The Impact of Positive and Negative Experiences on Overall Hotel Rating

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Motivation

Humans have a cognitive bias, called the negativity bias, that causes adverse events to have a greater impact on our psychological state than positive events. It is believed this is true even if the positive and negative experiences are of the same magnitude (Pilat et al. 2021). We want to test if the negative bias is true using a mundane yet common experience, staying in a hotel.

Research Question

Do positive or negative experiences have more of an effect on overall hotel rating?

Research Hypothesis

Negative experiences will be associated with a decrease in overall rating to a greater extent than positive experiences will be associated with an increase in overall rating due to negativity bias.

Prediction

If the hypothesis is correct, we would expect negative experience factors to have negative coefficients that are greater in magnitude than those of positive experience factors with positive coefficients.

Procedure

To test our hypothesis we used a dataset of hotel reviews from Kaggle. Each review had a positive section, negative section, and an overall rating. Our independent variable was experiences and our dependent variable was the guests' rating on a scale of 1-10. Experiences were defined in relation to common aspects of hotel stays including rooms, beds, staff, and breakfast. These aspects were identified from a list of most common words used in the reviews. Two bar graphs were created in the initial analysis which include the counts of how many times

each aspect word appeared in negative and positive reviews respectively. This was to gauge which aspects were most commonly mentioned, which demonstrates which aspects were important to the most reviewers. Related words or words with the same meaning were grouped together as one aspect. We then filtered out reviews that did not mention any of the identified aspects or reviews that mentioned the aspect in both the negative and positive section. We labeled reviews with one of the aspects mentioned in the positive section of the review as positive experiences with that aspect of their stay, and did the same for negative experiences. Each combination of experience polarity and aspect was treated as a level within our independent factor variable. Our levels were aspect one positive experience, aspect one negative experience, aspect two positive experience, aspect two negative experience, and so on for each of the four aspects. We used a mixed effects model with hotel as a random effect, the aspect factor variable as a fixed effect predictor, and the review score as the response variable. This enabled us to account for random variation due to the hotel for which the review was posted, then measure the linear relationship between the aspect present and review score

From our linear mixed effects model, we obtained coefficients for the impact of each positive and negative experience on the review score. The model summary included a series of ANOVA tests with a Welch–Satterthwaite approximation of the degrees of freedom to test if each factor was significant as a fixed effect. The coefficients for all factor levels except for negative breakfast were found to be significant to the model in these tests. We also conducted anova tests on the random effect and overall fixed effect, and found they were both significant to the model. These tests were not directly related to our research question, and were only done to assure the validity of our model.

After accounting for the hotel groups, the intercept of 8.5 represents the mean reviewer score for the positive rooms group and the coefficients represent deviations from that mean for the mean score of each other aspect group. The coefficient for the first positive rooms aspect group is encoded as zero, and all other aspects groups are defined relative to this reference level. As predicted all negative experiences had negative coefficients meaning they led to a decrease in overall ranking. However, unexpectedly two of the four positive factors, beds and breakfast, had negative coefficients. Most notable is that the coefficient for positive breakfast was more negative than the coefficient for negative breakfast. A possible explanation would be that the standards for a hotel continental breakfast are low, so if breakfast is worth mentioning in the negative portion of a review there may be a lack of other negative hotel features, but when it is mentioned in the positive section there are not any other good things to say about the hotel.

