DS223: Marketing Analytics - Homework 1

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Introduction

The **Hero MotoCorp Surge S32** is a newly introduced electric two-wheeler that aims to combine efficiency, sustainability, and affordability, making it an attractive option for consumers looking for eco-friendly mobility solutions. With the rising demand for electric vehicles (EVs), particularly in urban and semi-urban areas, the Surge S32 is positioned to appeal to a broad range of users, including daily commuters, environmentally conscious individuals, and cost-conscious consumers seeking lower operational expenses compared to traditional petrol-powered scooters.

One notable parallel to this innovation is the broader **adoption of electric two-wheelers in India**, which has gained significant momentum over the last five years. Government policies, such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, subsidies, and incentives, have contributed to the increasing penetration of electric mobility solutions. Additionally, factors such as rising fuel prices, growing environmental awareness, and improved battery technology have driven consumers to consider EVs as a viable alternative to conventional two-wheelers.

The **adoption trend of electric two-wheelers in India** serves as an insightful benchmark for understanding how the Hero Surge S32 might diffuse in the market. Historical data indicates that as charging infrastructure expands, battery costs decline, and consumer confidence in EV technology strengthens, the adoption rate of electric two-wheelers is likely to accelerate. Given Hero MotoCorp's strong brand reputation and existing customer base, the Surge S32 has the potential to contribute significantly to the ongoing transition toward **sustainable urban mobility**. By analyzing consumer behavior, policy incentives, and technological advancements, we can predict that the Hero Surge S32 will follow a similar diffusion pattern, making it a key player in India's evolving electric two-wheeler landscape.

Figure 1: Photos from the Indian Car Expo: The Hero MotoCorp Surge S32

Surge Future Mobility: Next-Gen Electric Vehicle Innovation

The **Surge Future Mobility platform** represents a breakthrough in modular electric vehicle (EV) design. The company focuses on **scalable, adaptable, and energy-efficient electric vehicle architecture**, paving the way for a sustainable future. The innovation introduces an **intelligent, modular EV platform, capable of supporting multiple configurations such as electric scooters, three-wheelers, and lightweight cargo vehicles**.

Key Components of the Surge Future Mobility Platform:

Ladder Frame Chassis

- A **reinforced, lightweight ladder frame structure** designed to maximize strength while minimizing weight.
- Ensures **better durability, impact resistance, and flexibility** for different vehicle applications.
- Provides a **modular foundation** to adapt to multiple EV configurations.

- A **high-energy-density battery pack** optimized for long-range performance.
- Designed for **fast swapping**, enhancing efficiency and reducing downtime.
- Integrated **thermal management system** for improved safety and longevity.

Advanced Battery Pack

Vehicle Cabin and Structural Safety

- A **high-strength metal frame** ensuring superior **passenger protection**.
- Enhanced **crash resistance and safety measures** to comply with industry standards.
- Lightweight, yet **rigid frame design** for improved aerodynamics and structural integrity.

- The **Adaptive Modular Smart Electric Platform (AMSEP)** allows multiple configurations.
- Suitable for **cargo transport, personal commuting, and commercial fleet applications**.
- Supports different powertrain options and weight classes to cater to diverse mobility needs.

Modular EV Platform

Safety and Smart Features

- Integrated **AI-based safety monitoring systems**.
- **Dynamic battery positioning** to optimize balance and performance.
- **Advanced regenerative braking system** for improved energy efficiency.

This innovation aligns with the global shift towards **sustainable, electric mobility**, addressing the **rising demand for adaptable, cost-efficient EVs**. The **Surge platform** is well-positioned to redefine electric transportation by offering **flexibility, modularity, and enhanced performance** across multiple vehicle segments.

Historical Data

The dataset was sourced from Statista, providing the number of electric two-wheeler sales in India from 2019 to 2023. These numbers will be used to estimate the Bass Model parameters for predicting the diffusion of the Hero MotoCorp Surge S32.

