BrightLife Cosmetics: Decoding Advertising Impact in the Beauty Industry | Case 5

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Question 1: Assessing Advertising Effectiveness

1. Individual Medium Effectiveness: Analyze and compare the effectiveness of TV, Radio, and Newspaper advertising mediums independently in terms of driving sales for BrightLife. Identify the medium with the highest return on investment (ROI) and recommend its prioritization in future campaigns.

<u>Effectiveness of Television Advertising</u>

Regression Statistics					
Multiple R	0.397032				
R Square	0.157634				
Adjusted R Square	0.154807				
Standard Error	9.561173				
Observations	300				

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	5097.865	5097.865	55.76555	9.07E-13
Residual	298	27241.98	91.41602		
Total	299	32339.84			

|	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48483.33	28.8329	1681.528	0	48426.59	48540.07	48426.59	48540.07
TV_Adspend	0.411095	0.05505	7.467633	9.07E-13	0.302758	0.519431	0.302758	0.519431

R Square (Coefficient of Determination): The R^2 value of 0.158 means that approximately 15.8% of the variability in sales can be explained by variability in TV advertising spending. This indicates that TV advertising spending alone accounts for a small portion of the variation in sales, and there are likely other factors influencing sales that are not included in the model.

Adjusted R Square: The adjusted R^2 value of 0.155 suggests that the explanatory power of the model is not significantly improved by including additional variables beyond TV advertising spending.

ANOVA: The ANOVA table shows that the regression model is statistically significant (p-value < 0.05), suggesting that TV advertising spending has a significant effect on sales. The F-statistic of 55.77 also supports this conclusion.

Intercept: The estimated sales when TV advertising spending is zero is approximately $48,483.33.

TV_Adspend: For each unit increase in TV advertising spending, sales are predicted to increase by approximately $0.41. The coefficient is statistically significant ($p < 0.05$).
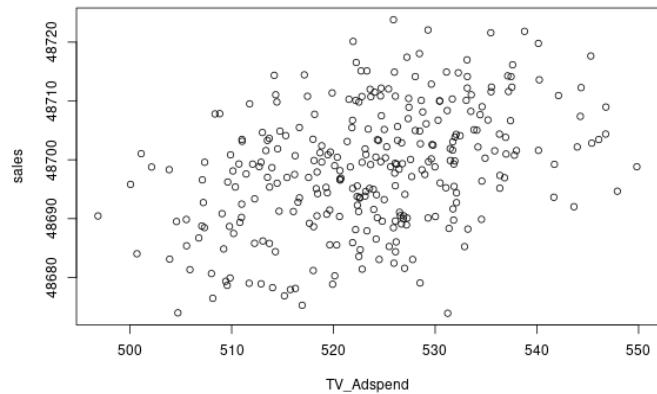
Overall, while there is a statistically significant relationship between TV advertising spending and sales, the model explains only a relatively small proportion of the variability in sales. This implies that other factors beyond TV advertising spending likely contribute to sales, and it may be beneficial to consider additional variables in the analysis to improve the predictive power of the model.

Effectiveness of Radio Advertising

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.200187421
R Square	0.040075004
Adjusted R Square	0.036853779
Standard Error	10.20656136
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1296.019204	1296.019	12.44092107	0.000486197
Residual	298	31043.82068	104.1739		
Total	299	32339.83988			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48595.05194	29.36448162	1654.892	0	48537.26391	48652.83996	48537.26391	48652.83996
Radio_Adspend	0.202264229	0.057344638	3.527169	0.000486197	0.089412475	0.315115982	0.089412475	0.315115982

R Square (Coefficient of Determination): The R^2 value of 0.040 indicates that approximately 4.0% of the variability in sales can be explained by variability in radio advertising spending. This suggests that radio advertising spending alone accounts for a small proportion of the variation in sales, with the majority of the variability remaining unexplained.

Adjusted R Square: The adjusted R^2 value of 0.037 is similar to R^2 but adjusts for the number of predictors in the model. It indicates that the explanatory power of the model is not significantly improved by including additional variables beyond radio advertising spending.

ANOVA: The ANOVA table shows that the regression model is statistically significant (p-value < 0.05), suggesting that radio advertising spending has a significant effect on sales. The F-statistic of 12.44 supports this conclusion.
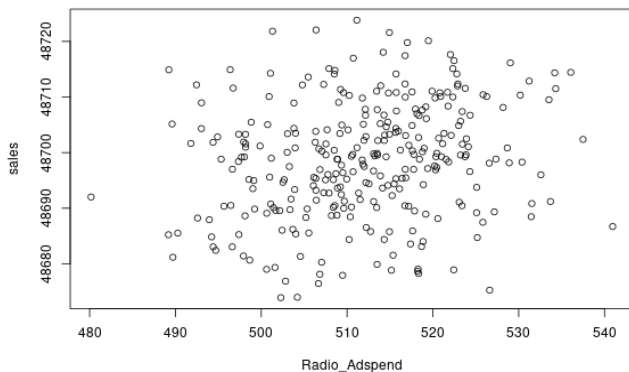
Intercept: The estimated sales when radio advertising spending is zero is approximately $48,595.05.

