Advertising and Revenue Dynamics: A Comparative Study of Dilomatox and Zoraffil

Jason Noble

School of Engineering & Technology, National University

ANA605, Analytic Models and Data Systems

Matthew Vanderbilt

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This report evaluates the impact of advertising spend on revenue for Dilomatox and Zoraffil, using 52 weeks of data from our accounting department and quarterly SEC filings. By conducting correlation and regression analyses, we found that Dilomatox exhibits a strong positive correlation with advertising (r = 0.90), with a significant regression coefficient indicating that <u>each million spent on advertising increases revenue by approximately $17.94 million</u>. Zoraffil, however, showed a weaker correlation (r = 0.52) and a lower regression coefficient, suggesting that advertising is less critical to its revenue generation. <u>The proposed $11 million reduction in the Dilomatox advertising budget is projected to decrease revenue by approximately $197.08 million for the year</u>. Residuals analysis confirmed the linear models used were appropriate. This report provides actionable insights for budgetary decision making and suggests future strategies for optimizing revenue returns.

Method

The dataset used in this analysis contains weekly data over a 52-week period for both Dilomatox and Zoraffil. The key variables for both are: <u>Advertising Spend</u>: The amount spent on advertising each week (in millions of dollars), and <u>Revenue</u>: The weekly revenue generated by each product (in millions of dollars). There was no missing or abnormal data and summary statistics are provided in Table 1. This analysis focused on understanding the direct relationship between the variables for each product and are illustrated in Figure 1 and Figure 2.

Table 1

Summary statistics for the analyzed variables

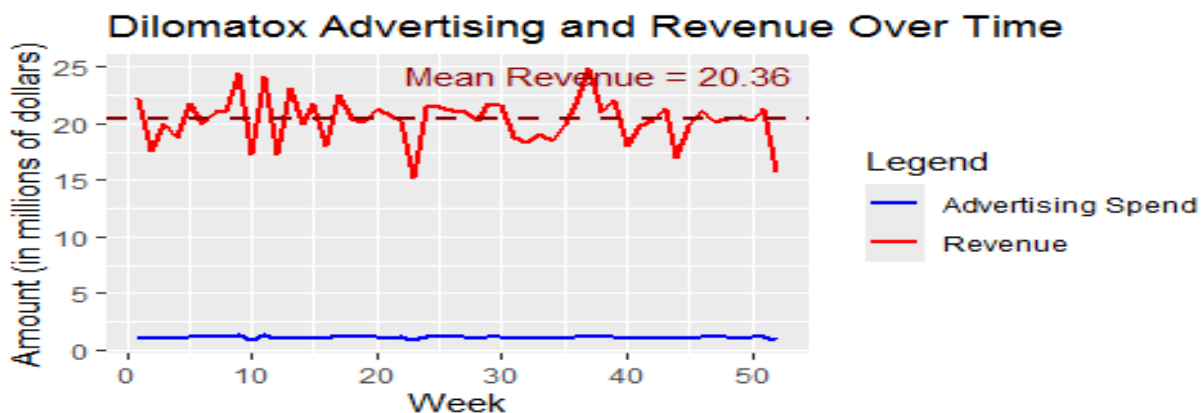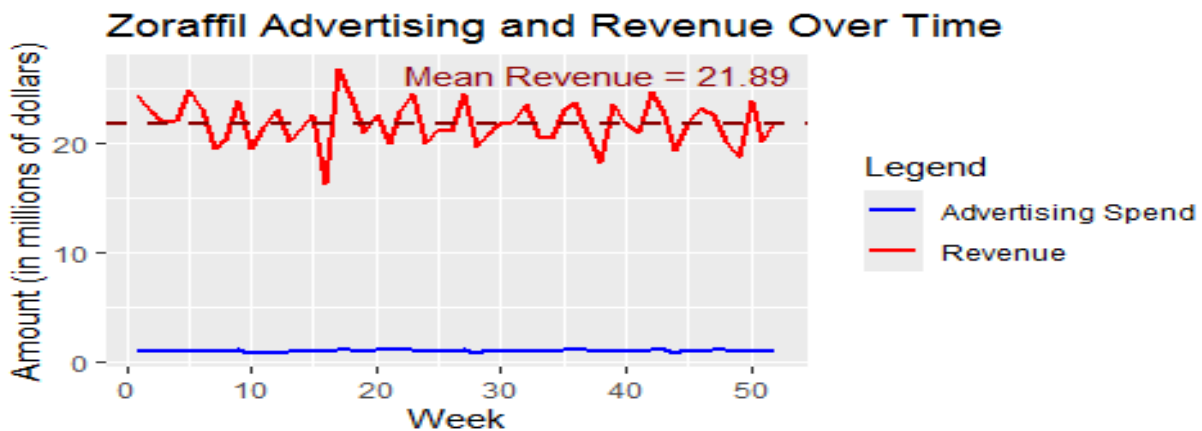| Variable	Dilomatox Adv.	Dilomatox Rev.	Zoraffil Adv.	Zoraffil Rev.
min	0.86	15.15	0.78	16.32
Q1	1.0375	19.695	0.9375	20.5225
median	1.11	20.475	1	21.92
Q3	1.16	21.47	1.07	23.1875
max	1.33	24.89	1.21	26.82
mean	1.0935	20.3579	1.0008	21.8944
sd	0.0995	1.983	0.0898	1.9698

