DATA ANALYSIS
AND
OPTIMIZATION OF THE SUPPLY CHAIN OF
BAKERY BUSINESS

Submitted by

Name : Supravat Bar

Roll Number : 21f1004015

Mid-Term Submission

IITM Online BS Degree Program,

Indian Institute of Technology, Madras, Chennai

Tamil Nadu, India, 600036

1)Executive Summary:

Rocher's The Bake Shop, a cloud kitchen bakery, initially thrived with its innovative use of mobile carts, offering high-quality baked goods at affordable prices. This novel approach distinguished the business from traditional brick-and-mortar bakeries, leading to impressive early sales growth. However, the shifting landscape of consumer behavior, driven by a surge in online shopping, now challenges Rocher's ability to maintain this momentum. Despite its strengths, Rocher's faces several critical challenges: increased competition from other online and physical bakeries has impacted revenue like reliance on cart sales exposes the business to weather-related disruptions, affecting sales consistency; the small size of the carts limits the volume and variety of products offered, leading to potential stock shortages and missed sales opportunities; and the cart-based model constrains the ability to fulfill home delivery requests, further limiting market reach.

To address these challenges, data from daily sales, customer feedback, and operational metrics were analyzed. This dataset, collected over several months, included variables such as revenue trends, product shelf-life data, and peak sales times across different locations. Statistical analysis and forecasting models were employed to identify patterns and potential solutions, with the goal of optimizing inventory, enhancing product shelf-life, and exploring viable delivery model.

The analysis revealed several important insights into Rocher's The Bake Shop's profitability and growth potential. Butterscotch Pastry, Fudgy Brownies, and Double Chocolate are the primary profit drivers, collectively contributing around 54% of total profits, with Fudgy Brownies and Pineapple Pastry boasting the highest profit margins at approximately 25%-40%. Applying the Pareto Principle showed that three key SKUs—including Butterscotch Pastry, Fudgy Brownies, and Double Chocolate—account for about 50% of total profit. Additionally, improving storage techniques to extend product shelf-life could reduce waste by 20%, while diversifying the inventory based on local demand could increase average sales by 15% are expected to enhance revenue, improve operational efficiency, and boost customer satisfaction, supporting Rocher's The Bake Shop in its growth within Lucknow's competitive bakery market.

2)Proof of originality of the Data:

About:

Rocher's The Bakeshop is a dessert business based in Lucknow, Uttar Pradesh, India, specializing in direct-to-consumer (B2C) operations. They have a diverse menu featuring a variety of desserts such as cookies, brownies, donuts, jar cakes, and cheesecake. What sets them apart is their innovative strategy of using mobile carts and dedicated hawkers to ensure that their freshly baked delights reach customers in various locations.

Details:

Founders: Rohit Maurya, Abhay Chaturvedi

Number of employees: 8 (5 hawkers and 3 people in their cloud kitchen)

Address: Rocher's The Bakeshop Cloud Kitchen is located at 2/21, Kursi Road, Sector C, Jankipuram, pin-226021, Lucknow, phone number is 9340709803.

Here are some links for validation:

1.Interaction with the Co-founder of the business: Link

2.Here is the dataset link: Link

3.The authorization letter: Link

(Pic-1) Cart with the selling man

**Here, The video Link to see the cart selling the products.

(pic-2) Picture of the cart

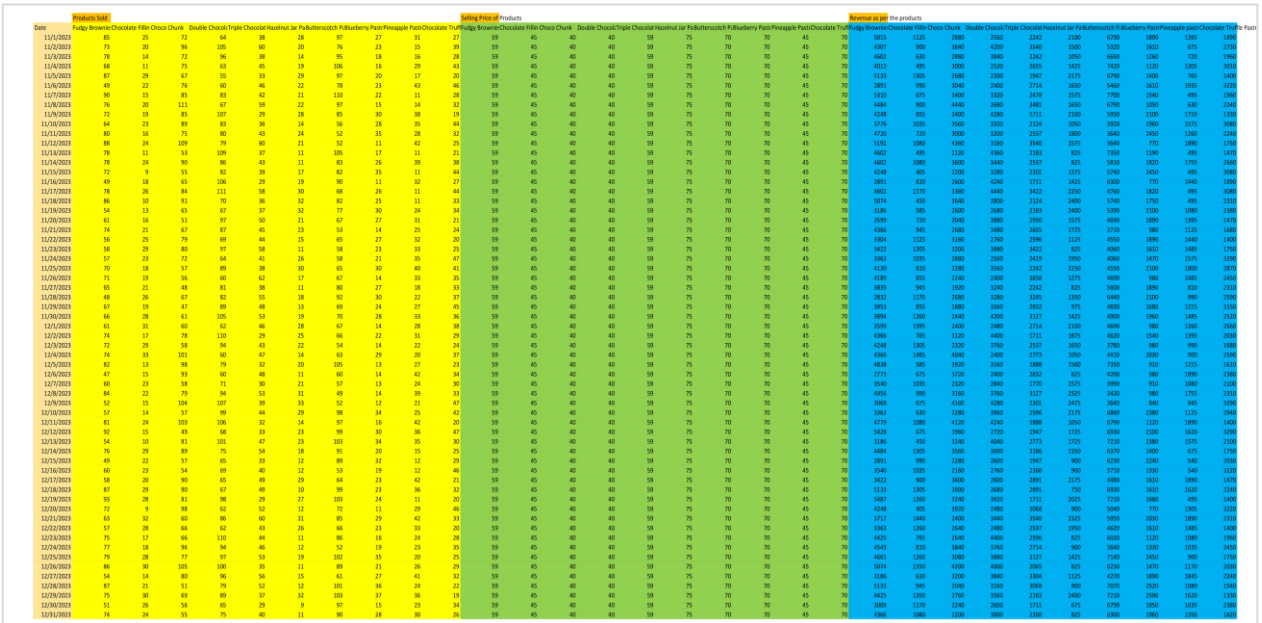
(pic-3) Picture of the cloud kitchen

2) **Metadata:**

I have meticulously gathered an extensive 5 months of dataset, commencing from the 1st of November 2023 and extending until the 31st of March 2024. My focus was on understanding the inner workings of the bakery business. The dataset I compiled was rich in daily sales data, diligently logged in an Excel sheet. This data formed the backbone of my analysis, offering insights into revenue trends and performance metrics.

Digging deeper, I also captured data on the production cost of each item. This led to a fascinating discovery profit margin between 25% to 40% over every product. This information is crucial as it sheds light on the bakery's pricing strategy and its ability to maintain profitability while meeting customer expectations.

In the sales data tables, I have utilized ten columns to represent the sales performance of ten distinct products. The products included in my analysis are as follows: Fudgy Brownies, Chocolate Filling Doughnut, Choco Chunk, Double Chocolate, Triple Chocolate Brownie, Hazelnut Jar Pastry, Butterscotch Pastry, Blueberry Pastry, Pineapple Pastry, and Chocolate Truffle Pastry. I have collected data on the sales price and the production costs associated with each of these products.



(1.1) Snapshot of Data

The collected data underwent thorough analysis utilizing descriptive statistics, complemented by insightful visual representations in various chart formats. Bar charts were employed to compare revenue across all products, while pie charts

were instrumental in gauging revenue proportions. Additionally, a diverse range of charts including line charts, stacked bar charts, and Pareto charts were utilized to gain comprehensive insights into the dataset. These visualizations not only enhance understanding but also facilitate informed decision-making and strategic planning within the business context.

3)Descriptive Statistics:

Central Tendencies:

- **Mean (Average) Price:** 57.3, suggesting that the typical price in the dataset is around this value.
- **Median Price (Q2):** 59, showing that half of the prices are above and half are below this level, which aligns closely with the mean, indicating a balanced distribution.
- **Mode Price:** 70, appearing most frequently (3 times), suggesting some clustering around this price point.
- **Range:** 35, with prices between 40 and 75.
- **Standard Deviation:** 13.57, showing that prices typically vary by about 13.57 units from the average.