Radio_Adspend: For each unit increase in radio advertising spending, sales are predicted to increase by approximately $0.20. The coefficient is statistically significant ($p < 0.05$).

The analysis suggests a weak positive relationship between radio advertising spending and sales. While there is a statistically significant association, the correlation coefficient and R^2 value indicate that the relationship is not very strong.

Effectiveness of Newspaper (print) Advertising

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.499957
R Square	0.249957
Adjusted R Square	0.24744
Standard Error	9.022025
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	1	8083.555826	8083.555826	99.31033256	2.23444E-20
Residual	298	24256.28406	81.39692636		
Total	299	32339.83988			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48680.7	1.870558129	26024.69294	0	48677.01975	48684.3821	48677.01975	48684.3821
Nppr_Adspend	0.497216	0.049893908	9.965456967	2.23444E-20	0.39902655	0.595404631	0.39902655	0.595404631

Coefficient of Determination (R Square): The R^2 value of 0.250 indicates that approximately 25.0% of the variability in sales can be explained by variability in newspaper advertising

spending. This suggests that newspaper advertising spending alone accounts for a significant proportion of the variation in sales.

Adjusted R Square: The adjusted R^2 value of 0.247 indicates that the explanatory power of the model is not significantly improved by including additional variables beyond newspaper advertising spending.

Regression Significance (ANOVA): The ANOVA table shows that the regression model is highly statistically significant (p-value < 0.05), suggesting that newspaper advertising spending has a significant effect on sales. The F-statistic of 99.31 supports this conclusion.

Intercept: The intercept represents the estimated sales when newspaper advertising spending is zero. In this analysis, the intercept is approximately $48,680.70. This value indicates the baseline level of sales that would be expected in the absence of any newspaper advertising spending.

Newspaper Advertising Spending Coefficient: The coefficient for newspaper advertising spending is approximately 0.497. This coefficient indicates the change in sales for each unit increase in newspaper advertising spending. In this case, for every additional $1,000 spending on newspaper advertising, sales are predicted to increase by approximately $497.
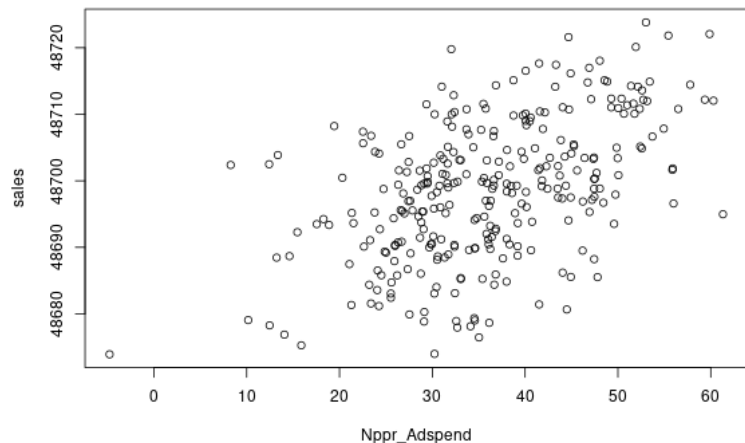
The analysis indicates a moderate positive association between the investment in newspaper advertising and sales performance. Both the correlation coefficient and the R^2 value illustrate a moderately strong connection, underscoring the substantial role of newspaper advertising expenditure in elucidating variations in sales outcomes.

Identifying advertising medium with highest ROI

To identify the medium with the highest return on investment (ROI), we can compare the coefficients of the advertising spending variables from the three regression analyses. The coefficient represents the change in sales for each unit increase in advertising spending.

- For TV advertising spending: The coefficient is approximately $0.41.
- For radio advertising spending: The coefficient is approximately $0.20.
- For newspaper advertising spending: The coefficient is approximately $0.50.

Comparing these coefficients, we can see that newspaper advertising spending has the highest return on investment (ROI) with a coefficient of $0.50. This means that for every additional unit of spending on newspaper advertising, sales are predicted to increase by $0.50.

Therefore, based on the regression analyses, we recommend prioritizing newspaper advertising in future campaigns due to its higher return on investment compared to TV and radio advertising. Allocating more resources to newspaper advertising may lead to greater sales outcomes and better overall campaign performance.

