

# Forecasting, Sentiment, and Financial Analysis for HUL

BDM Capstone Project

**Name:** Nitish Rishi | **Roll Number:** 22f3000645

IITM Online BS Degree Program, IIT Madras

# Business Context

**Hindustan Unilever Limited (HUL)** is India's largest FMCG company, managing over 60 brands across Personal Care, Home Care, and Foods.

**The Challenge:** Despite market leadership, HUL faces significant hurdles in:

- ✓ Aligning production cycles with fluctuating demand.
- ✓ Capturing rapid shifts in consumer sentiment.
- ✓ Optimizing inventory to sustain profitability.



# Project Objectives



## Demand Forecasting

Build a predictive model for quarterly revenue using internal financial data and external macroeconomic indicators like CPI and Google Trends.



## Sentiment Analysis

Analyze over 3000 customer reviews to uncover hidden pain points and measure the disconnect between star ratings and text sentiment.



## Financial Efficiency

Benchmark HUL's operational efficiency, specifically Working Capital and Asset Utilization, against key FMCG industry peers.

# Data & Key Statistics

**Source:** HUL Investor Relations (Quarterly Reports), MoSPI (CPI), RBI (CSI), Google Trends.

We constructed a robust multivariate time-series dataset by aggregating 29 quarters of HUL's segment-wise financial data (2018-2025). This was enriched with external macroeconomic signals—specifically the Consumer Price Index (CPI) and Consumer Sentiment Index (CSI)—and further enhanced by integrating Google Trends search volume indices.

**Source:** Walmart Customer Reviews

NLP analysis of customer feedback across 13 key SKUs (Dove, Knorr, Lipton) to find disconnects. We deployed a comprehensive Natural Language Processing (NLP) framework on more than 3000 verified customer reviews scraped from Walmart, using a two-phase strategy to capture both high-relevance and low-rated feedback

**Source:** Annual Reports of HUL and Peers (ITC, Dabur, Britannia, Marico)

We conducted a rigorous benchmarking analysis of HUL's operational efficiency against key FMCG peers using standardized financial ratios. The study focused on Working Capital Management and Asset Utilization, specifically calculating the Cash Conversion Cycle (CCC), Inventory Turnover, and Asset Turnover ratios.

# Data Cleaning & Preprocessing

## Alignment & Aggregation

- Temporal Alignment: Converted monthly macroeconomic indicators (CPI, CSI) to Quarterly Moving Averages to align with financial reporting periods.
- Signal Aggregation: Created "Segment-Level" search indices by averaging normalized search volume for all brands within a category (e.g., Dove + Lifebuoy to Personal Care Index).

## NLP Pipeline

- De-duplication: Merged "Phase 1" (Relevance) and "Phase 2" (Low-Rating) datasets, applying strict de-duplication to remove overlapping reviews.
- For Sentiment: Preserved punctuation and casing (raw text) for VADER intensity scoring.
- For Topic Modeling: Applied Lemmatization, Stop-word removal, and Tokenization using NLTK.