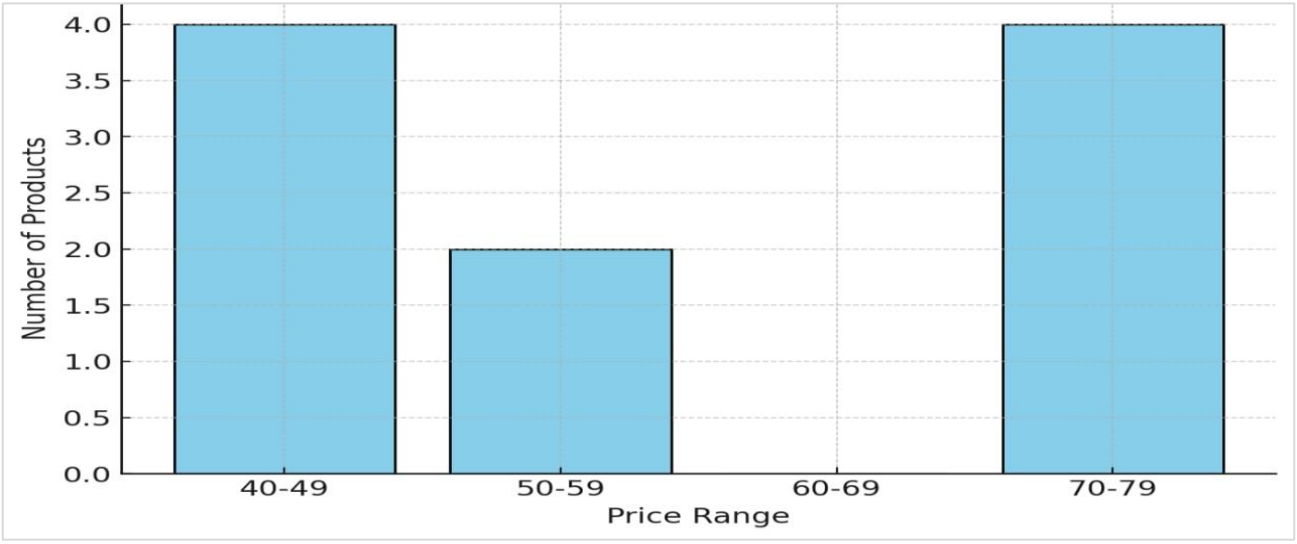
Range and Quartiles:

- **Quartiles:** Q1 = 45, Median (Q2) = 59, Q3 = 70.
- **Interquartile Range (IQR):** 25, showing moderate spread in the middle 50% of prices.
- **Range:** Prices span from a minimum of 40 to a maximum of 75.

- **Skewness**: Slightly negative (-0.13), showing a minor left skew, meaning a few lower prices slightly pull the distribution left.
- **Coefficient of Variation (CV)**: 23.68%, which suggests moderate relative variability in prices around the mean.

Price Distribution:

- 40-49: 4 products
- 50-59: 2 products
- 60-69: 0 products
- 70-79: 4 products



(1.2) Distribution of the price

This distribution shows two main clusters in the 40-49 and 70-79 ranges, with a gap in the 60-69 range, suggesting a possible bimodal distribution with no products priced in the 60s.

4)Detailed Explanation of Analysis Process:

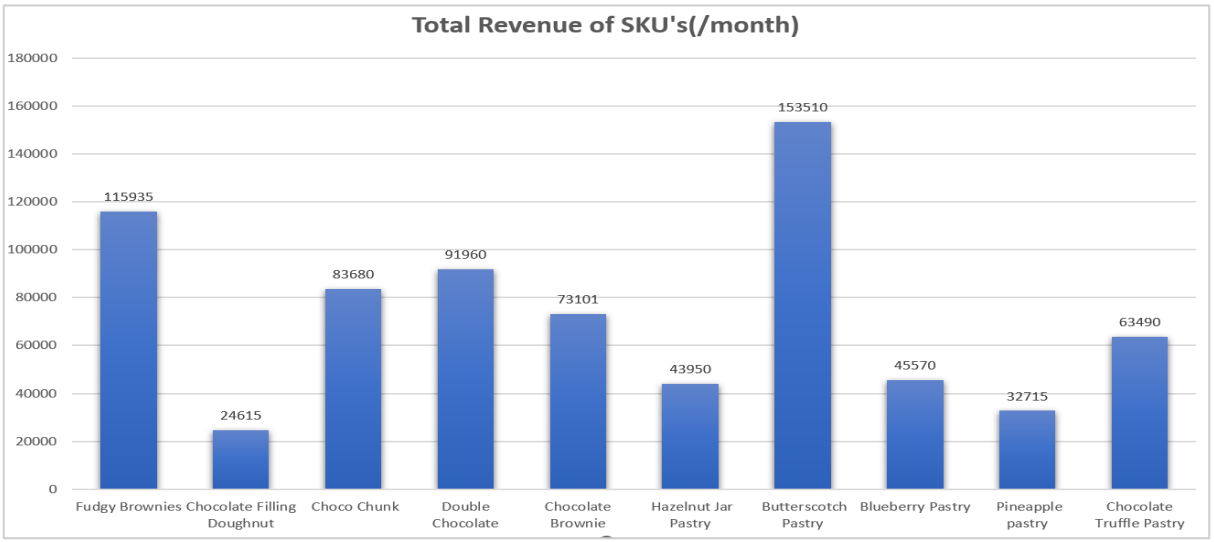
I compiled data spanning 5 months in Excel Sheets, meticulously cleaning, organizing, and analyzing it. The initial step involved a detailed review to ensure data integrity, addressing inconsistencies, missing values, and outliers. This preparation set the stage for comprehensive analysis using descriptive statistical methods, including mean, average, profit, and inventory stock calculations, providing a deep dive into business operations.