Figure 1

Figure 2

Figures 2-10, show that the sample size of 52 did not provide a reliable and normal distribution, models were resampled to confirm the means associated with our data.
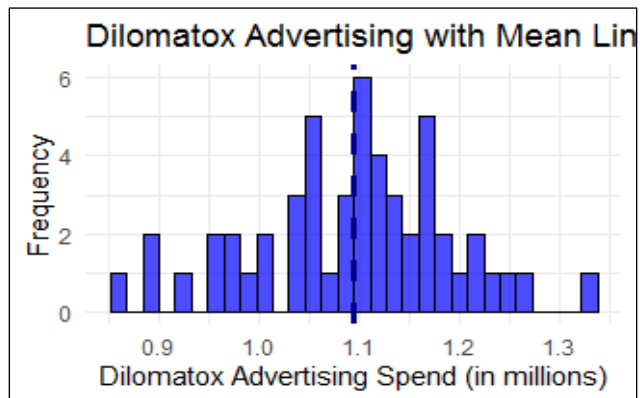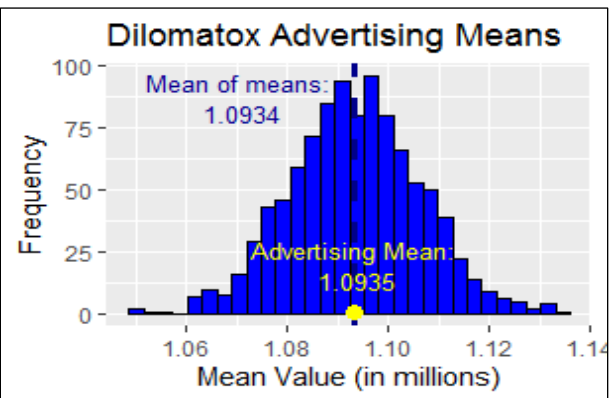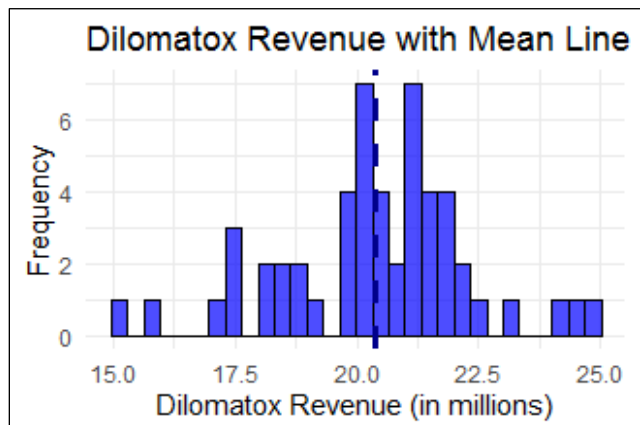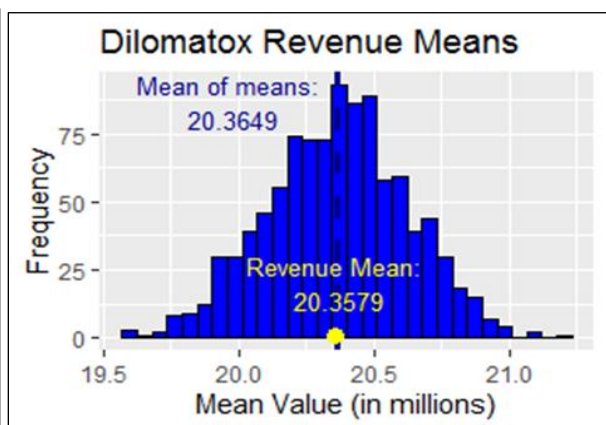
Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Zoraffil Advertising with Mean Line