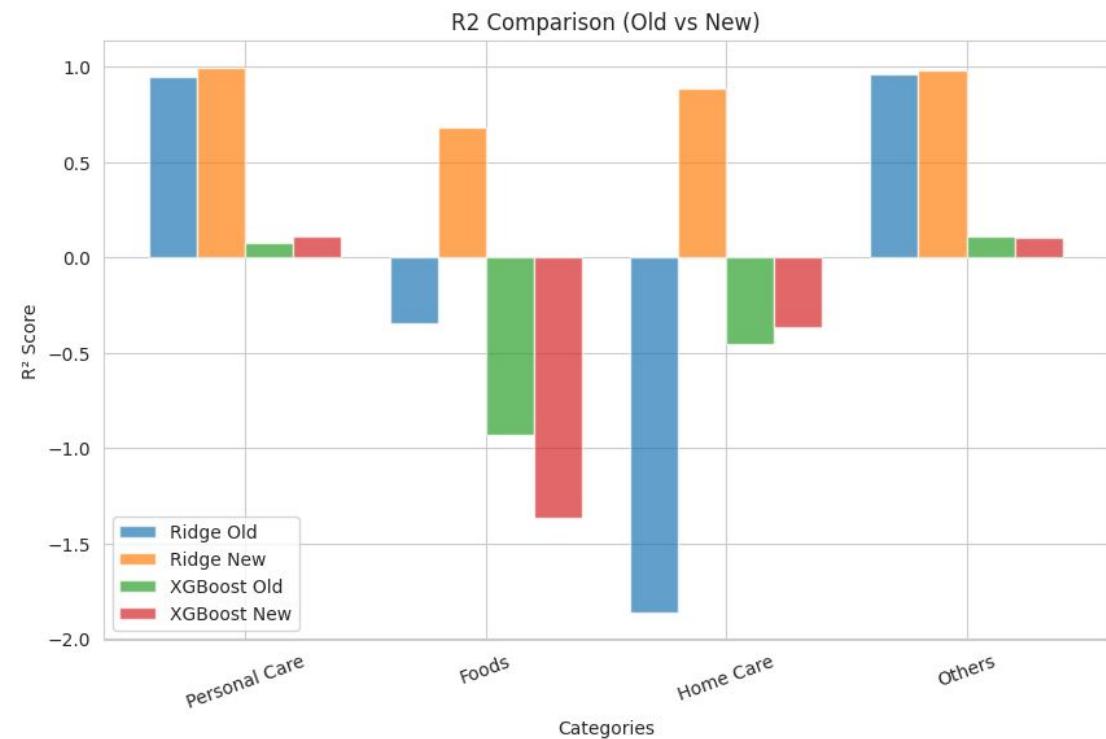
## Cleaning & Standardization

- Data Cleaning: Converted accounting artifacts (hyphens for nulls, comma-separated strings) from Annual Reports into computational numeric formats.
- Z-Score Standardization: Normalized financial ratios across peer companies (ITC, Dabur, etc.) to enable fair comparison despite vastly different market caps.

# Forecasting Model

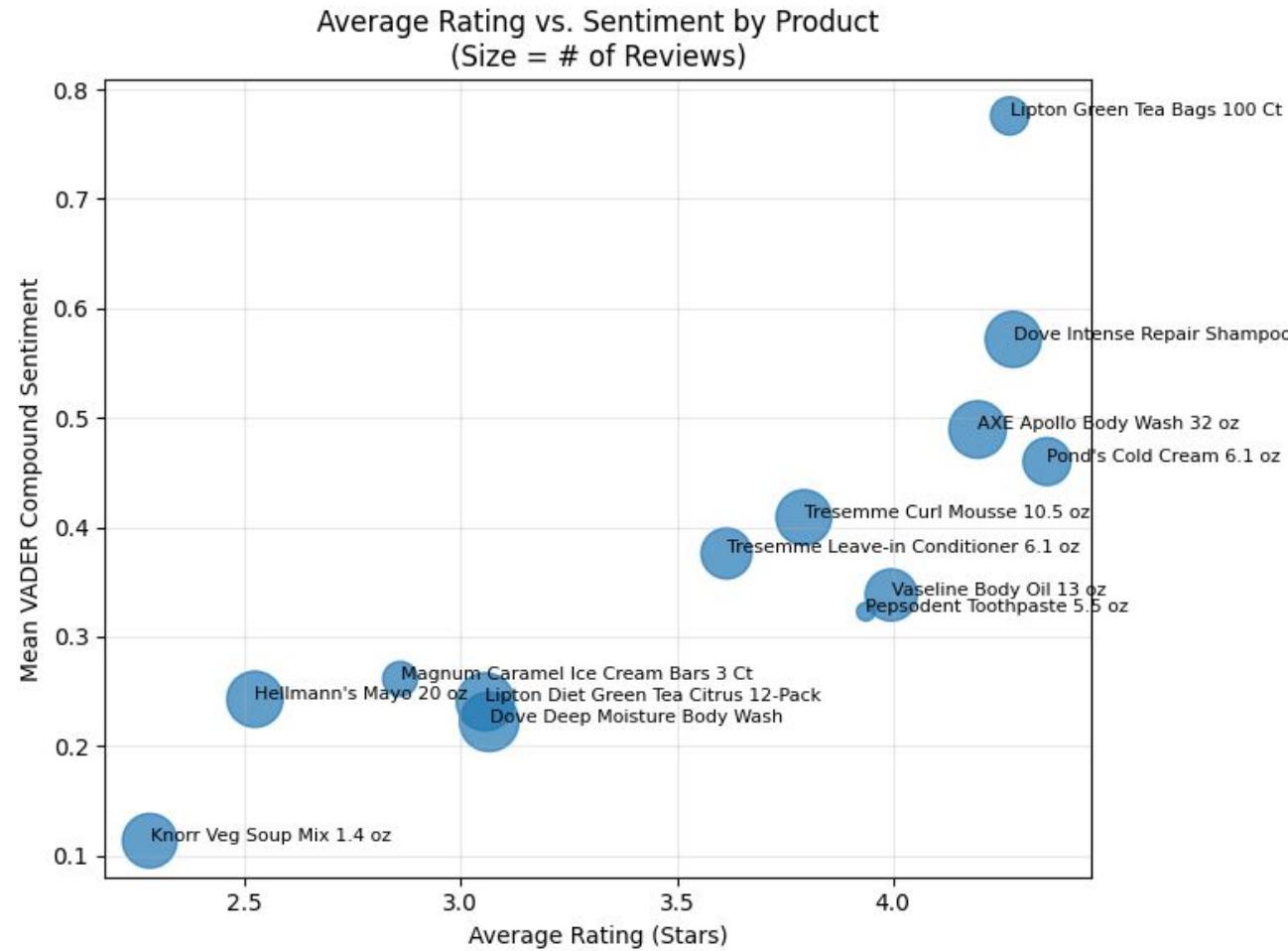
Ridge Regression outperformed XGBoost and SARIMA due to the limited quarterly dataset size. It generalized better, avoiding the overfitting seen in non-linear models.