Visual representations played a pivotal role in the analysis, employing a variety of chart types—including column, bar, line, and pie charts—to effectively illustrate revenue, product profitability, production costs, and their respective proportions. These visual tools were essential for comprehensively understanding performance trends, identifying patterns, and generating actionable insights for decision-making.

To effectively depict the distribution of revenue and profit across the various products, a Pareto chart was utilized, integrating both line and bar elements. This chart visually represented the cumulative contributions of each product to the overall revenue and profit, facilitating the identification of key contributors and their corresponding profitability margins. Such a detailed analysis, supported by

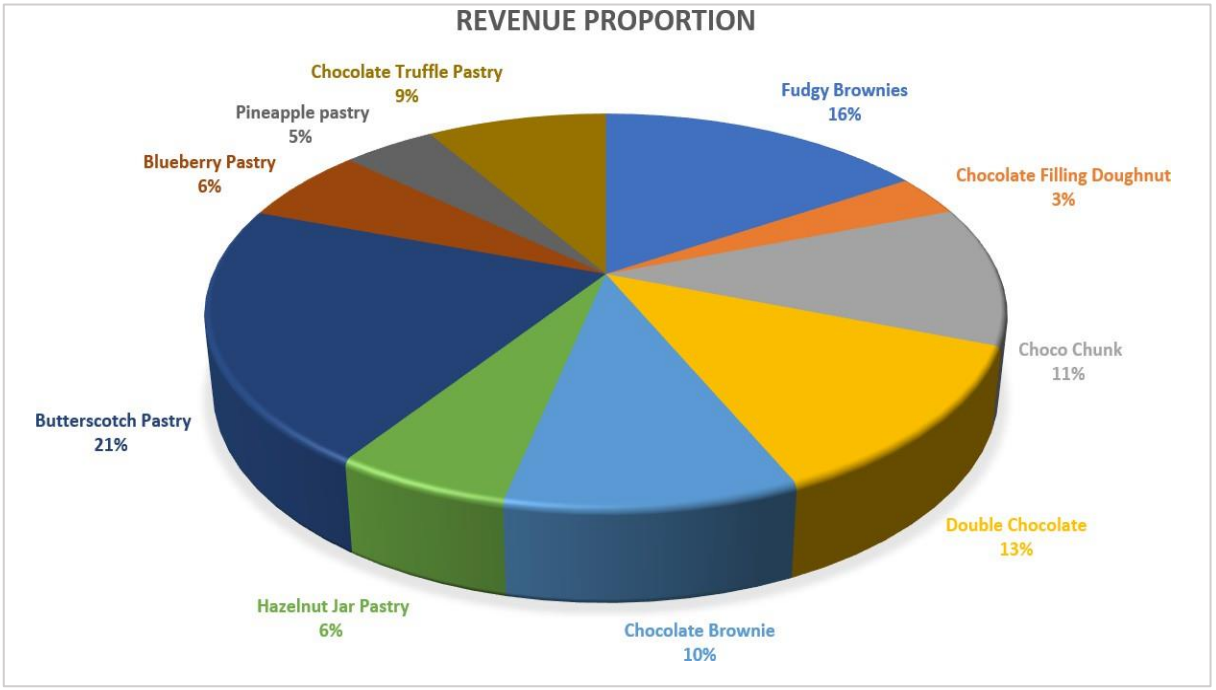
these visual aids, empowered stakeholders to make informed decisions and develop strategies for performance optimization. For the representation of profit proportions, a pie chart was employed, which segmented the circular graph into slices corresponding to each product's profit contribution. The size of each slice was directly proportional to the profit generated by the respective product, allowing for a clear visual comparison of profitability across the product range. Furthermore, a stacked bar chart was utilized to compare revenue and production costs over time, providing a comprehensive overview of market competitiveness and product performance. This multifaceted approach to data visualization enabled a deeper understanding of the business landscape and informed strategic initiatives.