Zoraffil Advertising Means

Figure 9

Figure 10

Zoraffil Revenue with Mean Line

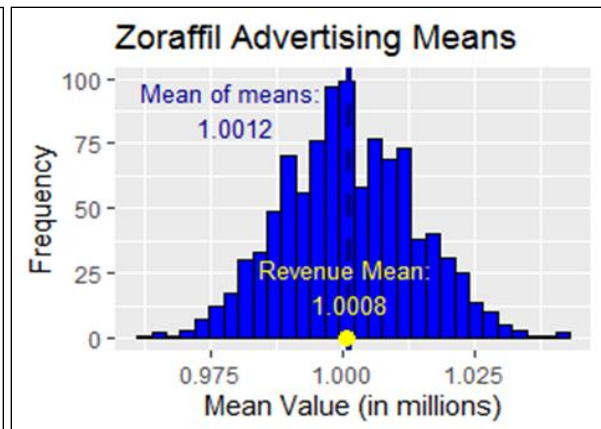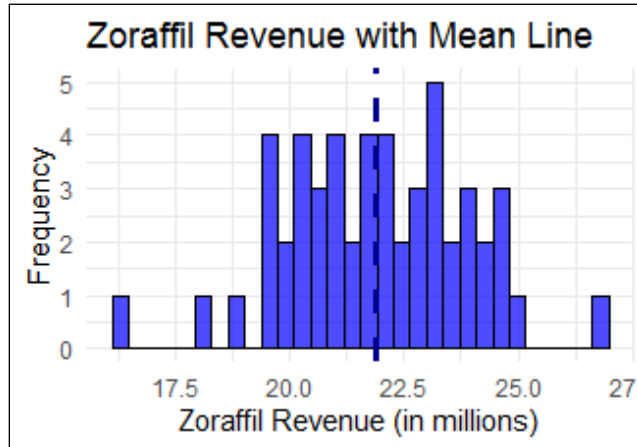Zoraffil Revenue Means
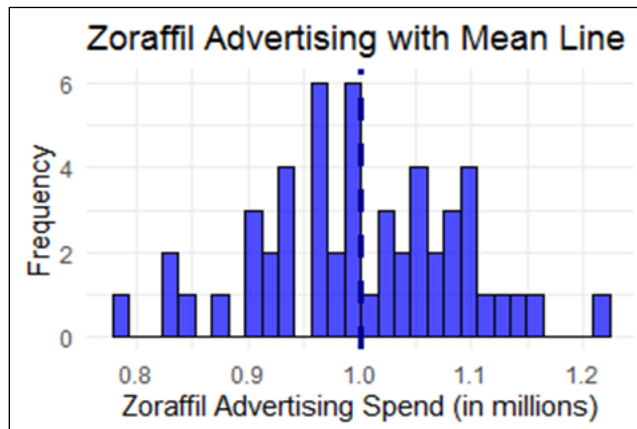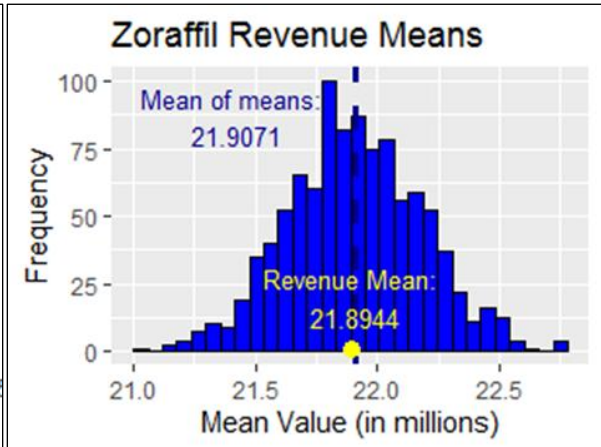
Correlation analysis between advertising spend and revenue for Dilomatox, Cor = 0.90, indicates a strong positive relationship. The small confidence interval, .83-.94, helps confirm the strength at that level. In contrast, the correlation for Zoraffil, Cor = 0.52 suggests a moderately positive relationship, but the confidence interval, .29-.70, suggests that value is less trustworthy. These results indicate that advertising spend is a more critical driver of revenue for Dilomatox compared to Zoraffil.

The linear regression model for Dilomatox yielded a regression coefficient of 17.94, meaning that each additional million dollars spent on advertising is directly associated with an

increase of approximately $17.94 million in revenue. The model for Zoraffil showed a lower regression coefficient of 11.50, indicating that the Zoraffil revenue is less reliant on advertising. This regression model was used to project an $11 million reduction in the advertising budget, the results showed revenue reduced by $197.08 million for the year. A paired T-test was also run, comparing the current budget for this year against the reduced budget and it calculated the same revenue loss.