Results

Figure 1. Positive Word Frequency Bar Graph

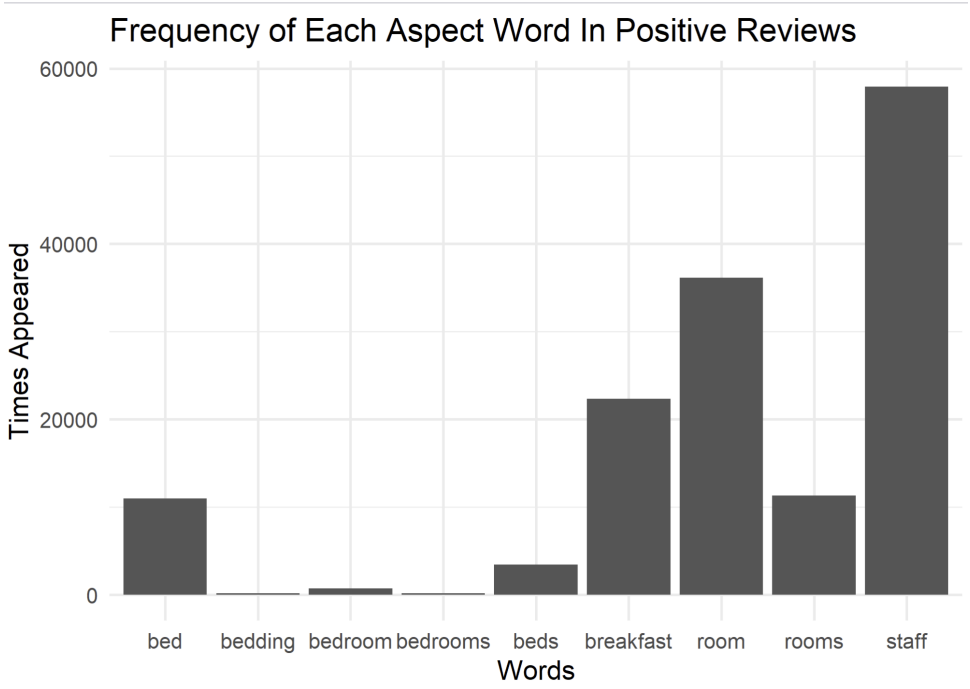

Figure 2. Negative Word Frequency Bar Graph

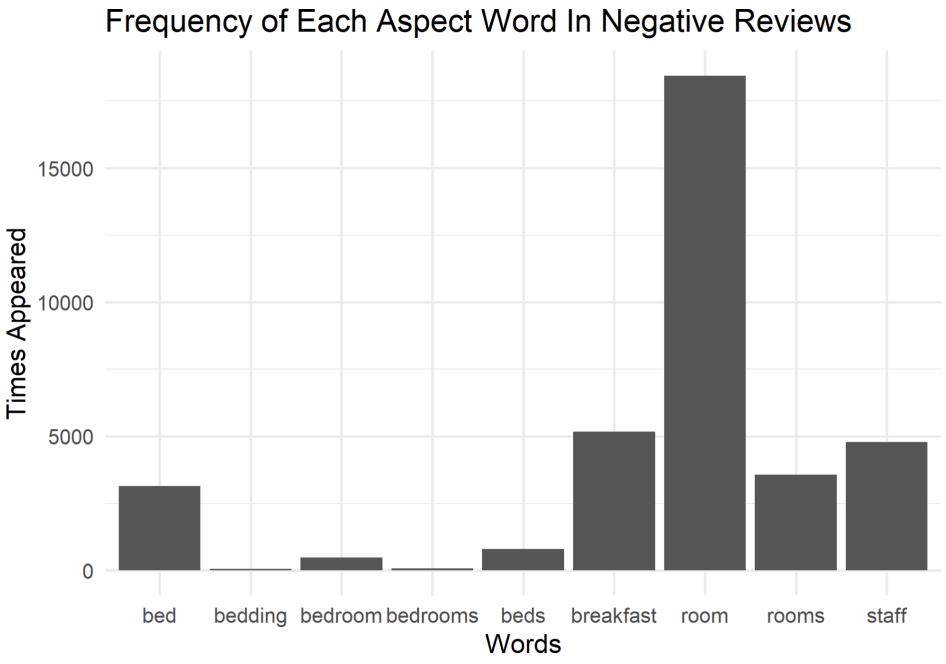

Figure 3. Aspect Coefficients and Significance

Aspect	Coefficient	t-value	p-value
Intercept (Positive room)	8.5	557.062	p<0.001
Negative room	-0.647	-85.341	p<0.001
Positive beds	-0.149	-12.265	p<0.001
Negative beds	-0.45	-31.008	p<0.001
Positive staff	0.29	37.247	p<0.001
Negative staff	-1.088	-81.374	p<0.001
Positive breakfast	-0.146	-13.111	p<0.001
Negative breakfast	-0.0154	-1.476	p=0.14

Figure 4. Confidence Intervals

Aspect		Lower	Upper	Overlap Each Other
Rooms	+	0	0	No
	-	-0.6615183	-0.63181481	
Beds	+	-0.1722468	-0.12478096	No
	-	-0.4782743	-0.4214059	
Staff	+	0.27508907	0.305648603	No
	-	-1.1138357	-1.06144149	
Breakfast	+	-0.1678436	-0.12418653	No
	-	-0.0359187	0.005064494	

Analysis

To test whether the difference between the coefficients of each corresponding pair of positive and negative experiences was significant, we created 95% confidence intervals for each coefficient, then checked whether the intervals for each positive-negative pair overlapped. Our null hypothesis was that for each pair of positive and negative experiences, there is no difference between their coefficients and 95% confidence intervals surrounding them would overlap. The alternative hypothesis was that there is a significant difference between the coefficients of corresponding experiences at the 0.05 level. None of the confidence intervals for the coefficients of each positive-negative pair for rooms, bed, staff, or breakfast overlapped, so we reject our null hypotheses and can conclude that the differences between each pair are not due to random chance.

Conclusions

The differences between positive and negative coefficients were significant for all aspects, so we can interpret this difference as it relates to negativity bias. Since the reviews for rooms and staff had negative coefficients for negative reviews, positive coefficients for positive reviews, and larger negative coefficients than positive coefficients, negative experiences had a greater effect on overall reviewer scores than positive experiences in these cases. This means our findings support the interpretation of negativity bias for these cases. However, we can not make an overall claim on the effects of negativity bias since these conditions were not all met for bed or breakfast. This discrepancy warrants further investigation. For future research, we might consider repeating our analysis on negativity bias in movie, restaurant, amusement park, and other product reviews.

References

Pilat D., & Sekoul D., & Warje K. (2021). Negativity Bias. The Decision Lab. Retrieved December 1, 2024, from https://thedecisionlab.com/biases/negativity-bias

Liu, J. (2017). *515k Hotel Reviews Data in Europe* [Data set]. Kaggle. Retrieved October 28, 2024, from https://www.kaggle.com/datasets/jiashenliu/515k-hotel-reviews-data-in-europe

Acknowledgments

We have not used any AI tools or technologies to prepare this paper.