5)Results and Findings:



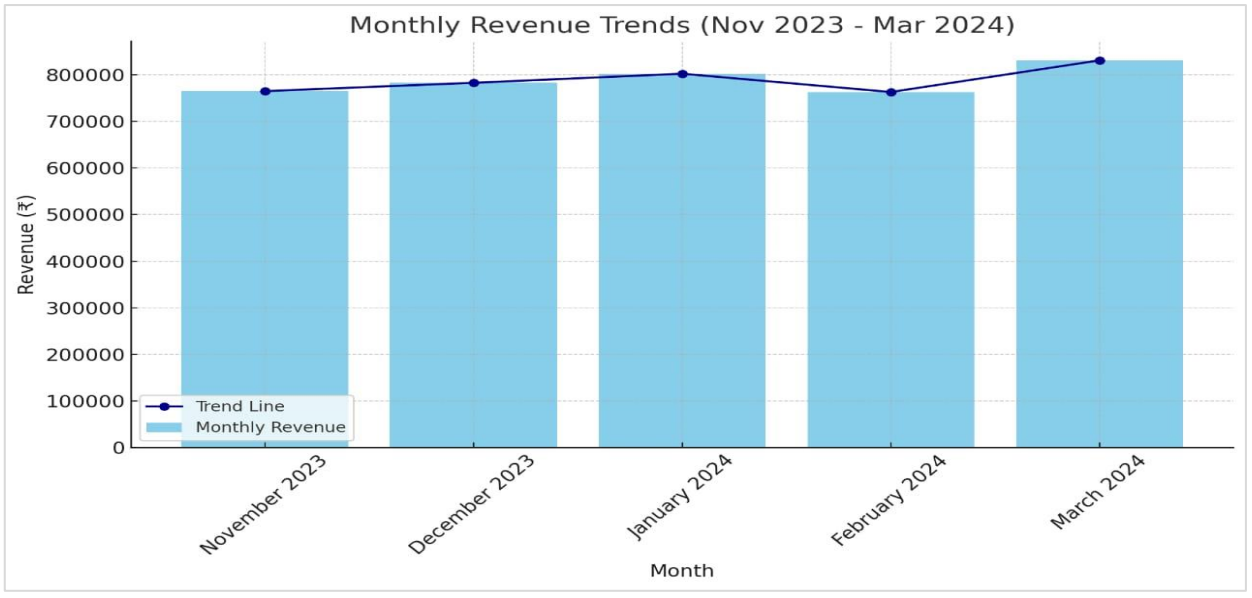
(1.3) Total Revenue of the products over a month

The bar chart above illustrates the total monthly revenue generated by various products. It is evident from the data that the Butterscotch pastry generates the highest revenue among the items listed, while the Chocolate filling doughnut accounts for the lowest revenue during the same period. This trend highlights the significant disparity in sales performance across different product offerings.