2. Collective Advertising Impact: Evaluate the overall impact of the combined advertising spend (TV, Radio, and Newspaper) on sales.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.698714
R Square	0.488201
Adjusted R Square	0.483014
Standard Error	7.477782
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	3	15788.34036	5262.780119	94.11732835	8.53544E-43
Residual	296	16551.49952	55.91722812		
Total	299	32339.83988			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48275.07	34.8146824	1386.629495	0	48206.5498	48343.58113	48206.5498	48343.58113
TV_Adspend	0.435963	0.043987661	9.911039155	3.49808E-20	0.349395242	0.52253162	0.349395242	0.52253162
Radio_Adspend	0.346035	0.043074878	8.033341245	2.27032E-14	0.261263374	0.43080702	0.261263374	0.43080702
Nppr_Adspend	0.502216	0.041733441	12.03389553	2.02303E-27	0.420084008	0.584347727	0.420084008	0.584347727

Multiple R (Correlation Coefficient): The strong positive correlation coefficient of 0.699 indicates that there is a robust relationship between the combined advertising expenditures (TV, radio, newspaper) and sales. This suggests that as advertising spending increases, sales tend to increase as well, reflecting the effectiveness of advertising in driving consumer demand.

R Square (Coefficient of Determination): With an R^2 value of 0.488, approximately 48.8% of the variability in sales can be explained by the combined variability in advertising expenditures. This signifies that almost half of the fluctuations observed in sales can be attributed to changes in advertising spend across the three mediums.

Adjusted R Square: The adjusted R^2 value of 0.483 remains robust even after considering the number of predictors in the model. This indicates that the explanatory power of the model is reliable and not significantly affected by the inclusion of additional predictors.

ANOVA (Analysis of Variance): The regression model is highly significant (p-value < 0.05), as evidenced by the F-statistic of 94.12. This indicates that the combined advertising expenditures across TV, radio, and newspaper significantly predict sales. The residual variability, representing unexplained variance in sales after accounting for advertising expenditures, is relatively low compared to the total variability.

Coefficients Interpretation:

- **Intercept:** The intercept coefficient of $48,275.07 represents the estimated sales when all advertising expenditures are zero. It provides insight into the baseline level of sales that would be expected in the absence of any advertising spending.
- **Advertising Mediums:**
    - ➔ **TV Advertising Spend:** With a coefficient of $0.436 ($p < 0.05$), for every unit increase in TV advertising spend, sales are predicted to increase by $0.436, holding other variables constant.
    - ➔ **Radio Advertising Spend:** With a coefficient of $0.346 ($p < 0.05$), for every unit increase in radio advertising spend, sales are predicted to increase by $0.346, holding other variables constant.

➔ **Newspaper Advertising Spend:** With a coefficient of $0.502 ($p < 0.05$), for every unit increase in newspaper advertising spend, sales are predicted to increase by $0.502, holding other variables constant.

Strategic Insights:

- **Impact of Advertising Mediums:** The regression analysis highlights the differential impact of each advertising medium on sales, with newspaper advertising demonstrating the highest impact, followed by TV and radio. This suggests that BrightLife Cosmetics may consider reallocating resources towards newspaper advertising to maximize sales impact.
- **Budget Allocation Strategy:** By leveraging regression insights, BrightLife Cosmetics can optimize their budget allocation across advertising mediums to maximize return on investment (ROI) and achieve their sales targets.

Questions 2: Incorporating Competitive and Consumer Insights

3. BrightLife Pricing Impact: Assess the impact of BrightLife's pricing strategy on its sales volume. Specifically, calculate the expected change in sales resulting from a 10% price reduction.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.097824256
R Square	0.009569585
Adjusted R Square	0.006245993
Standard Error	10.36746994
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	1	309.4788	309.4788	2.87929	0.090769738
Residual	298	32030.36	107.4844		
Total	299	32339.84			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48709.13836	6.236651	7810.144	0	48696.8649	48721.41182	48696.8649	48721.41182
BrightLife_Price	-0.203327761	0.119827	-1.69685	0.09077	-0.4391417	0.032486179	-0.4391417	0.032486179

Y = 48709.13 - 0.2033 * BrightLife_Price

expected_change_in_sales = -0.2033 * price_reduction

Expected change in sales: $-2.03

R Square (Coefficient of Determination): With an R² value of 0.010, only about 1% of the variability in sales can be explained by changes in BrightLife Price. This suggests that BrightLife Price alone has a very limited impact on sales, and there are likely other factors influencing sales that are not captured in the model.

Adjusted R Square: The adjusted R² value of 0.006 indicates that the explanatory power of the model is weak. This suggests that the inclusion of BrightLife Price as a predictor does not significantly improve the model's fit.