Residuals analysis was also conducted to confirm that the assumptions of linear regression were satisfied for both drug models. It provides confidence in the model's output, supported the use for making the future revenue forecast, and confirmed that our data is missing some key variable in the Zoraffil revenue.

Results

We set out to discover how strongly tied the revenue streams were to the advertising budgets. The correlation analysis conducted provided coefficients that show one drug is more dependent on advertising to keep sales elevated.

Dilomatox Advertising and Revenue Relationship

Analysis revealed a strong positive correlation between the Dilomatox advertising spend and revenue (Figure 11), with a correlation coefficient of $r = 0.90$. This is a robust linear relationship, where increases in advertising spend are closely followed by corresponding increases in revenue. This relationship is further supported by the close fit of the data points to the regression line. The strength of this correlation suggests advertising is a significant driver of Dilomatox sales performance. The implications of this finding are critical for budgetary decisions, as any changes in advertising spend are likely to have a direct and substantial impact on revenue. Such a strong correlation also suggests a high return on investment from advertising, making it a key area for sustaining and growing revenue. This analysis highlights the importance of maintaining or even increasing advertising budgets to capitalize on this strong relationship.

Figure 11
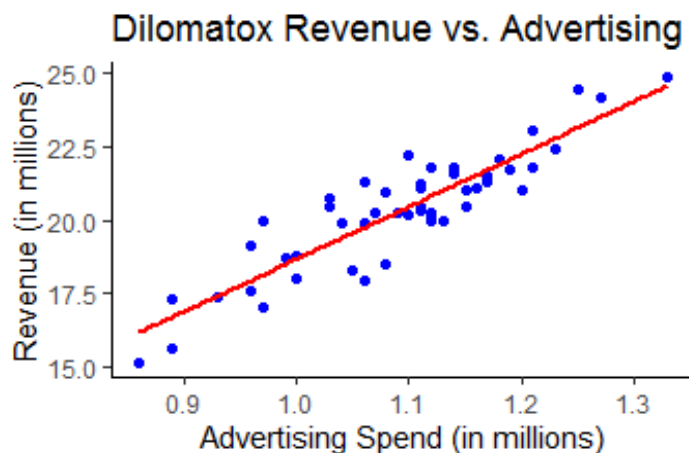
Zoraffil Advertising and Revenue Relationship

In contrast, Zoraffil exhibits a weaker positive correlation between advertising spend and revenue (Figure 12), with a correlation coefficient of $r = 0.52$. Although there is a positive relationship, the correlation is moderate, indicating that other factors may play a significant role in driving Zoraffil revenue. The scatter plot shows a wider spread of data points, with a less pronounced upward trend compared to Dilomatox, highlighting the variability in the Zoraffil response to advertising. This suggests that while advertising does contribute to revenue, its impact is less predictable and may vary depending on other market dynamics or internal factors. Their market segment appears less responsive to advertising; or brand loyalty, word-of-mouth, or other marketing strategies might be more influential. The weaker correlation could explain why Zoraffil has made the decision to reduce their advertising budget.

Figure 12
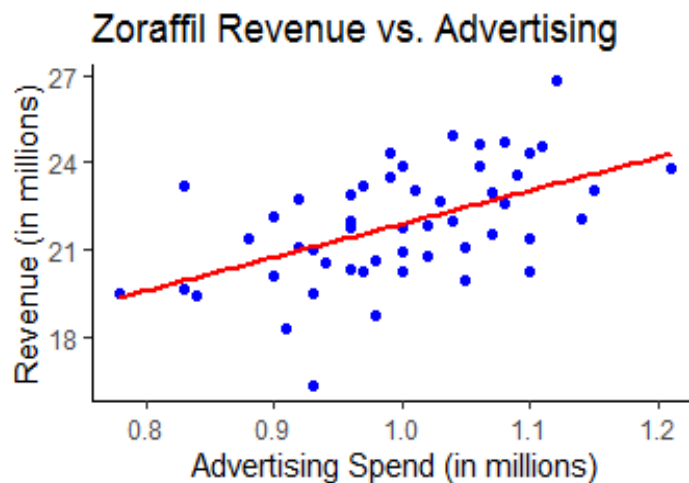
Dilomatox and Zoraffil Revenue Relationship

Despite both Dilomatox and Zoraffil being part of the same product portfolio, the correlation between their revenues is surprisingly low, r = 0.12. This weak correlation suggests that the revenues of these two drugs do not directly influence each other, even though their revenue patterns might appear to fluctuate in a similar manner over the time period. The line graph (Figure 13) illustrates this simultaneous fluctuation, where both revenues rise and fall together, yet the underlying relationship is not driven by a shared factor like marketing or seasonal trends. Instead, the parallel movement in their revenues may be attributed to external factors such as doctor recommendations, or economic conditions that impact the pharmaceutical industry as a whole.

