Starbucks Report

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Introduction and Company Value

Company Background

Starbucks Corporation, more commonly known as Starbucks, is an American coffeehouse chain. As of 2022, Starbucks operates over 35,000 stores across 80 countries. Starbucks' success has been attributed to many things historically, from its business values to its loyal following and more. However, all of their decisions have been made based on its mission; "**to inspire and nurture the human spirit - one person, one cup, and one neighborhood at a time**."

Today, it's the most recognized coffeehouse brand across the United States, frequently appearing in the headlines for either its new beverages or recent business decisions. It has been the face of recent controversies, such as new CEO Brian Niccol's decision to commute to work via private jet as well as a decreased offering of discounts and promotions. With this change in leadership, Starbucks is currently in the hot seat, and the future of the company is in his hands.

Motivation for Variables

Revenue: We decided to forecast Starbucks' *quarterly revenue* for various reasons. The revenue was the most easily accessible data point, whereas other metrics were not publicly available. Revenue also allows us to examine the differences in growth overtime and forecast how Starbucks may perform in coming quarters. **Google Trend Data:** We decided to forecast Google searches of the term "Starbucks." This data is relevant to our analysis since it gauges not only the engagement of consumers, but also from prospective customers. The trends data allows us to track important dates where engagement is higher and its context such as a popular drink or product.

Data and Key Insights

Data Source

We accessed our data from Starbucks' [investors page](#) on their website, which hosts publicly accessible financial data for company stakeholders. Starbucks reports their revenue by quarter, so we've chosen to use this same format creating our forecast.

For the Google Trends Data, we retrieved the engagement data of the last five years to align with the quarterly revenue data. Since Google Trends records by date and year, we aggregated the data by mean to group by quarter and year.

Initial Observations

Revenue: During the peak of Covid, revenues took a fall. Otherwise, there is a clear upward trend. Starbucks continues to grow over the years.

Google Trend Data: This trend data is measured as a 0-100 class. We see peaks during quarter 1, but there does not appear to be an overall trend.