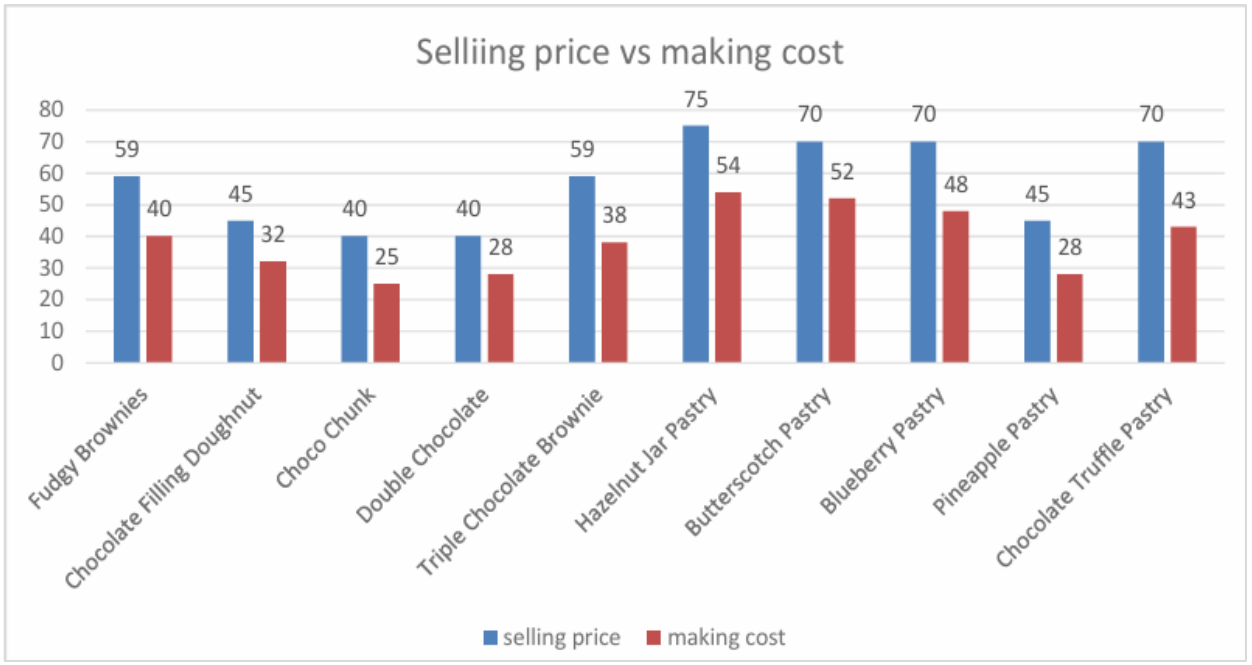
(1.4) SKU's proportion to Total Revenue

The pie chart above illustrates the revenue distribution among the various products. Notably, the Butterscotch pastry occupies the largest slice, accounting for 21% of total sales revenue, indicating its significant contribution to overall performance. In contrast, the Chocolate filling doughnut represents only 3% of the total revenue, highlighting its relatively minor role in the product lineup. This visual representation emphasizes the disparity in revenue contributions among the different products, providing valuable insights into their performance.



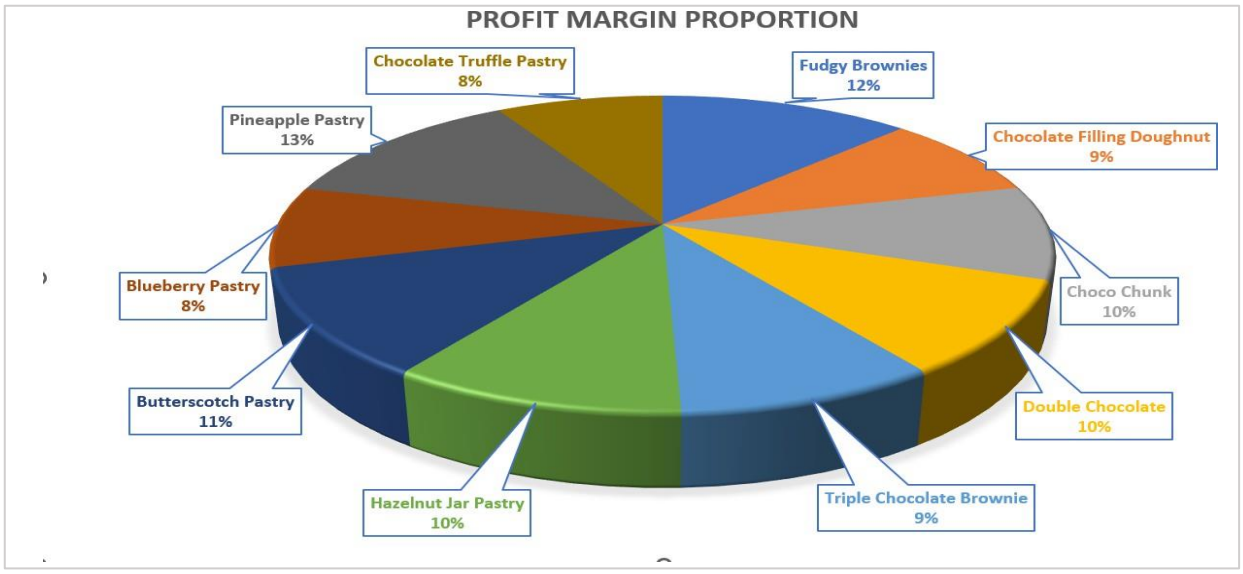
(1.5) Revenue trends over month

The combo chart above illustrates the revenue trends over five consecutive months. It is evident that the revenue trends are relatively flat, indicating that the bakery business has struggled to achieve growth and expand its operations. While there was a slight increase in revenue in January compared to December of the previous year, this improvement was short-lived, as revenue declined in February. This pattern suggests inefficiencies within the business model, highlighting challenges in sustaining revenue growth. The lack of significant upward movement in the revenue trend underscores the need for a thorough evaluation of the business strategies and operations to identify opportunities for improvement and expansion.