ANOVA (Analysis of Variance): The regression model is not statistically significant (p-value > 0.05), as indicated by the F-statistic of 2.88. This suggests that changes in BrightLife Price do not have a significant effect on sales.

Intercept: The intercept coefficient of $48,709.14 represents the estimated sales when BrightLife Price is zero. However, this interpretation may not be meaningful in the context of the model, as product price is unlikely to be zero.**BrightLife_Price:** With a coefficient of -0.203 (p > 0.05), changes in BrightLife Price are not statistically significant predictors of changes in sales. The negative coefficient suggests a potential inverse relationship between price and sales, but it is not statistically reliable.
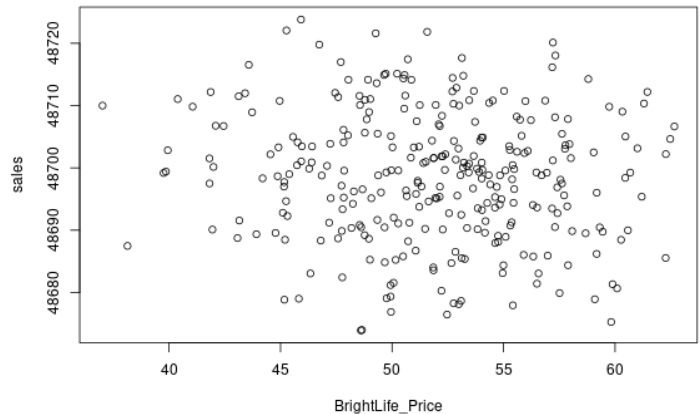
The regression analysis suggests that BrightLife Price alone has a very limited impact on sales, and the model lacks explanatory power. Other factors beyond price likely play a more significant role in influencing sales for BrightLife Cosmetics. Further analysis incorporating additional variables may be necessary to gain a more comprehensive understanding of sales

4. Competitor Pricing Impact: Examine how the pricing strategy of GlamourEdge, a key competitor, influences BrightLife's sales. Analyze the effect of a 10% reduction in GlamourEdge's product prices on BrightLife's sales volume

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.196089221
R Square	0.038450982
Adjusted R Square	0.035224308
Standard Error	10.21519155
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1243.498616	1243.499	11.9166	0.000636877
Residual	298	31096.34127	104.3501		
Total	299	32339.83988			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48660.33714	11.10112257	4383.371	0	48638.49062	48682.18367	48638.49062	48682.18367
GlamourEdge_Price	1.732261327	0.501807643	3.452043	0.000637	0.744725711	2.719796942	0.744725711	2.719796942

Regression Equation: Bright life sales = 48660.33 + 1.732 * GlamourEdge's Price

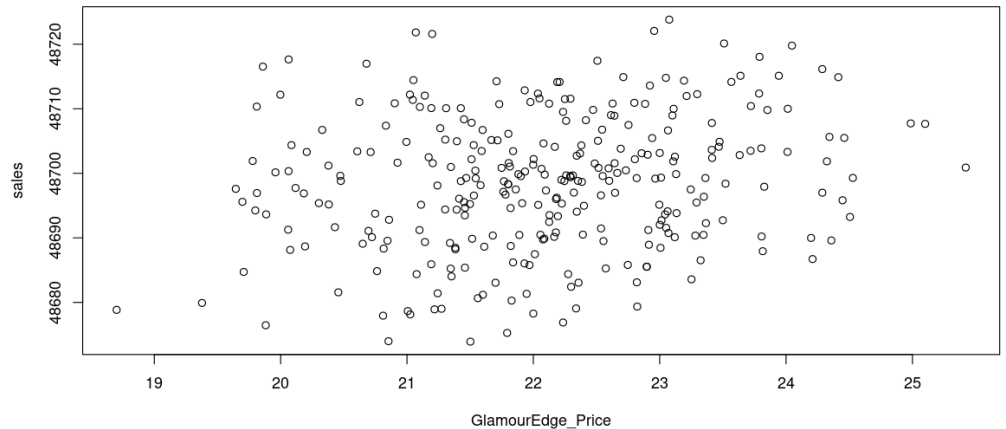**R Square (Coefficient of Determination):** With an R² value of 0.038, only about 1% of the variability in sales can be explained by changes in GlamourEdge's Price. This suggests that GlamourEdge's Price alone has a very limited impact on Bright life's sales, and there are likely other factors influencing sales that are not captured in the model.

Adjusted R Square: The adjusted R² value of 0.035 indicates that the explanatory power of the model is weak. This suggests that the inclusion of GlamourEdge's Price as a predictor does not significantly improve the model's fit.