Descriptive Statistics

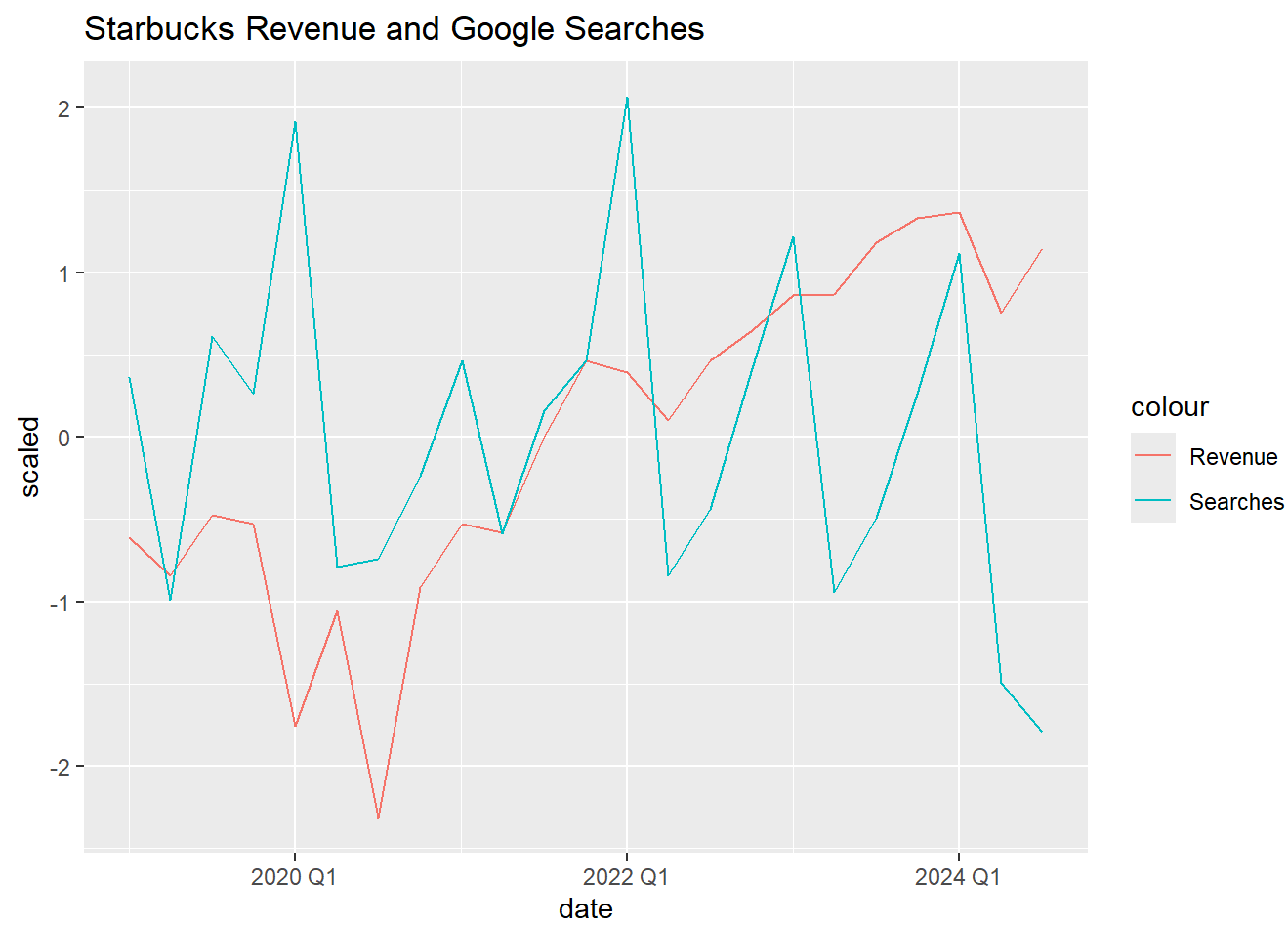## Variable Analysis

Quarterly Revenue

Mean: $7,492.57

Standard Deviation: $1,414.813
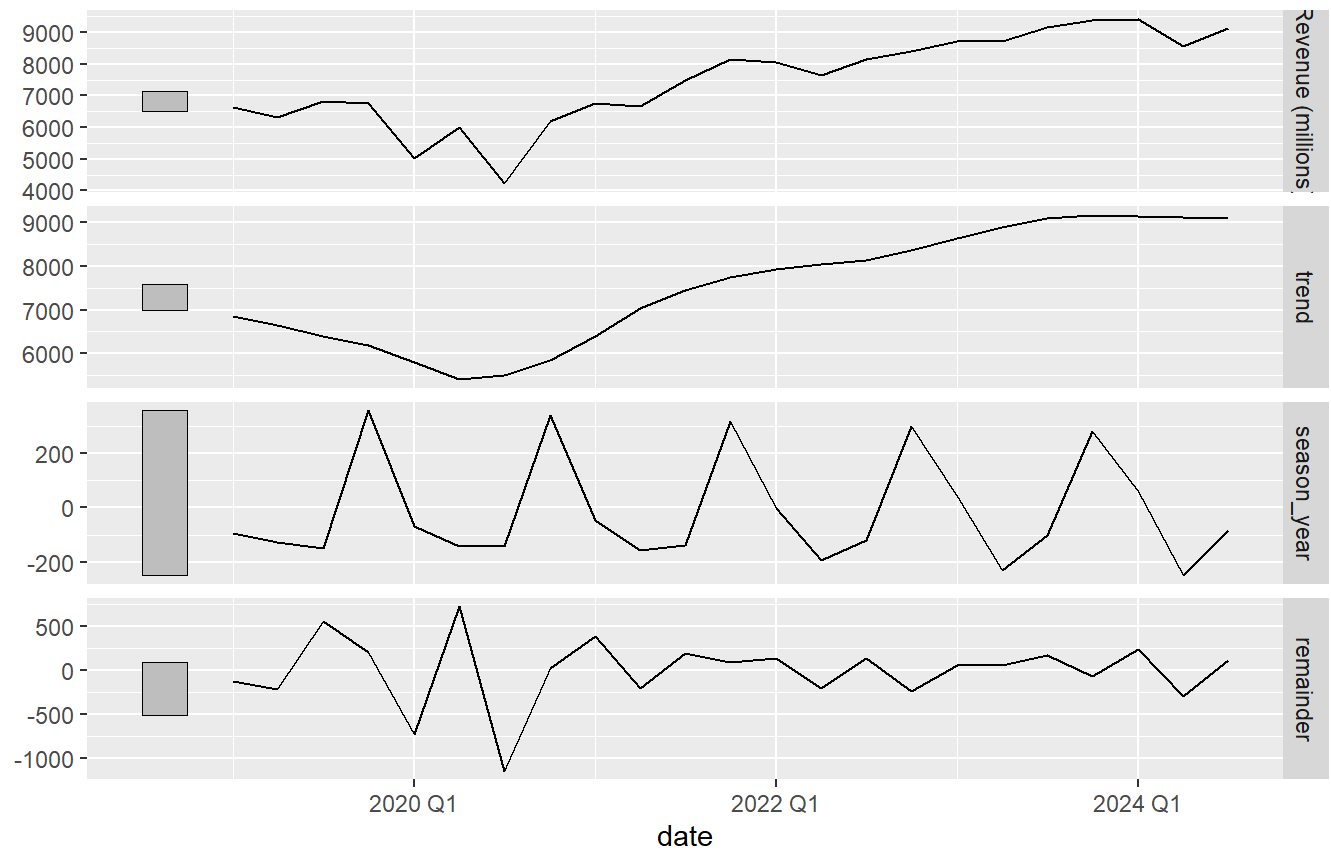
Google Trend

