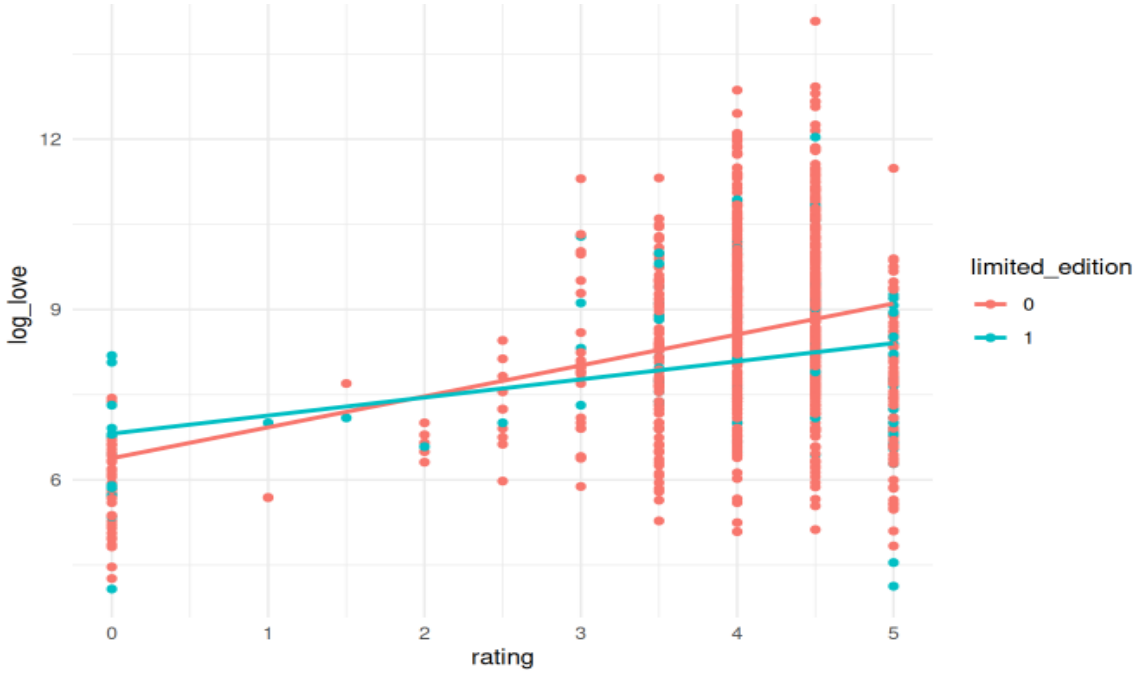
Appendix N

Interaction analysis for limited edition vs rating

The interaction test between limited edition and rating predictors suggests no statistically significant interaction effect. The F-test yielded an F-value of 4.46, with a corresponding p-value of 0.037. 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 limited edition vs. rating are parallel across different levels of these predictors.

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

Interaction plot of limited edition vs rating



Analysis of variance

```{r}
inter_model1 <- lm(log_love ~ rating*limited_edition, 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)
rating	1	290.27	290.27	132.07	0.00
limited_edition	1	12.36	12.36	5.62	0.02
Rating * limited_edition	1	9.80	9.80	4.46	0.03
Residuals	996	2189.05	2.20	NA	NA

F-test Analysis

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

$$H_0 : \beta_1 = 0$$
$$H_A : \beta_1 \neq 0$$
$$\alpha = 0.05$$
$$\text{Reject if } F^* > F(0.99, 1, 996) = 6.66$$
$$F^* = 4.46$$
$$P_{value} = 0.035$$

From the ANOVA output, we have F* = 4.46, we fail to reject H0 and conclude that the interaction terms should be dropped from the model. The p-value associated with this test is 0.035.