- ✓ **Ridge Robustness:** Ridge Regression consistently outperformed, effectively capturing linear relationships with macroeconomic indicators (CPI, CSI) without overfitting.
- ✓ **Foods:** Google Trends integration improved  $R^2$  to 0.65, correcting previous negative scores.
- ✓ **Impact of Google Trends:** Integrating search volume data significantly boosted Ridge performance, particularly in the **Foods** ( $R^2 \sim 0.65$ ) and **Home Care** segments.



# Sentiment Analysis: The Rating Disconnect

- ✓ **The Disconnect:** Identified a non-linear relationship between numerical ratings (Stars) and textual sentiment (VADER Score).
- ✓ **The "Frustrated but Polite" Cluster:** Products like **Knorr Veg Soup** have low ratings (~2.3 stars) but surprisingly neutral sentiment scores. Dissatisfaction drives from specific functional flaws (taste, packaging) rather than emotional brand rejection.
- ✓ **The "Satisfied but Quiet" Cluster:** High-rated products like **Pond's Cold Cream** (~4.4 stars) show only moderate sentiment scores. Users are functionally satisfied ("it works") but lack emotional enthusiasm.



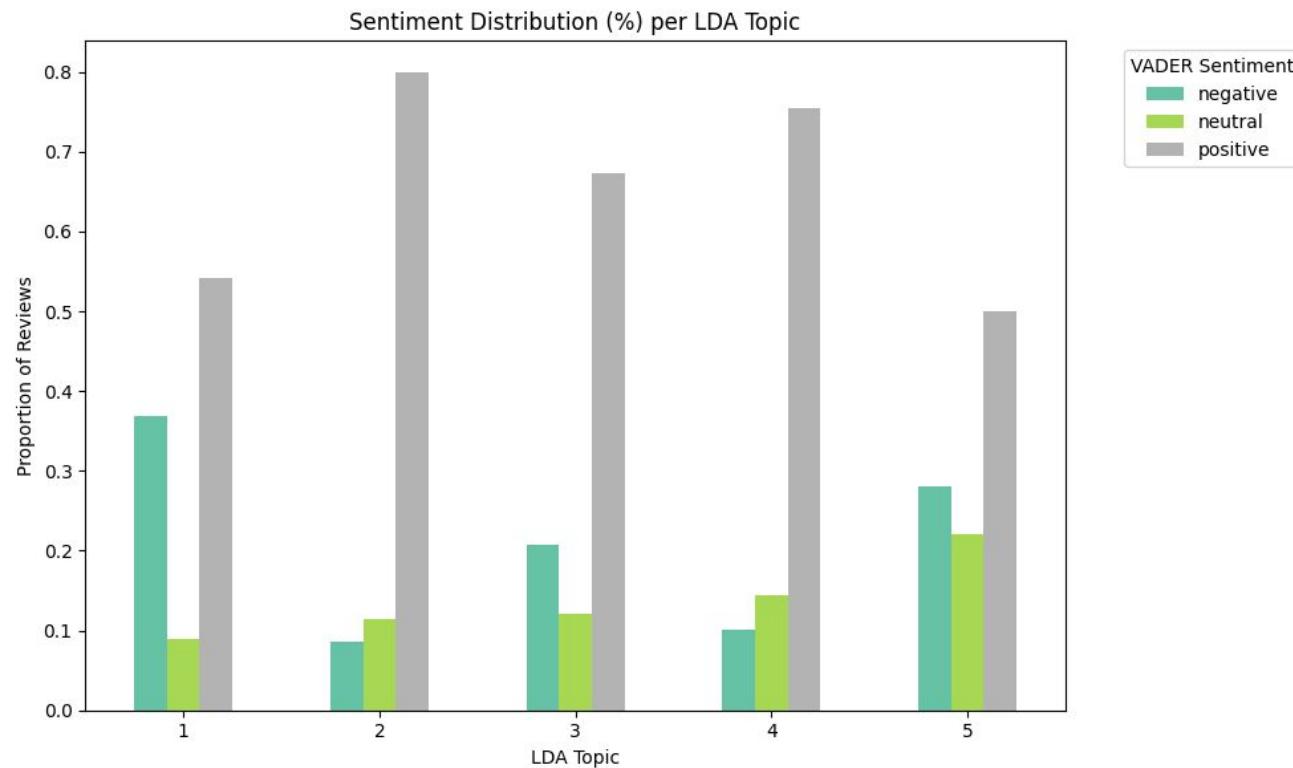
# Topic Modeling: Identifying Pain Points

By grouping reviews into 5 latent topics, we identified the root causes of negative sentiment.

- ✓ **Topic 5 (Packaging):** The most critical area. 28% negative sentiment driven by keywords like "bottle," "broken," and "leak."
- ✓ **Topic 2 (Haircare):** Highest positive sentiment (~80%), confirming strong product-market fit for formulas.

Conclusion:

Overall Product review is strong, there exist logistic issues Investing in better protective packaging will yield the highest ROI for improving customer satisfaction scores (CSAT).



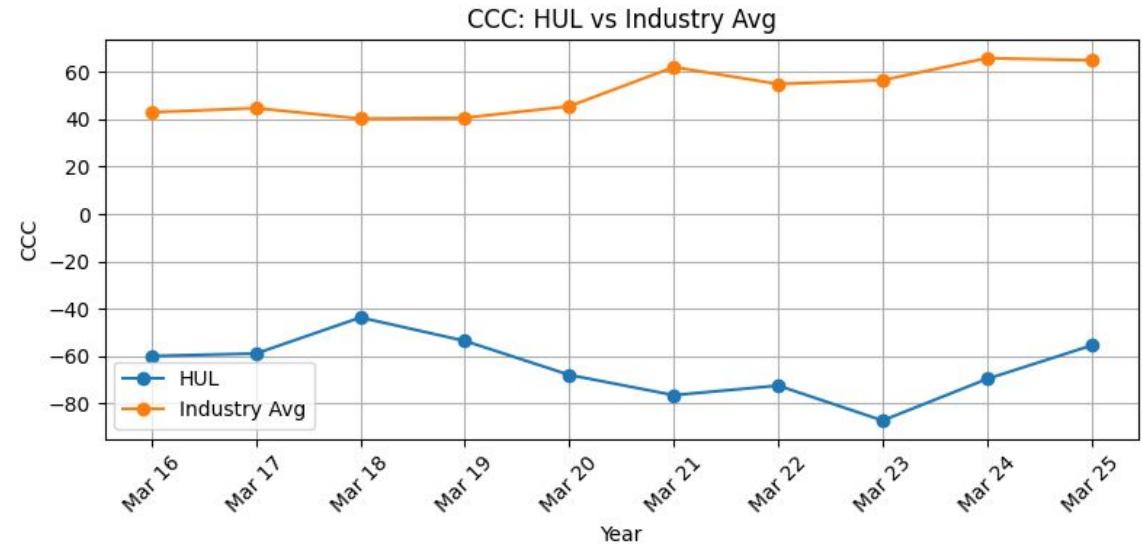
**1 – Recipes and Food Preparation    2 - Haircare Product  
3 - Desserts and Creams    4 - Tea and Beverage    5 - Packaging**