Mean: 77.24
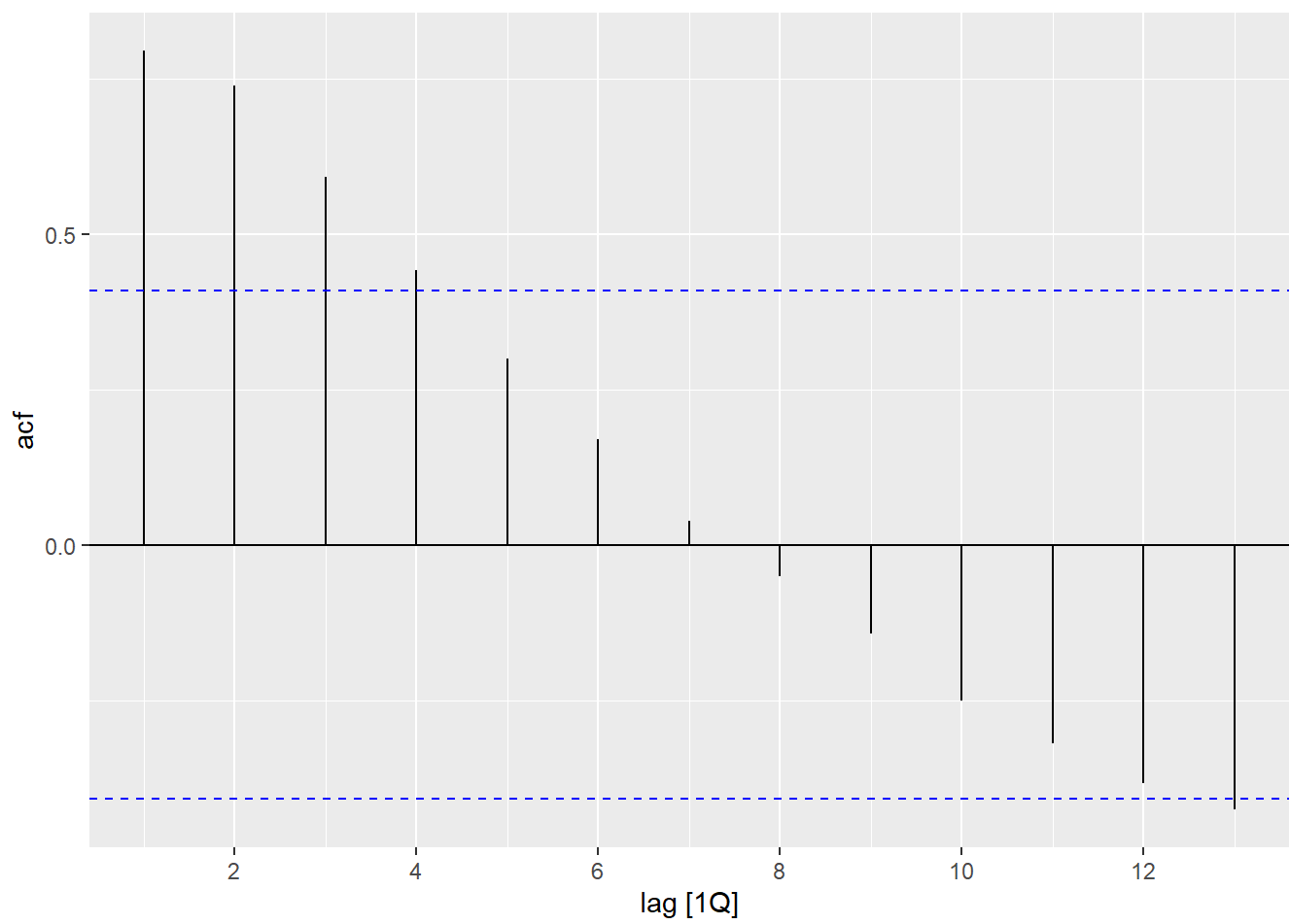
Standard Deviation: 6.64

Visualizations

Starbucks Revenue and Google Searches

STL Revenue

STL decomposition

`Revenue (millions)` = trend + season_year + remainder
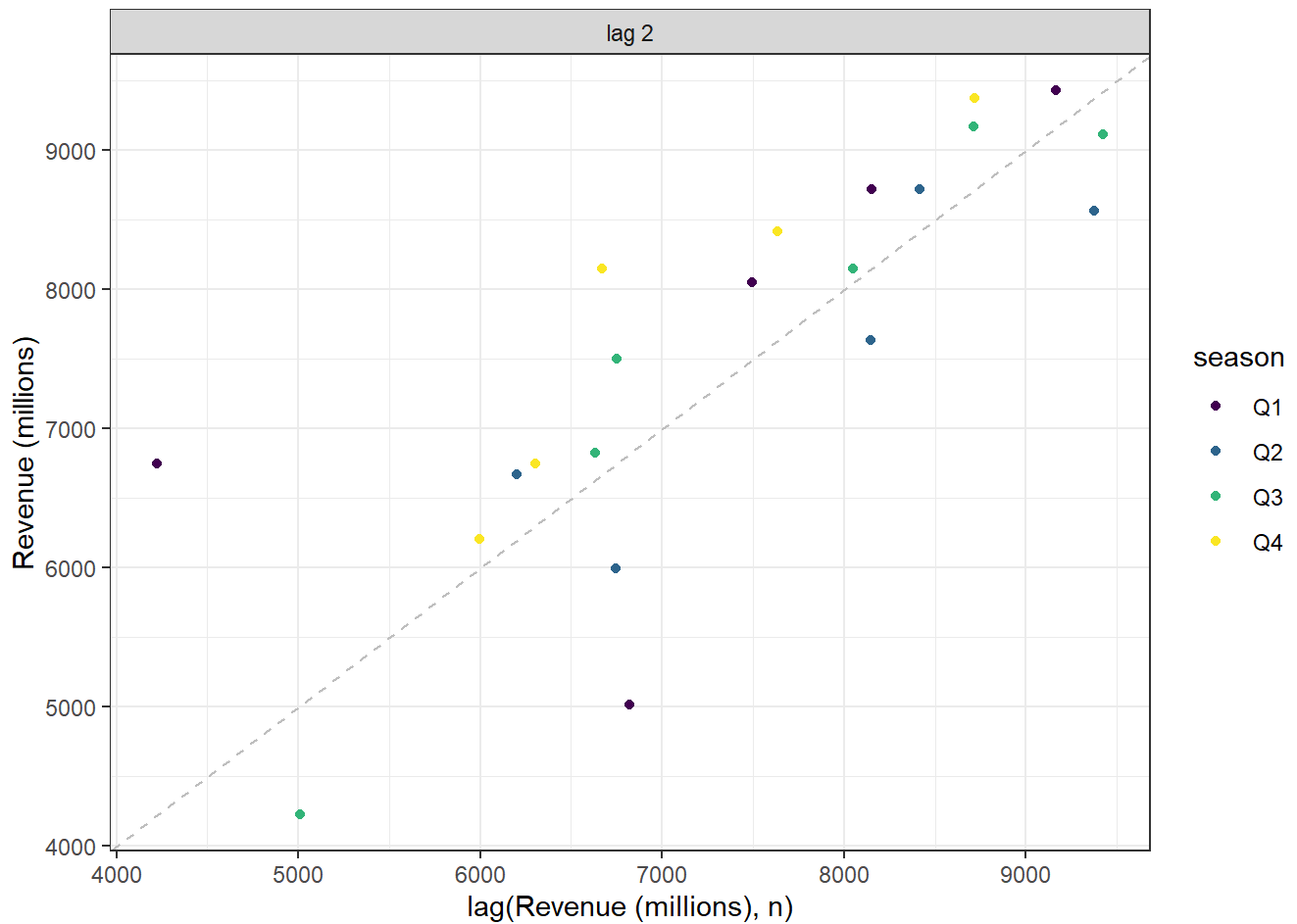
Forecasting Methodology