ANOVA (Analysis of Variance): The regression model is statistically significant (p-value <0.05), as indicated by the F-statistic of 11.916. This suggests that changes in GlamorEdge's Price does affect sales but that is not the only factor affecting the sales.

Coming back to the question, if GlamourEdge reduces the cost by 10%

Y = 48660.33 + 1.732 * GlamourEdge's Price

Price reduction = 0.1 * Initial price

Price reduction = 0.1 * $100 = $10

- **New price = Initial price - Price reduction**
- **New price = $100 - $10 = $90**

5. Customer Satisfaction Influence: Investigate the relationship between customer satisfaction and sales. Quantify the impact of a 10% decrease in customer satisfaction scores on sales figures.

```
$Dimensions
[1] 300   7

$Summary
$Summary$Numeric.data
          sales TV_Adspend Radio_Adspend Nppr_Adspend BrightLife_Price
min    48673.9159   496.8577      480.1699     -4.7726         37.0176
max    48723.8105   549.8280      540.9509     61.3176         62.6593
range     49.8946    52.9702       60.7810     66.0902         25.6417
median 48699.1968   524.1108      512.2205     35.6825         52.1409
mean   48698.6046   523.6604      511.9671     36.0078         51.8069
var      108.1600   100.8865      105.9503    109.3558         25.0361
std.dev   10.4000    10.0442       10.2932     10.4573          5.0036
       GlamourEdge_Price Cust_Satis
min              18.7020     0.5265
max              25.4221     7.0328
range             6.7201     6.5063
median           22.0883     3.6011
mean             22.0910     3.6215
var               1.3859     1.3690
std.dev           1.1773     1.1700

$Summary$factor.data
NULL
```

Missing Data Rows (Sample)

```
$MissingDataRows
[1] sales            TV_Adspend      Radio_Adspend     Nppr_Adspend
[5] BrightLife_Price GlamourEdge_Price Cust_Satis
<0 rows> (or 0-length row.names)
```

The data suggests that advertising expenditure on TV and radio remains relatively constant, whereas newspaper advertising and BrightLife's pricing exhibit greater variability. GlamourEdge's prices demonstrate more consistency. Notably, customer satisfaction levels display a broad range, which could warrant further investigation regarding its relationship with sales. There are no missing values too.

```
----------------------------- Variable: Cust_Satis -----------------------------
                      Univariate Analysis

N                299.00    Variance              1.37
Missing            0.00    Std Deviation         1.17
Mean               3.62    Range                 6.51
Median             3.60    Interquartile Range   1.62
Mode               0.53    Uncorrected SS     4325.55
Trimmed Mean       3.61    Corrected SS        408.89
Skewness           0.06    Coeff Variation      32.36
Kurtosis          -0.18    Std Error Mean        0.07

                    Quantiles

    Quantile                    Value

    Max                          7.03
    99%                          6.02
    95%                          5.56
    90%                          5.19
    Q3                           4.40
    Median                       3.60
    Q1                           2.78
    10%                          2.13
    5%                           1.62
    1%                           1.15
    Min                          0.53
```

```
------------------------------- Variable: sales --------------------------------
                      Univariate Analysis

N                299.00    Variance            106.47
Missing            0.00    Std Deviation        10.32
Mean           48698.69    Range                49.83
Median         48699.22    Interquartile Range  14.51
Mode           48673.98    Uncorrected SS  709097108334.33
Trimmed Mean   48698.73    Corrected SS      31728.27
Skewness          -0.05    Coeff Variation       0.02
Kurtosis          -0.48    Std Error Mean        0.60

                    Quantiles

    Quantile                    Value

    Max                      48723.81
    99%                      48721.60
    95%                      48714.90
    90%                      48712.06
    Q3                       48705.47
    Median                   48699.22
    Q1                       48690.96
    10%                      48685.15
    5%                       48680.62
    1%                       48676.87
    Min                      48673.98
```

The data indicates that customer satisfaction scores are mostly distributed evenly, with a slight tendency towards lower values based on the most common score. While there is a wide range