Figure 13
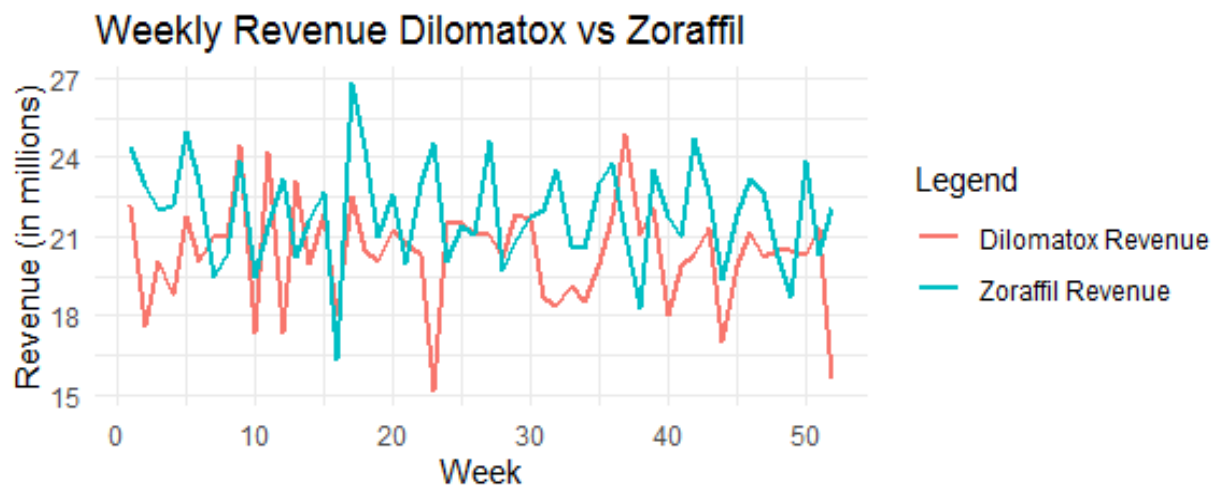
Looking into this weak correlation will be crucial for strategic planning, as it indicates that managing these products requires independent strategies rather than assuming a shared cause for revenue changes. This insight opens the door for deeper investigation into the external factors that might be influencing both products, but maybe not in similar ways.

Revenues were also analyzed week-to-week to see if weekly changes affected both drugs in a similar manner. The results, r = 0.22, suggest only a weak positive correlation between the week-to-week changes in Dilomatox and Zoraffil, but this correlation is not statistically significant. The p-value of 0.11 (>.05) indicates that we cannot confidently assert that there is a meaningful relationship between the two variables based on this data; as it could be random.

Dilomatox Revenue Regression Analysis Model

The regression analysis for Dilomatox confirms the strong relationship between advertising spend and revenue (Table 2). The regression model yields a significant coefficient for advertising spend, indicating that each $1 million spent on advertising leads to an approximate $17.94 million increase in revenue. This underscores the critical role of advertising in driving revenue for Dilomatox, with a high R^2 value indicating that a large proportion of the revenue variation is explained by the advertising alone. This statistical significance makes it a good tool for predicting future revenue. These finding suggests that advertising should remain a top priority in budget allocations, as it directly influences the company's bottom line.

Table 2

Dilomatox Revenue Regression Results

b_0	b_1	F	df_1 (DF)	t (p)	PRE	p
0.7432	17.9382	212.5	1 (50)	14.58 (0)	0.8095	0

Zoraffil Revenue Regression Analysis Model

The regression analysis for Zoraffil presents a more complex picture; with a lower regression coefficient and a less robust fit compared to Dilomatox (Table 3). While the model does show that increased advertising spend positively affects revenue, the impact is notably smaller, and the R^2 value indicates that a significant portion of the revenue variation is not explained by advertising alone. This suggests that other factors are influencing Zoraffil revenue. These results imply that while advertising is a factor, it may not be the most effective driver of revenue growth for Zoraffil. Instead, the company may be investing in other marketing strategies or operational improvements that could have a more substantial impact on sales.