# Financial Efficiency: Cash Conversion Cycle

## Working Capital Advantage

- HUL consistently maintains a **negative** Cash Conversion Cycle (CCC), providing a massive liquidity advantage over peers.

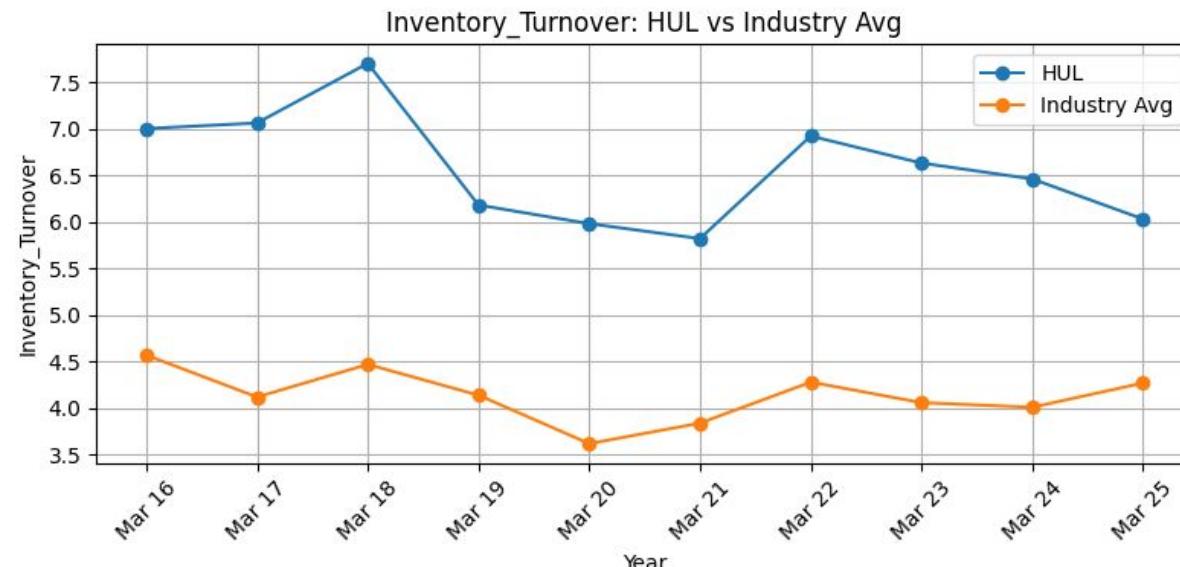
**Insight:** HUL collects cash ~100 days faster, effectively using supplier capital to fund operations.



## Stock-to-Sales Efficiency

- HUL (6.0x – 7.0x): Consistently outperforms the industry average of ~4.2x.

**Insight:** Higher turnover indicates lower risk of overproduction and fresher stock on shelves



# Sustainability & Project Insights



## Challenges

- Navigating Strict Plastic regulations (PWM 2024)
- Addressing the negative Sentiment in Packing



## Logistics

- Deploying EVs and expand shikhar app to feature green routing
- Leveraging forecasting to improve routing



## Finance

- Taking Advantage of High Liquidity and researching better Packaging Options
- Investing in EVs and app building

# Strategic Recommendations



## Rural Push

Reallocate 20% of the Foods marketing budget to rural markets where demand forecasting shows more resilience than urban centers.



## Packaging Audit

Initiate an immediate audit of packaging suppliers to address "Topic 5" leaks and breakages, aiming to reduce negative sentiment by 28%.



## Self-Funding

Leverage the 99-day CCC lead-time advantage to self-fund digital transformation initiatives without raising external debt.