Model Selection

To perform our forecast, we considered four different models:

1. Time Series Linear Model (TSLM) with trend and seasonal components. This model is often used when examining linear relationships.
2. Time Series Linear Model (TSLM2) including a quadratic trend. This model is often used when data shows a non-linear trend.
3. Exponential Smoothing Model (ETS). This model is often used for data with trends and seasonal patterns.
4. Autoregressive Integrated Moving Average Model (ARIMA). This model is often used with non-stationary data that can be made stationary through differencing.

To perform both of our analyses, we followed the processes below to test our data against various models.

Process Overview

The first model we prepared was our revenue forecast. To prepare our model, we first imported it and turned it into a time series tibble for an effective analysis, rev_ts. We started our date from the first quarter of 2019 until the 3rd quarter of 2024.

Following that, we prepared our data into and tested it with TLSM, TLSM2, ETS, and ARIMA models.

After we created our models, we evaluated them by examining the accuracy. We specifically looked at metrics such as the Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) to assess our accuracy.

Model Fit Accuracy Metrics

.model	.type	ME	RMSE	MAE	MPE	MAPE	MASE	RMSSE	ACF1
TSLM	Training	0.000	736.545	540.696	−1.527	8.875	0.475	0.528	0.420
TSLM2	**Training**	**0.000**	**697.474**	**503.177**	**−1.429**	**8.127**	**0.442**	**0.500**	**0.354**
ETS	Training	149.007	761.028	587.403	0.841	9.199	0.516	0.546	−0.119
ARIMA	Training	138.052	745.485	570.391	0.773	8.846	0.501	0.535	−0.036

.model	date	Revenue (millions)	.mean	Year	Quarter	95%
TSLM	2024 Q3	N(9326, 957352)	9325.569	2024 Q3	Q3	[7407.86, 11243.28]
TSLM2	**2024 Q3**	**N(9999, 1158387)**	**9999.216**	**2024 Q3**	**Q3**	**[7889.74, 12108.69]**
ETS	2024 Q3	N(8817, 637079)	8816.783	2024 Q3	Q3	[7252.39, 10381.17]
ARIMA	2024 Q3	N(8895, 611323)	8894.944	2024 Q3	Q3	[7362.5, 10427.38]