Table 3

Zoraffil Revenue Regression Results

b_0	b_1	F	df_1 (DF)	t (P)	PRE	p
10.383	11.502	18.98	1 (50)	4.3357 (0)	0.2752	0.0001

Paired T-Test: Impact of Budget Reduction on Dilomatox

Using a regression model and also a paired T-test, we looked at the potential impact of the CFO's proposed $11 million reduction in advertising spend on the Dilomatox revenue. Both model predicted that a budget cut of $211,538 a week ($881,923 spent) would result in a significant decrease in weekly revenue (16.56 million), approximately $3.79 million less (Figure 14), 95% confidence interval of 3.24 – 4.35 million. This decrease is statistically significant, as confirmed by the paired t-test ($t = 13.798$, $df = 51$, $p < 2.2e-16$).
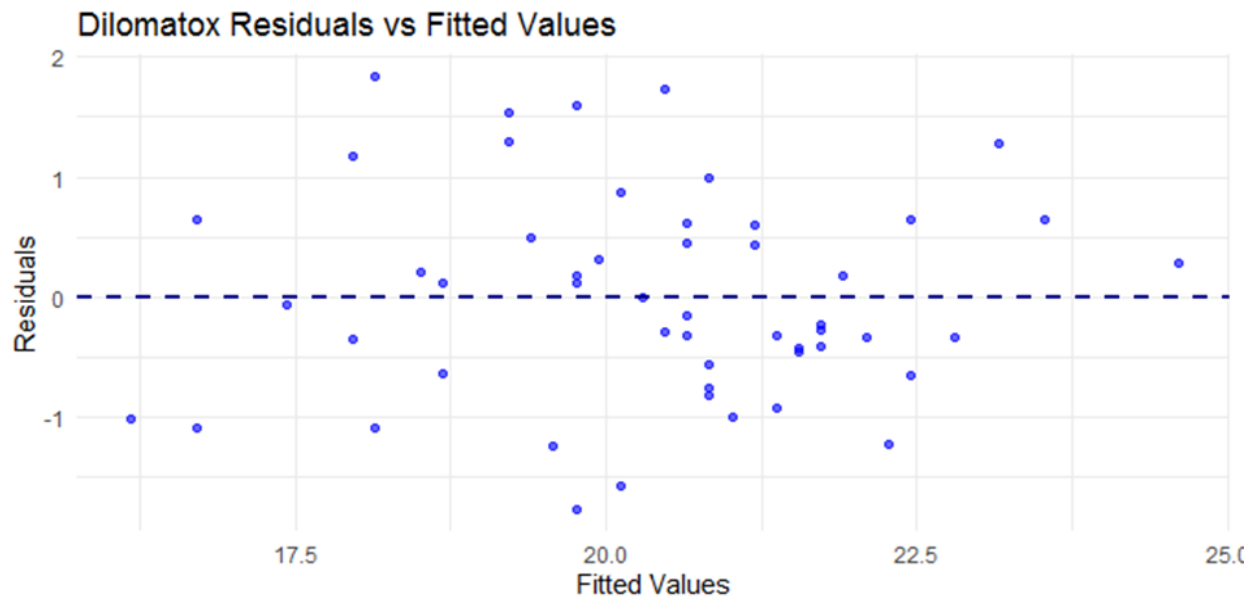
Figure 14
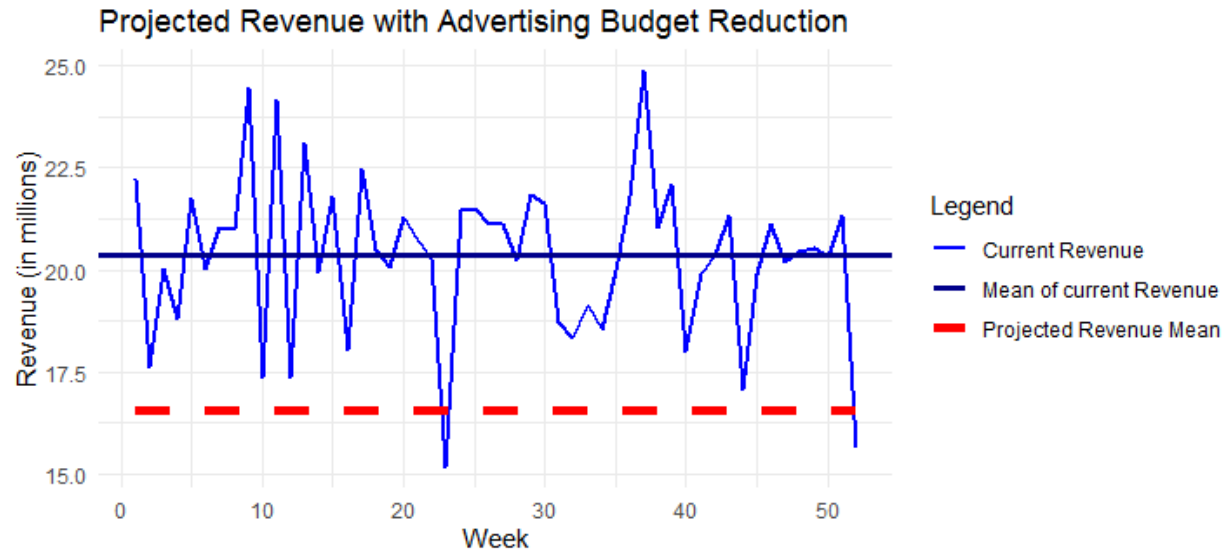
This finding underscores the reliance of Dilomatox revenue on advertising spend, while also highlighting the risk associated with reducing the marketing budget. The projected revenue loss is substantial and could have long-term implications for market share and profitability if the budget cut is implemented. This analysis suggests that the company should carefully weigh a cost savings method against the potential revenue loss before deciding on the budget reduction. The results also provide a clear quantitative basis for discussions with stakeholders about the importance of maintaining or even increasing advertising investments to sustain and build revenue growth.