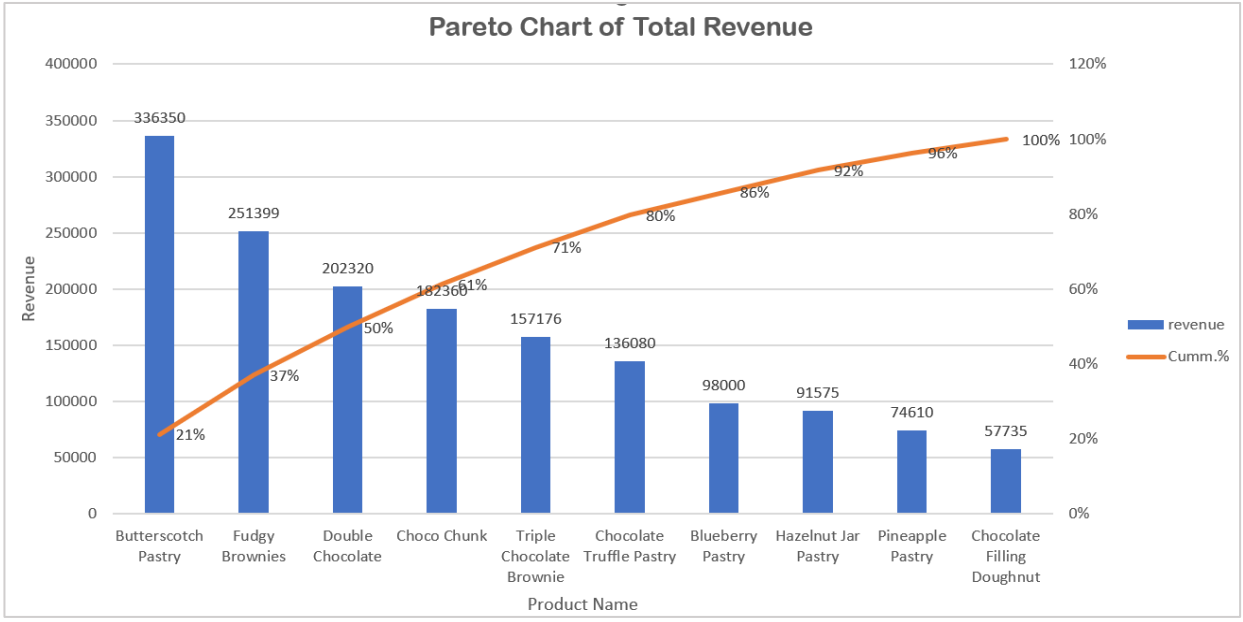
(1.6) selling and making cost

The stacked bar chart above illustrates the pricing and associated production costs of various products, encompassing expenses such as raw material costs, cloud kitchen management, employee salaries, electricity bills, and other utilities. The data indicates that the company is achieving a profit margin of approximately 25% to 45% on each product. This range reflects a reasonable level of profitability within the Indian market, suggesting that the company is effectively managing its costs while maintaining competitive pricing. The visual representation provides valuable insights into the relationship between product pricing and production costs, underscoring the potential for sustained profitability in the business.