Using this, we were able to determine that [MODEL] was the most accurate model.
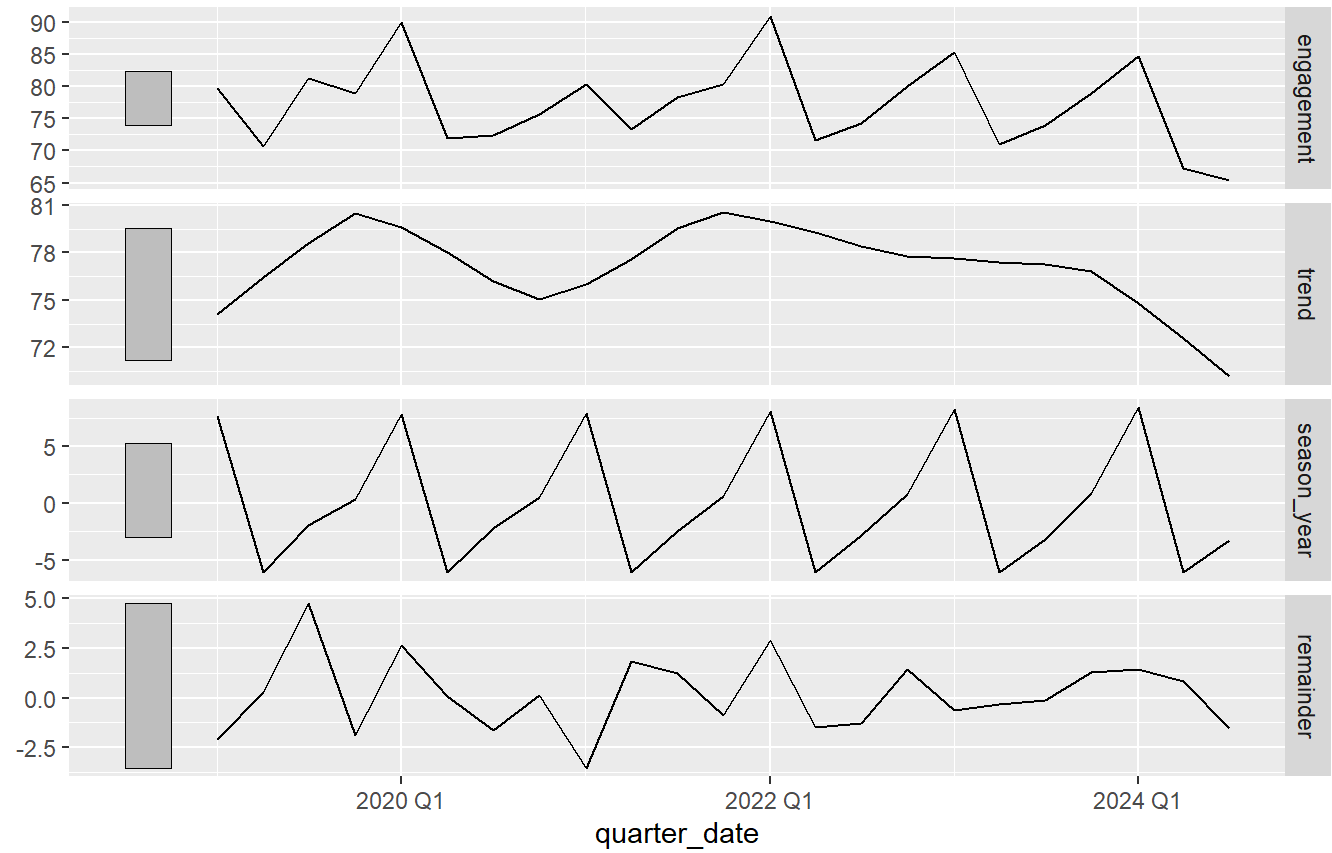