Residuals Analysis for Dilomatox

The residual analysis for the Dilomatox revenue model shows a random distribution of residuals around zero, confirming that the assumptions of linear regression are satisfied. The residual plot (Figure 15) visually reinforces this conclusion, showing no systematic deviations and that the linear relationship between advertising spend and revenue is appropriate. The lack of

any discernible pattern in the residuals indicates that there are no major issues that would undermine the validity of the model. This strengthens the confidence in the model's predictions and supports its use for making future revenue forecasts.

Figure 15


Dilomatox Residuals vs Fitted Values

Residuals Analysis for Zoraffil

The residual analysis for the Zoraffil revenue model, while generally satisfactory, reveals a slightly wider dispersion of residuals compared to Dilomatox (Figure 16), reflecting the weaker fit of the model. Although there is no clear pattern suggesting a major violation of regression assumptions, the increased spread of residuals indicates that the model does not capture all the factors influencing Zoraffil revenue. This might be due to unaccounted-for variables or the inherently more complex nature of Zoraffil revenue drivers. Despite this, the residuals do not show any systematic bias, meaning the model is still useful, though with a lower degree of

confidence compared to the Dilomatox model. This finding supports a need for further
investigation into the Zoraffil driving factors.

Figure 16

Zoraffil Residuals vs Fitted Values
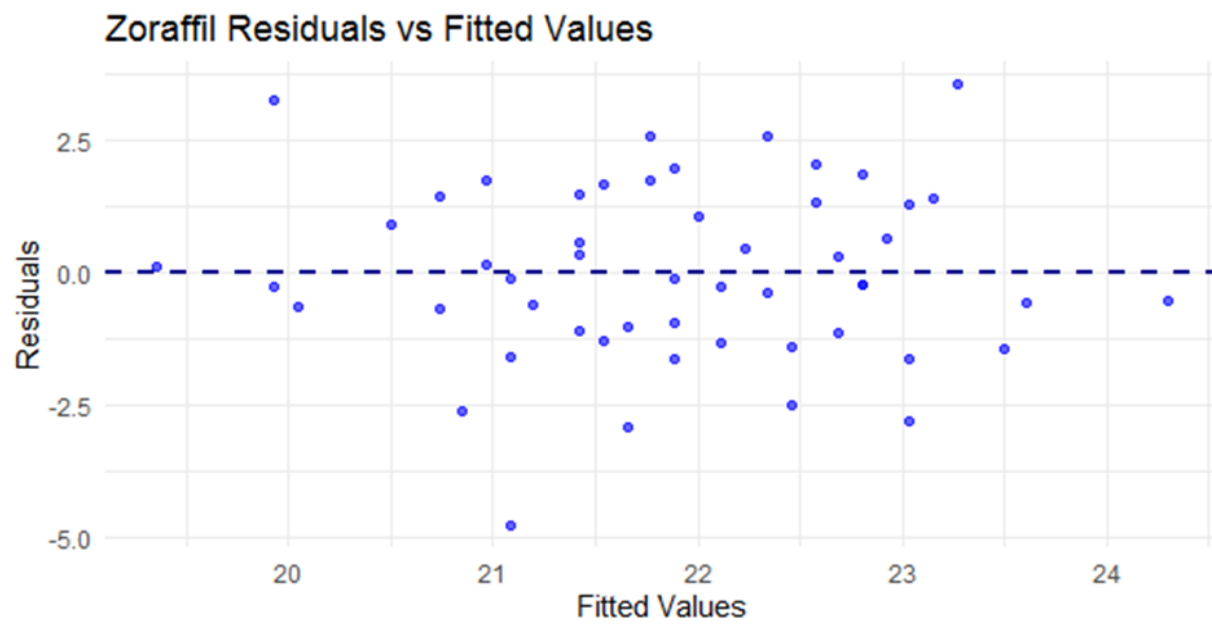
Discussion