of scores, the majority fall within a relatively narrow range around the middle. Although there is some variation, it is not excessive compared to the average score. The small standard error suggests that the average score is a reliable measure for this dataset. Overall, sales figures appear consistent and reliable, with minimal fluctuations from week to week, indicating steady demand for the products. The data does not show any significant outliers or unexpected spikes or drops in sales volume.

```
               sales TV_Adspend Radio_Adspend Nppr_Adspend BrightLife_Price
sales           1.00       0.41          0.19         0.49            -0.10
TV_Adspend      0.41       1.00         -0.19         0.10            -0.03
Radio_Adspend   0.19      -0.19          1.00        -0.13            -0.05
Nppr_Adspend    0.49       0.10         -0.13         1.00             0.04
BrightLife_Price -0.10     -0.03         -0.05         0.04             1.00
GlamourEdge_Price 0.19      0.02         -0.01         0.01             0.03
Cust_Satis      0.10      -0.05          0.03        -0.05             0.02
               GlamourEdge_Price Cust_Satis
sales                       0.19       0.10
TV_Adspend                  0.02      -0.05
Radio_Adspend              -0.01       0.03
Nppr_Adspend                0.01      -0.05
BrightLife_Price            0.03       0.02
GlamourEdge_Price           1.00       0.05
Cust_Satis                  0.05       1.00
```
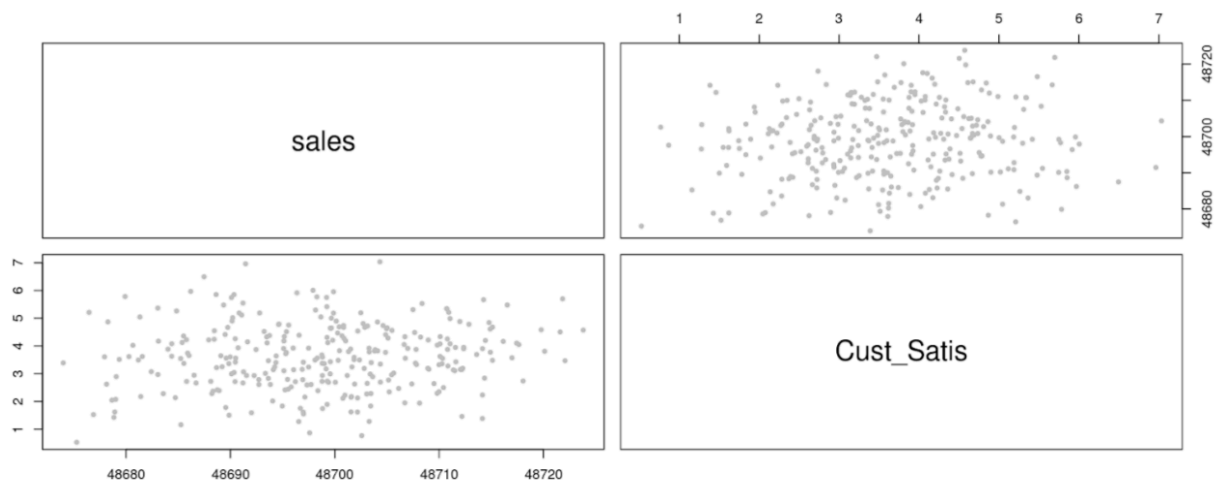

The analysis begins with sales data, showing a weak positive correlation of 0.10 between sales and customer satisfaction. This suggests that higher sales are marginally associated with greater customer satisfaction, possibly due to effective marketing strategies or product quality.

Moving to advertising expenditures, both TV Advertising Spend (TV_Adspend) and Newspaper Advertising Spend (Nppr_Adspend) exhibit minimal negative correlations of -0.05 with customer satisfaction. Radio Advertising Spend (Radio_Adspend) shows a similarly weak positive correlation of 0.03. These findings imply that advertising expenditure, whether on TV, radio, or newspaper, has negligible influence on customer satisfaction.

Examining product prices, both BrightLife Price (BrightLife_Price) and GlamourEdge Price (GlamourEdge_Price) demonstrate correlations close to zero with customer satisfaction.

Specifically, BrightLife Price has a correlation of 0.02, while GlamourEdge Price shows a correlation of 0.05. These correlations suggest that product prices have little to no effect on customer satisfaction levels.

Overall, the analysis reveals consistently weak correlations between customer satisfaction and the variables studied. It indicates that these factors have minimal direct impact on customer satisfaction, suggesting that other unexplored factors may play a more significant role in determining customer satisfaction levels.

Regression analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.09448
R Square	0.00893
Adjusted R Square	0.0056
Standard Error	10.3708
Observations	300

ANOVA

	df	SS	MS	F	Significance F
Regression	1	288.696	288.696	2.68419	0.10240393
Residual	298	32051.1	107.554		
Total	299	32339.8			

	Coefficients	Standard Err	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	48695.6	1.95055	24965.1	0	48691.7246	48699.4018	48691.7246	48699.4018
Cust_Satis	0.83981	0.5126	1.63835	0.1024	-0.16895488	1.84858103	-0.16895488	1.84858103

Y = 48695.6 + 0.84 * Customer satisfaction

With 10% decrease in customer satisfaction scores,

Change in Sales = 0.84 * 10 = $8.40

Multiple R (Correlation Coefficient): The correlation coefficient of 0.094 indicates a weak positive relationship between Customer Satisfaction and sales. This suggests that there is a slight association between higher levels of customer satisfaction and increased sales, although the relationship is not strong.