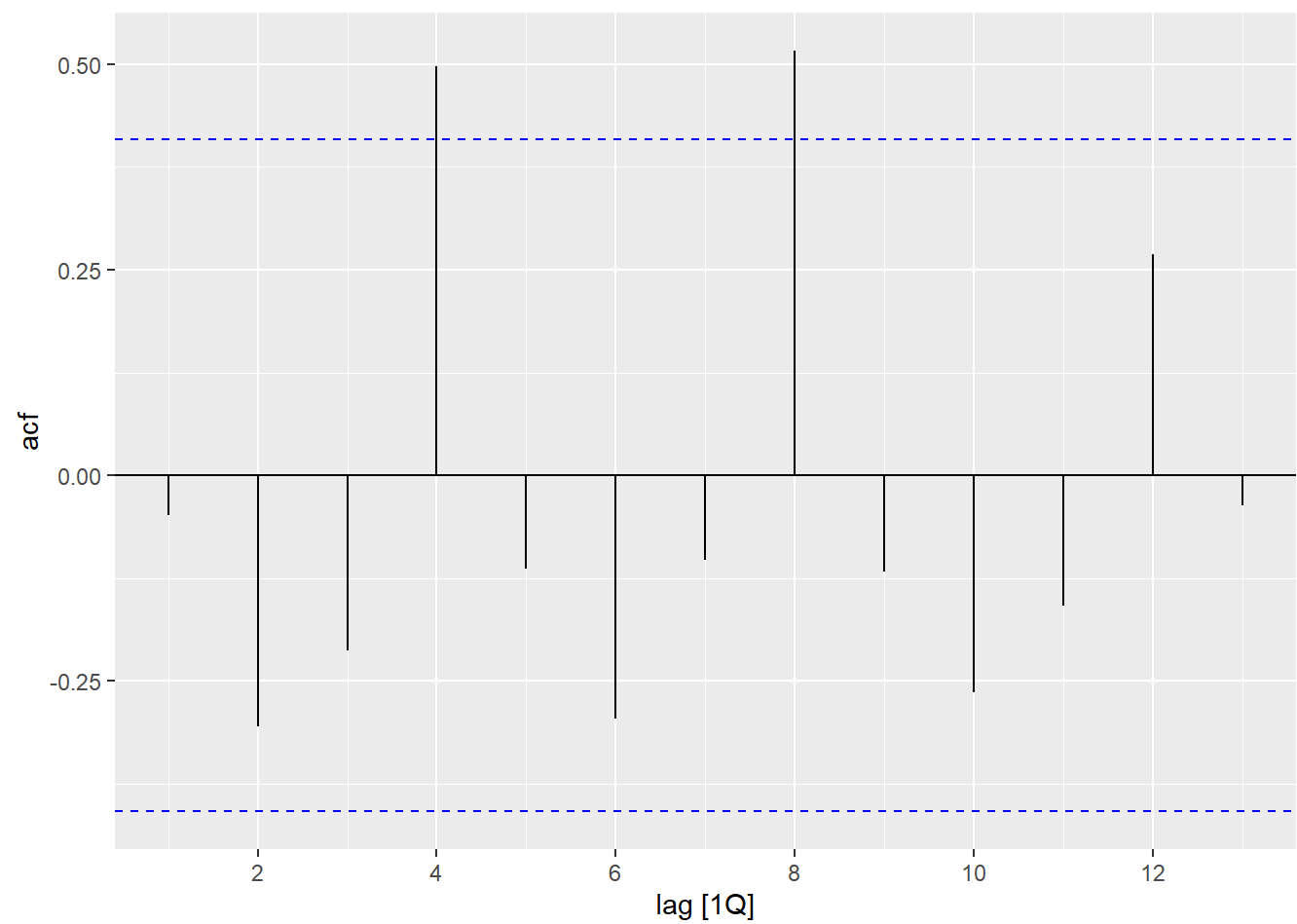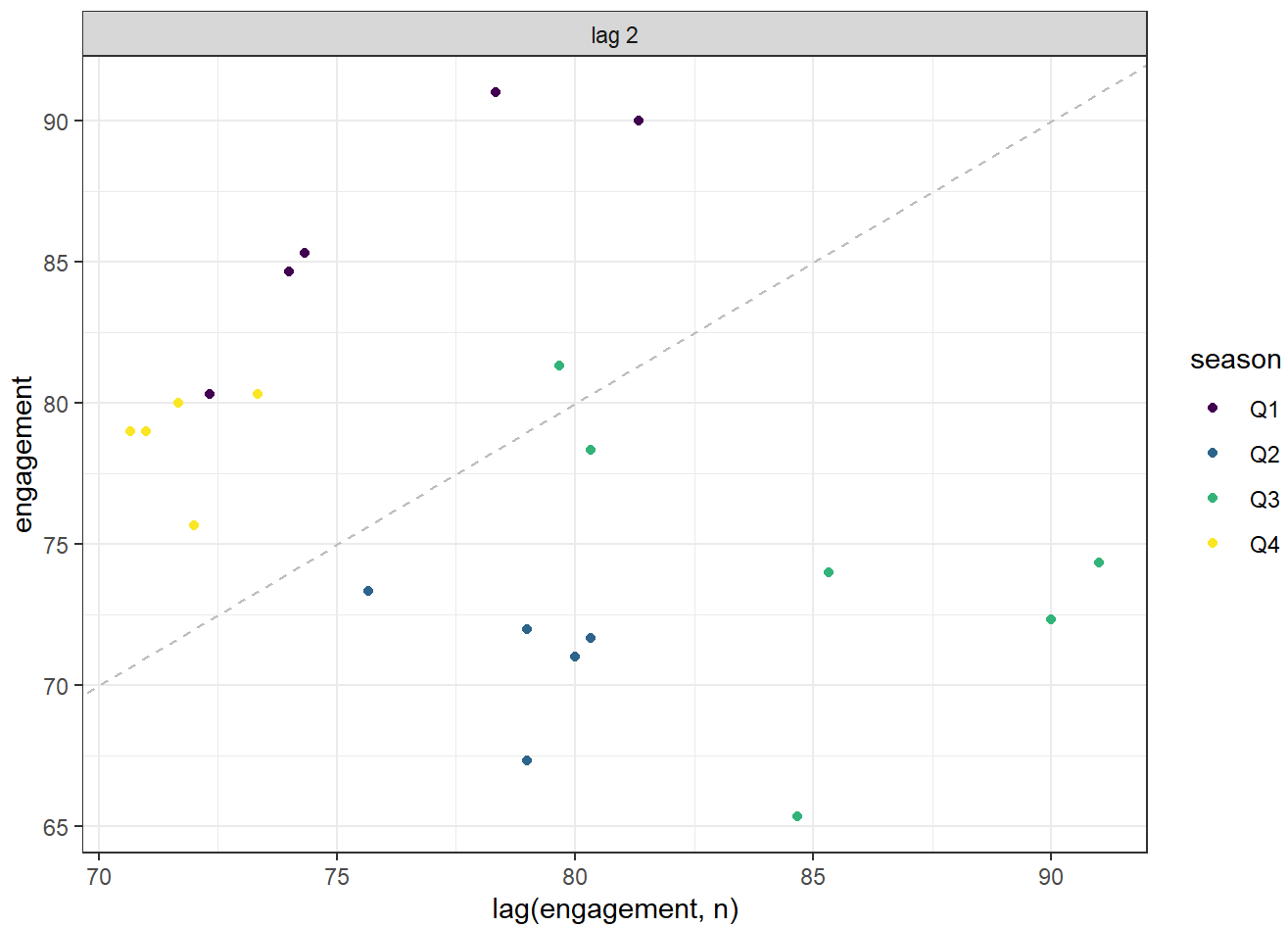
Google Trends