Number of electric vehicles sold in India 2019-2023, by type				
Number of electric vehicles sold in India from 2019 to 2023, by type (in 1,000 units)				
	Two-wheeler	Three-wheeler	Four-wheeler	Bus
2019	30,36	134,17	1,67	0,51
2020	29,11	91,24	4,20	0,09
2021	156,20	159,91	13	1,18
2022	631,09	352,74	38,17	1,99
2023	856,84	582,55	80,12	2,67

Figure 2: Sales data of Vehicles in India 2019-2023 (thousand units)

Bass Model Parameter Estimation and Diffusion Prediction

The **Bass Model equation** is:

$$\frac{f(t)}{1-F(t)} = p + \frac{q}{M} \times [A(t)] \iff \frac{f(t)}{1-F(t)} = p + q \times F(t)$$

where:

1. $f(t)$ = fraction of the total market adopting at time t
2. $F(t)$ = cumulative adoption fraction
3. p = innovation coefficient
4. q = imitation coefficient
5. M = market potential (total number of adopters)

After estimating the parameters via Python and visualizing it:

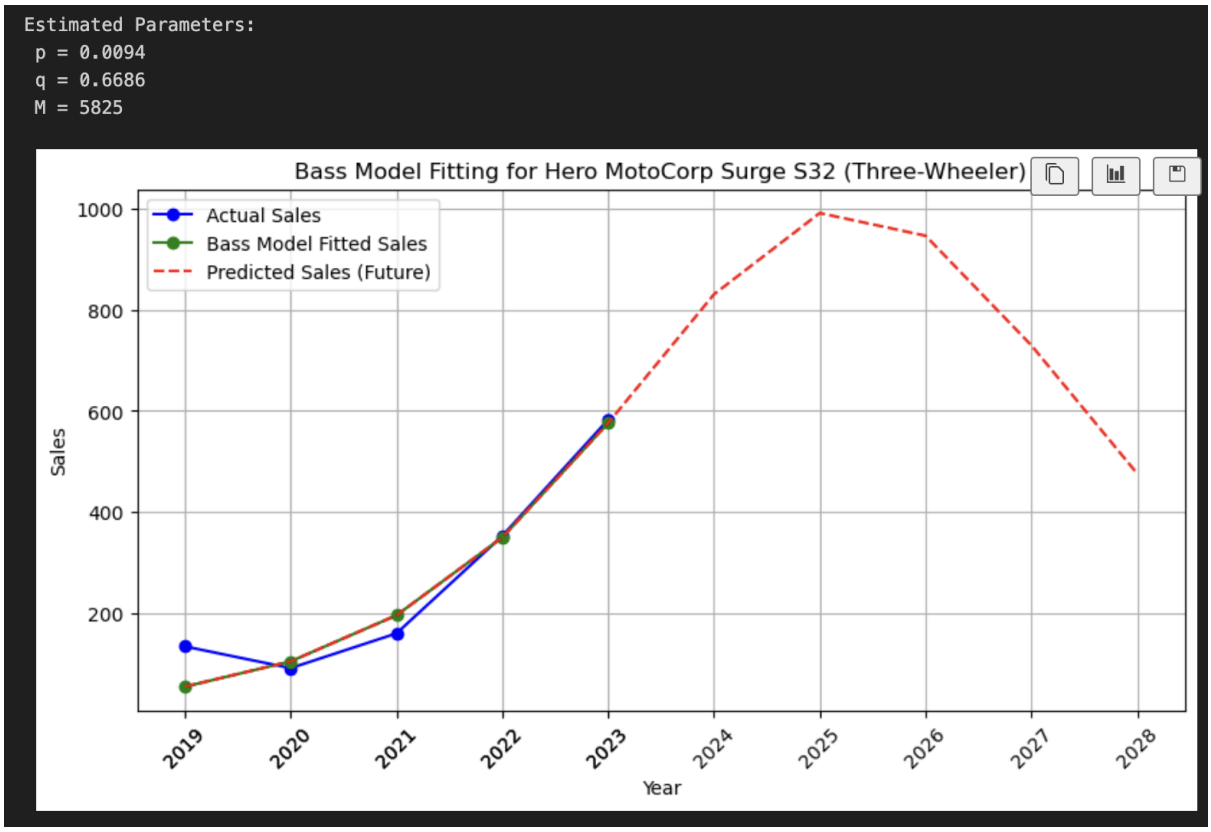

Figure 3: Bass Model Estimation and Forecasting (thousand units)

The results are:

$$p = 0.0094,\ q = 0.6686,\ M = 5825$$

Scope Selection: Global vs. Country-Specific Analysis

For this study, I choose a country-specific analysis focusing on India. The rationale behind this decision is:

- India is one of the largest markets for two-wheelers, with significant policy support for EV adoption.
- The Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme provides strong incentives for EV adoption.
- Infrastructure developments such as charging stations and battery-swapping technologies are more relevant on a country level than globally.
- Cultural and economic factors, such as price sensitivity and government subsidies, play a crucial role in the adoption of electric vehicles in India.