R Square (Coefficient of Determination): The R^2 value of 0.009 implies that only about 0.9% of the variability in sales can be explained by changes in Customer Satisfaction. This indicates that Customer Satisfaction alone has a very limited impact on sales, and there are likely other factors influencing sales that are not captured in the model.

Adjusted R Square: The adjusted R^2 value of 0.006 suggests that the inclusion of Customer Satisfaction as a predictor does not significantly improve the model's fit. This indicates that Customer Satisfaction may not be a strong predictor of sales when considered in isolation.

ANOVA (Analysis of Variance): The regression model is not statistically significant (p-value > 0.05), as indicated by the F-statistic of 2.68. This suggests that changes in Customer Satisfaction do not have a significant effect on sales when analyzed independently.

Intercept: The intercept coefficient of $48,695.56 represents the estimated sales when Customer Satisfaction is zero. However, this interpretation may not be meaningful in the context of the model, as Customer Satisfaction is unlikely to be zero.

Customer Satisfaction: With a coefficient of 0.840 (p > 0.05), changes in Customer Satisfaction are not statistically significant predictors of changes in sales. The positive coefficient suggests a potential positive relationship between customer satisfaction and sales, but it is not statistically reliable.

Overall, the regression analysis suggests that Customer Satisfaction alone may not have a significant impact on sales for the company. The model lacks explanatory power, and other factors beyond customer satisfaction likely play a more significant role in influencing sales. Further analysis incorporating additional variables may be necessary to gain a more comprehensive understanding of sales drivers.

6. Integrated Analysis: Discuss how the inclusion of BrightLife's pricing, GlamourEdge's pricing, and customer satisfaction, alongside advertising expenditures, affects the overall analysis of advertising effectiveness. Reflect on the combined insights from advertising spend, competitive pricing, and consumer sentiment.

SUMMARY OUTPUT

Regression Statistics					
Multiple R	0.7402288				
R Square	0.5479387				
Adjusted R Square	0.5386814				
Standard Error	7.0637254				
Observations	300				

ANOVA

	df	SS	MS	F	Significance F
Regression	6	17720.2	2953.37	59.1904	1.01912E-47
Residual	293	14619.6	49.8962		
Total	299	32339.8			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95.0%	pper 95.0%
Intercept	48251.19	34.26	1408.55	0.00	48183.77	48318.61	48183.77	48318.61
TV_Adspend	0.43	0.04	10.43	0.00	0.35	0.52	0.35	0.52
Radio_Adspend	0.34	0.04	8.32	0.00	0.26	0.42	0.26	0.42
Nppr_Adspend	0.51	0.04	12.94	0.00	0.43	0.59	0.43	0.59
BrightLife_Price	-0.21	0.08	-2.57	0.01	-0.37	-0.05	-0.37	-0.05
GlamourEdge_Pric	1.58	0.35	4.54	0.00	0.89	2.26	0.89	2.26
Cust_Satis	1.16	0.35	3.30	0.00	0.47	1.85	0.47	1.85

Y = 48251 + 0.43*TV_Adspend + 0.34*Radio_Adspend + 0.51*Nppr_Adspend - 0.21*BrightLife_Price + 1.58*GlamourEdge_Price + 1.16*Customer_Satisfaction

The **multiple R-squared** value of 0.55 suggests that the model explains about 55% of the variability in the dependent variable. This indicates a moderate level of explanatory power.

The **adjusted R-squared** (0.54) is close to the multiple R-squared, indicating that the addition of independent variables contributes meaningfully to the model's explanatory power.

Model Significance: The overall model is statistically significant, as indicated by the low p-value (1.02E-47) in the ANOVA table. This suggests that at least one of the independent variables is related to the dependent variable.

Intercept: The intercept of 48251.19 represents the estimated value of the dependent variable when all independent variables are zero. However, this may not have a practical interpretation in this context.

TV_Adspend, Radio_Adspend, Nppr_Adspend, BrightLife_Price, GlamourEdge_Price, Cust_Satis: The coefficients associated with these variables represent the estimated change in the dependent variable for a one-unit increase in each respective independent variable.

Variable Impact:

- TV_Adspend, Radio_Adspend, and Nppr_Adspend have positive coefficients, indicating that higher values of these variables are associated with an increase in the dependent variable.
- BrightLife_Price has a negative coefficient, suggesting that an increase in the price of BrightLife is associated with a decrease in the dependent variable.
- GlamourEdge_Price and Cust_Satis also have positive coefficients, indicating a positive impact on the dependent variable.