The analysis provided multiple avenues of evidence that for reasons that should be looked into, it is inappropriate to compare the market performance of Dilomatox to Zoraffil. The linear regression models were useful in quantifying the impact of marketing spend on revenue, providing clear, actionable insights. The model for Dilomatox, demonstrated a strong relationship with revenue, reflected in a coefficient of 0.90. This indicates that marketing spend is almost the entire driver of revenue for Dilomatox.

However, the analysis also revealed that the model for Zoraffil was less conclusive, with a weaker correlation between marketing spend and revenue. The regression model that included Zoraffil revenue as a predictor for Dilomatox revenue showed a very small, and negative, coefficient, suggesting that Zoraffil performance does not meaningfully impact Dilomatox revenue and they do not fluctuate together. This speaks to the need to look for other unexamined factors that play a significant role for our competitor.

The model successfully predicted the outcome, with the regression equation showing a clear and significant relationship between the Dilomatox marketing spend and its revenue. The R^2 value of 0.81 for this model was strong, indicating that a substantial proportion of the variance in revenue could be explained by the model. This suggests that the model is effective for predicting how changes in marketing spend might influence revenue for Dilomatox.

In contrast, the model for Zoraffil was less predictive, with a lower R^2 value of 0.28 and other weaker stats. This indicates that the model does not capture as much of the variance in revenue, suggesting that other factors not included in the model would be more influential for Zoraffil.

The initial hypothesis was that marketing spend would predict revenue for both Dilomatox and Zoraffil. For Dilomatox, the results support this hypothesis, as we observed a significant positive relationship between marketing spend and revenue. Therefore, we can reject the null hypothesis (which states that there is no relationship) for Dilomatox.

For Zoraffil, however, the weaker relationship, lower R^2 value, and 0 in the CI all suggest that the null hypothesis cannot be confidently rejected. The evidence does not strongly support the initial hypothesis for Zoraffil, indicating that additional predictors need to be considered.

Looking forward, it is clear that the fluctuations in Dilomatox should be a focus, and looking at external factors to explain the random revenues across the weeks. These could include factors such as an unknown market component, brand loyalty, doctor and clinic prescription preference, regional influence, demographic difference, or economic conditions that were not accounted for in the current model. Additionally, a future study should consider looking back further than 1 year during data analysis, it would help in identifying trends and improving the distribution and reliability of the model's predictions.

The significant projected decline in revenue for Dilomatox following the budget reduction emphasizes the importance of increasing and optimizing—or at the very least—maintaining the advertising spend for this product.

Conclusion

In this analysis, we aimed to understand the factors influencing Dilomatox revenue by exploring the relationship between marketing spend alongside possible interactions with Zoraffil marketing efforts and revenue stream. Our primary objective was to determine whether marketing expenditures affect revenue for Dilomatox and to what extent these factors could predict future performance.

We conducted a thorough examination of revenue using multiple linear regression models based on marketing spend. The hypothesis was that marketing spend, does significantly impact Dilomatox revenue. Through our analysis, we found that Dilomatox marketing spend is indeed a strong predictor of its revenue, with a substantial positive relationship 0.90. This finding allowed us to reject the null hypothesis, confirming that marketing spend plays a crucial role in driving revenue for Dilomatox.

However, the results for Zoraffil are unclear, it has weaker relationships and lower predictive power, suggesting that other factors not included in this analysis are likely influencing Zoraffil's performance.

Suggested Actions: The strong relationship between marketing spend and revenue suggests that there is a 95% probability that the connection between advertising and revenue is .885 +/- .055. <u>Increasing the marketing budget should be of the highest priority. Every additional million dollars spent on advertising Dilomatox returns $17.94 +/- 2.47 million</u>. Secondarily, maintaining the current budget should allow a small revenue gain, if we start to focus on understanding and smoothing the fluctuations. If a reduction is necessary, alternative strategies to maintain revenue should be explored, such as targeted promotions or increased investment in other high-impact marketing activities.

While we have validated the importance of marketing spend for Dilomatox, further analysis is needed to fully understand the dynamics at play for Zoraffil. Finding out what drives their sales may open up our sales to a whole new base of customers. If more evidence is needed, we could run an experiment with the remaining weeks of this fiscal year, we could test both increased and decreased advertising spends looking to validate the increased or decreased budgets.

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