Starbucks Google Searches
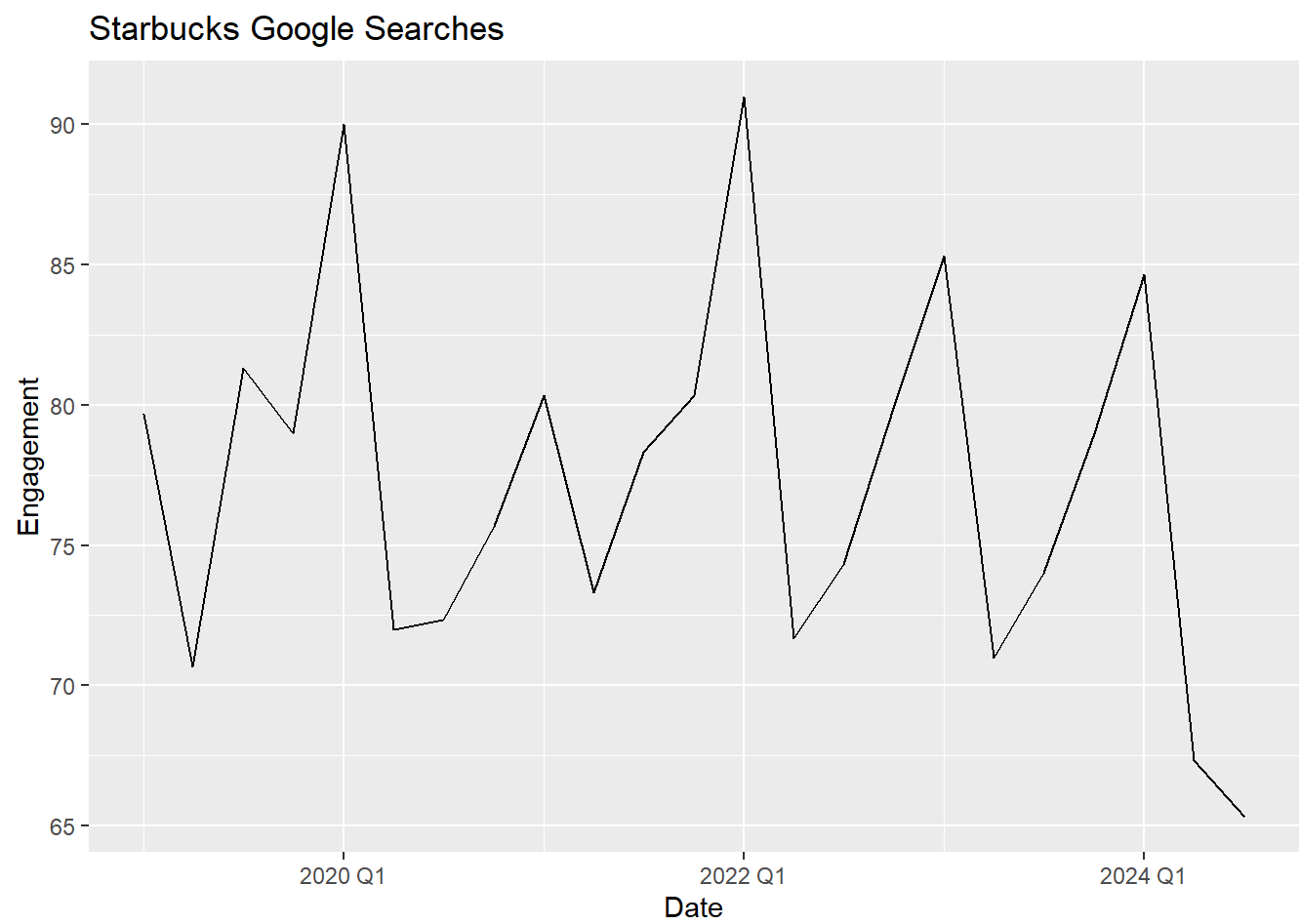
STL-Google

STL decomposition

engagement = trend + season_year + remainder

ACF and Lag-Google

Train and Test-Google

	Model Fit Accuracy Metrics								
.model	.type	ME	RMSE	MAE	MPE	MAPE	MASE	RMSSE	ACF1
TSLM	Training	0.000	3.002	2.320	−0.139	2.940	0.562	0.551	0.184
TSLM2	Training	0.000	2.873	2.131	−0.127	2.681	0.516	0.527	0.212
ETS	Training	−0.039	3.013	2.325	−0.186	2.949	0.563	0.553	0.192
ARIMA	**Training**	**−0.146**	**2.568**	**2.058**	**−0.303**	**2.640**	**0.498**	**0.472**	**−0.049**

.model	quarter_date	engagement	.mean	95%
TSLM	2024 Q3	N(76, 16)	75.62121	[67.8, 83.44]
TSLM2	2024 Q3	N(73, 20)	73.13987	[64.45, 81.83]
ETS	2024 Q3	N(76, 11)	76.17535	[69.61, 82.74]
ARIMA	**2024 Q3**	**N(73, 9.1)**	**72.53324**	**[66.63, 78.44]**