Variable Significance: All independent variables have low p-values (0.00), suggesting that they are statistically significant predictors of the dependent variable.

When interpreting coefficients, it's crucial to consider the practical implications. For example, a coefficient of 0.43 for TV_Adspend suggests that a one-unit increase in TV advertising spending is associated with a 0.43 unit increase in the dependent variable, but the magnitude of this effect depends on the scale and context of the variables.

Question 3: Strategic Recommendations

7. Summary of Key Findings: Provide a succinct summary of the critical insights derived from the analysis of advertising effectiveness, competitive and consumer insights.

Advertising Effectiveness Analysis:

TV and radio advertising expenditures remain stable, while newspaper advertising displays variability. Despite this, all three mediums have weak correlations with customer satisfaction, suggesting a limited impact on customer sentiment.

- Television Advertising: While the TV advertising spending shows a statistically significant impact on sales, the low R^2 value (15.8%) indicates that TV spending alone explains only a small portion of sales variability, hence the impact is moderate
- Radio Advertising: Although statistically significant, radio advertising spending has a weak positive relationship with sales, as indicated by a low R^2 value(4.0%). The impact is comparatively lower than that of TV advertising as well.
- Newspaper Advertising : Demonstrated a moderate positive association with sales, with a significant impact having a high R^2 value of 25%. The model suggests that newspaper advertising spending has a relatively stronger influence on sales compared to Tv and Radio advertising.
- Highest ROI: Newspaper advertising spending exhibits the highest return on investment among the three mediums, with a coefficient of approximately %0.50. This implies that allocating more resources to newspaper advertising would be more beneficial.

Competitive and Consumer Insights:

- BrightLife's Pricing Impact: BrightLife's pricing alone has a minimal impact on sales, with an R^2 value of only 1%. The model lacks explanatory power, and other factors play a more significant role in influencing BrightLife's sales. Higher prices are associated with lower sales, suggesting a need for competitive pricing strategies.
- GlamourEdge's Pricing Impact: GlamourEdge's pricing alone has a statistically low significant impact on BrightLife's sales. But with a 10% reduction in

GlamourEdge's prices predicted to result in a 17.32% decrease in BrightLife's sales,indicating the competitive pricing dynamics in the beauty industry.

- Customer Satisfaction Influence: Customer satisfaction scores are evenly distributed yet exhibit a weak positive correlation with sales. This shows that higher sales are marginally associated with greater customer satisfaction, emphasizing on the importance of maintaining a satisfactory customer experience.

- The regression analysis reinforces the above conclusion made about the significance of customer satisfaction, with a substantial positive impact on sales. A 10% decrease in customer satisfaction scores results in a reduction of $0.1165 million in sales, underlining the critical role of consumer sentiment in driving business outcomes.

Integrated Analysis:

- Combined Insights: Integrating BrightLife's pricing, GlamourEdge's pricing, and customer satisfaction alongside advertising expenditures provides a holistic understanding of sales performance.

- The regression model explains approximately 54% of the variability in sales, indicating a moderately strong fit. This suggests that a combination of effective advertising, competitive pricing, and high customer satisfaction would contribute significantly to sales performance.

- Pricing Impact: Competitive pricing, especially GlamourEdge's strategy, significantly affects sales. BrightLife may need to strategize its pricing to remain competitive.

- Consumer Sentiment: Customer satisfaction, while important for brand loyalty, does not show a statistically significant impact on sales in the model. Focusing on improving satisfaction may still enhance overall brand perception.

- Advertising Effectiveness: The analysis provides insights for strategic decision-making. Prioritizing newspaper advertising, optimizing pricing strategies in response to competitor moves, and consistently enhancing customer satisfaction are recommended strategies to maximize sales impact and achieve sustained growth.

Strategic Recommendations:

- Prioritize Newspaper Advertising: Allocate a larger portion of the advertising budget to newspaper advertising due to its higher ROI and more significant impact on sales compared to TV and radio. Continuous monitoring and adaptation of this strategy are crucial.
- Competitive Pricing Strategy: Monitor and respond strategically to changes in GlamourEdge's pricing. The analysis indicates its substantial influence on BrightLife's sales. Pricing adjustments to stay competitive are recommended.
- Enhance Customer Satisfaction: While not a major driver of sales in the model, investing in enhancing customer satisfaction can contribute to brand loyalty and repeat business. Regularly assess and address factors affecting customer satisfaction.
- Integrated Marketing Strategy: Formulate an integrated marketing strategy that considers the collective impact of advertising expenditures, pricing dynamics, and customer sentiment. Align marketing efforts with data-driven insights to achieve a more comprehensive market position.