Given these factors, a country-specific diffusion analysis allows us to capture more accurate adoption patterns and market dynamics compared to a broad global perspective.

Estimating the Number of Adopters Over Time

The Bass Model allows us to predict the number of adopters in each time period based on the estimated parameters (p, q, and M). By analyzing the adoption curve, we can determine the expected trajectory of electric vehicle (EV) diffusion in the Indian market.

Projected Adoption Pattern of Hero MotoCorp Surge S32

From the Bass Model estimation, the expected number of adopters follows a typical S-shaped curve, indicating an initial slow adoption phase, followed by a rapid growth phase, and eventually reaching saturation as the market matures.

The diffusion pattern suggests:

- **Early adoption phase (2019-2022):** A small group of technology enthusiasts and environmentally conscious consumers adopt electric two-wheelers. Government incentives play a crucial role in attracting early adopters.
- **Acceleration phase (2023-2025):** A significant rise in adoption occurs as infrastructure improves, battery costs decline, and consumer awareness increases. During this period, imitation effects dominate, meaning that new adopters are influenced by previous adopters.
- **Market saturation phase (2026 and beyond):** Adoption slows down as most of the potential market has already transitioned to EVs. The number of new adopters per year decreases, leading to market stabilization.

Based on our parameter estimations:

- The peak adoption rate is expected in 2025, where the highest number of new adopters will purchase the Hero MotoCorp Surge S32.
- Post-2025, the growth in new adopters will start to decline as the market reaches saturation.

Key Factors Influencing Adoption Trends Several factors contribute to the predicted peak and eventual decline in adoption rates:

1. **Government Policies and Incentives:**

- Continued subsidies and incentives under the Faster Adoption and Manufacturing of Electric Vehicles (FAME-II) program will support market penetration. However, policy shifts could impact the diffusion pattern.

2. **Battery Technology Improvements:**

- Advances in lithium-ion battery efficiency, along with cost reductions, will drive consumer adoption. Battery-swapping technology could also play a crucial role in sustaining adoption levels.

3. **Charging Infrastructure Expansion:**

- The availability of widespread and fast-charging networks will enhance consumer confidence and accelerate adoption.

4. **Economic and Market Conditions:**

- Rising fuel prices make EVs a more cost-effective option in the long run. Additionally, economic growth

and increasing disposable income levels could boost demand.

5. **Competition from Other EV Manufacturers:**
- The presence of alternative EV brands offering competitive pricing and features may impact the market share of the Hero Surge S32.

6. **Consumer Awareness and Social Influence:**
- Word-of-mouth, peer influence, and the perceived benefits of EV ownership (low maintenance, lower operational costs) will drive late adopters to transition.

Conclusion:
The Bass Model prediction aligns well with real-world EV market trends, suggesting that Hero MotoCorp's Surge S32 will experience peak adoption in 2025, followed by a gradual decline as the market nears saturation. However, the company can extend its product life cycle and maintain sales momentum through:
- New product launches (next-gen models with improved battery life and features).
- Strategic pricing and financing options to attract price-sensitive consumers.
- Investment in infrastructure and service networks to improve consumer convenience.

Ultimately, the success of Hero MotoCorp's Surge S32 in India will depend on its ability to leverage technology, policy support, and consumer trends to maximize adoption in the coming years.

References

[1] Hero MotoCorp Surge S32 Launch Event. YouTube. Available at: https://www.youtube.com/watch?v=s_Uv4Jw7dHE

[2] Surge Future Mobility – Official Website. Available at: https://www.surgefuturemobility.com

[3] Hero MotoCorp Surge S32: A Game Changer in Electric Mobility. Time Magazine. Available at: https://time.com/7094825/hero-motocorp-surge-s32/