Results and Business Impact

Forecasting Results

Starbucks Revenue TSLM2 Forecast
Quarterly Data
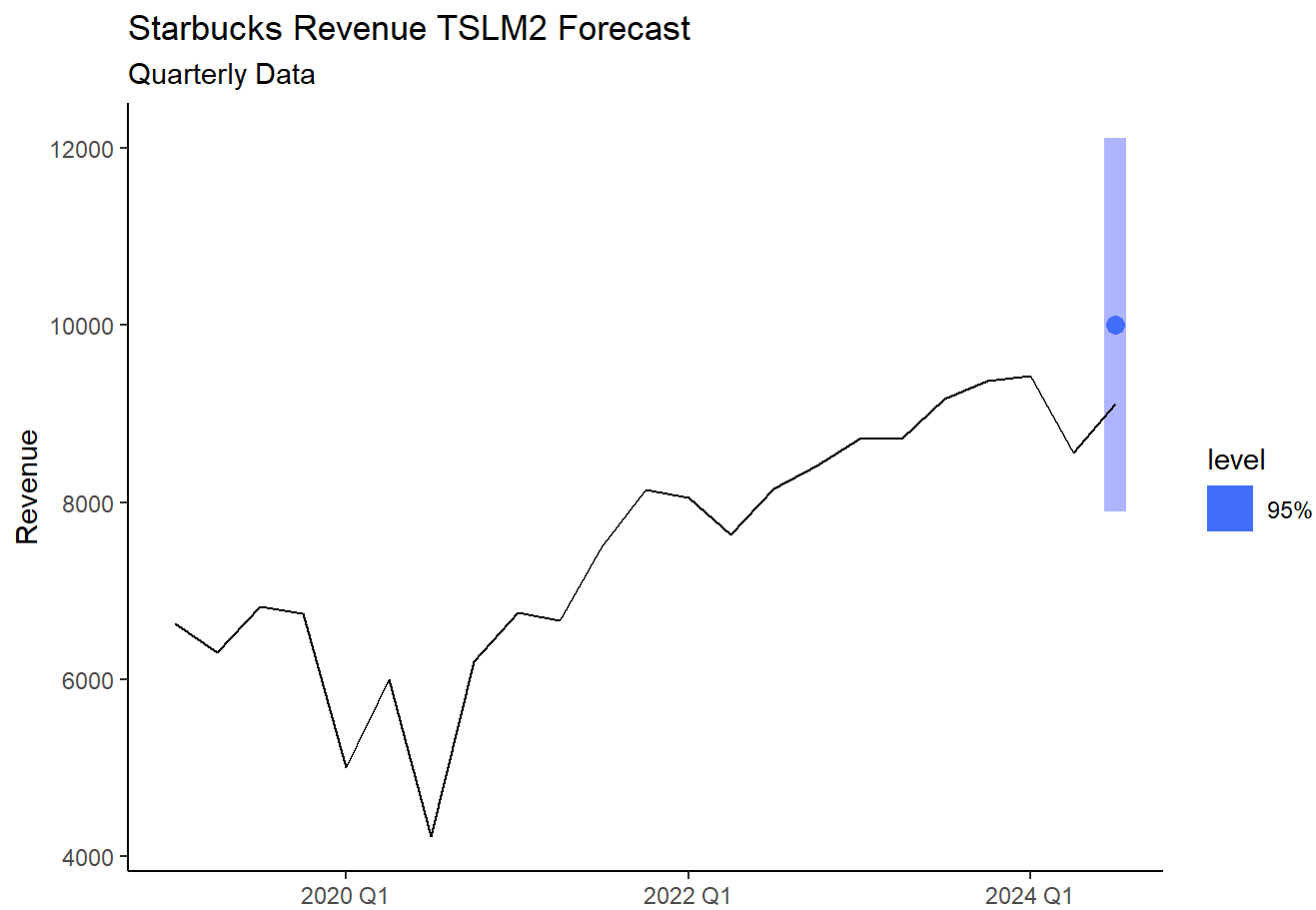
Google Trends Engagement ARIMA Forecast
Quarterly Data
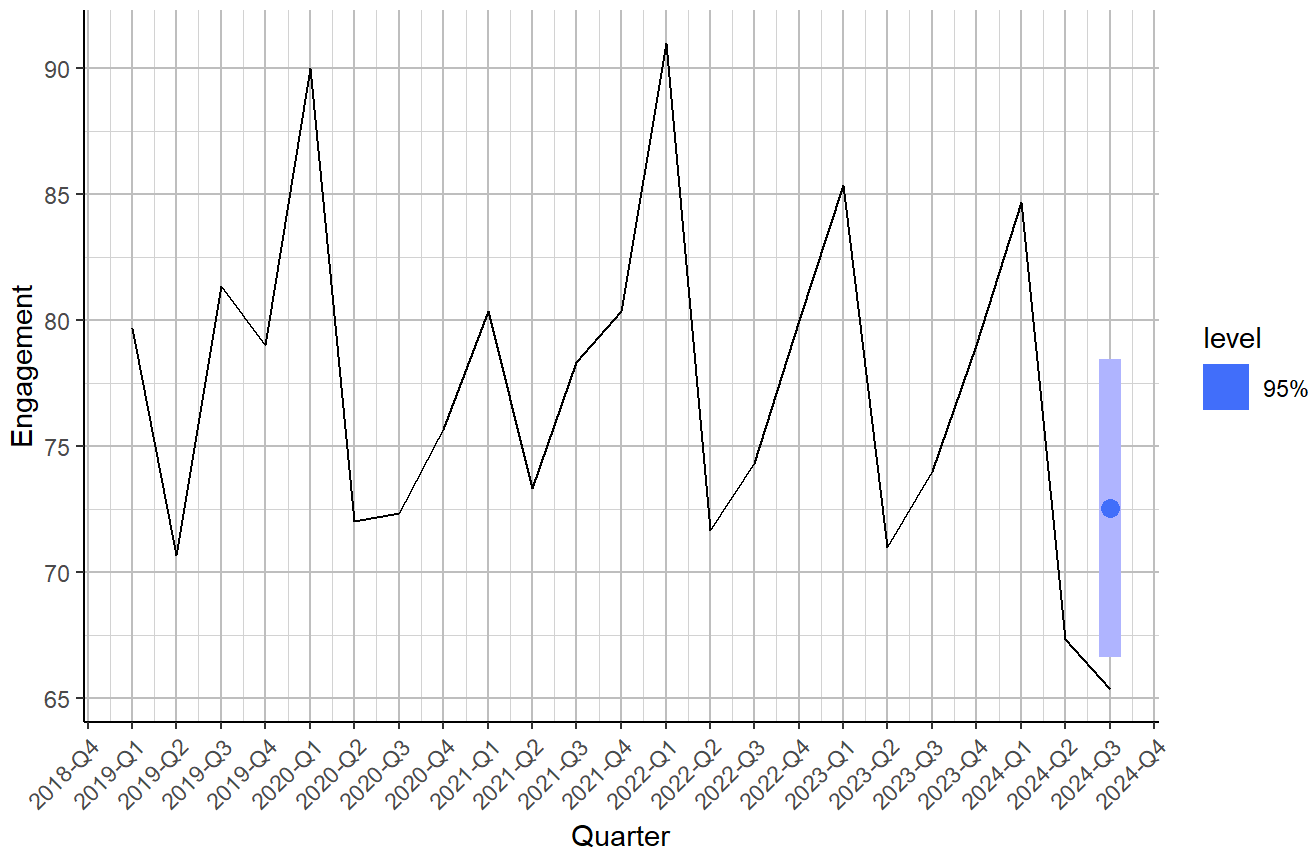
Implications for the Company

Revenue

Based on our forecasted analysis, we anticipate a revenue increase for Q3 2024, which there was, despite the wider confidence intervals. This reinforces our expectation to maintain consistent revenue growth through the end of the year. However, it's important to note that the lower bound of the interval is below that of Q3 2024, indicating the possibility of a downturn. This underscores the importance of enhancing customer retention strategies.

While the confidence intervals are wide, our model's strength lies in its ability to account for dips in previous quarters, including the downturn experienced during the COVID-19 lockdowns. Should any pent-up demand from that period resurface, particularly for Starbucks or similar consumer brands, we could see a resurgence in revenue as customers fulfill their unmet consumption desires. This could be best shown with our quadratic model.

Google Trends

Q3 2024 engagement fell significantly below expectations, marking the lowest engagement level observed —even compared to our training set forecasts. While the model did predict a relatively low engagement value for this quarter, it still overestimated the actual outcome.

Why is this important?

This discrepancy raises several key questions: Should we reevaluate our marketing strategies? Do we need to reassess our target market? These insights are valuable for our marketing department as they indicate potential areas for adjustment to better align our campaigns with current trends.