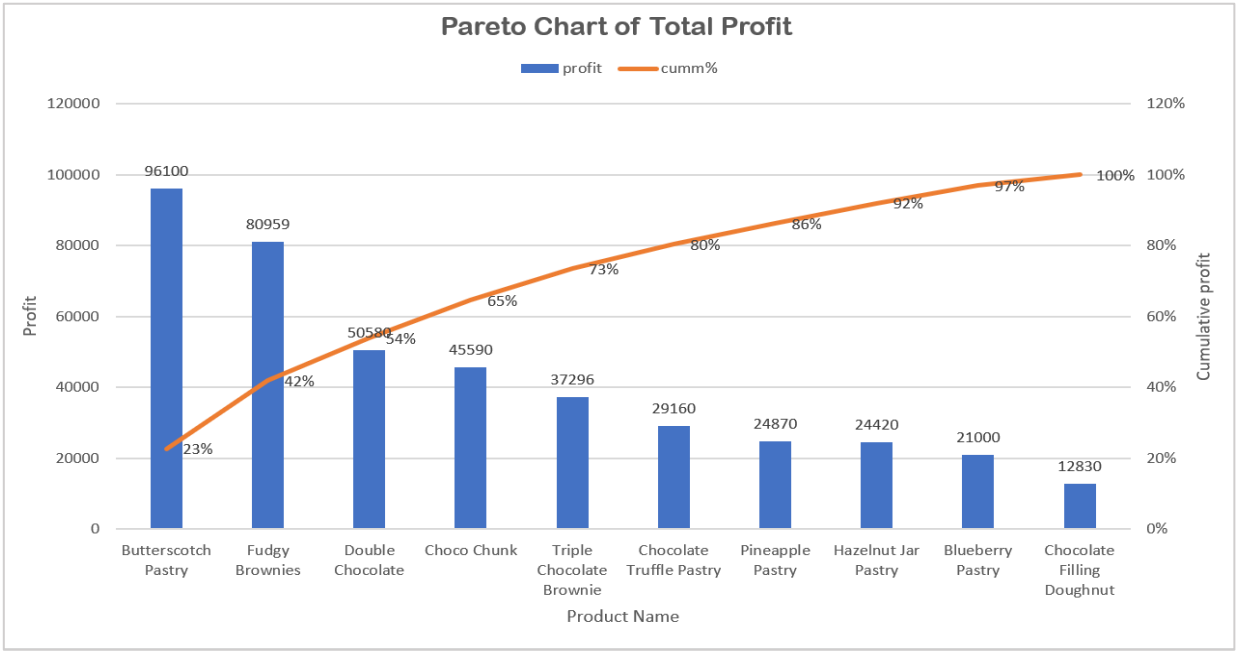
(1.7) profit margin proportion

The pie chart above illustrates the distribution of total profit among various products. Notably, the Pineapple pastry emerges as the most profitable item, accounting for 13% of the total profit. Following closely is the Fudgy brownie, which contributes 12% to the overall profit. The Butterscotch pastry also plays a significant role, further underscoring its importance in the product lineup. This visual representation highlights the varying contributions of each product to the overall profitability, providing valuable insights for strategic decision-making regarding product focus and resource allocation.



(1.8) Pareto chart of Total Revenue

The Pareto chart above illustrates the distribution of revenue among the various products. It reveals that 50% of total revenue is generated by three key products: Butterscotch pastry, Fudgy brownies, and Double Chocolate items. In contrast, the remaining 50% of revenue is derived from the other products in the portfolio. This distribution highlights the significance of these three products as major contributors to overall revenue, suggesting that focused marketing and inventory strategies for these items could enhance profitability. The chart effectively emphasizes the importance of understanding the revenue contributions of individual products for informed decision-making and resource allocation.



(1.9) Pareto chart of Total Profit

The Pareto chart presented above demonstrates that a substantial 54% of total profit is generated by three primary products: Butterscotch pastry, Fudgy brownies, and Double Chocolate items. The remaining 46% of profit is derived from the combined contributions of all other products in the portfolio. This distribution underscores the significant impact that these three products have on overall profitability, indicating that targeted strategies for their promotion and management could yield further financial benefits. The chart effectively highlights the importance of recognizing the key profit drivers within the product lineup for strategic decision-making and resource optimization.

Upon analyzing the data through graphs and charts, several significant findings have surfaced.

- Butterscotch pastry, Fudgy Brownies, Double Chocolate emerges as the main profit drivers for the business, this three contributes around 54 percent of their total profit. This stability makes it a crucial inventory component, challenging efforts to cut expenditure.
- The Chocolate Truffle pastry, Pineapple pastry, and Choco Chunk product demonstrate the highest profit margins among the offerings, at approximately 37%. This significant profitability indicates their strong market performance and presents opportunities for enhanced marketing and focus on these items to boost revenue.
- Fudgy Brownies, Double Chocolate, Butterscotch Pastry, and Choco Chunk contribute around 61% of total revenue, marking them as the top-selling products and essential to overall sales performance.

In summary, our analysis underscores the profitability of Butterscotch pastry, Fudgy Brownies and Double Chocolate, with Choko Chunk and Pineapple Pastry standing out for their high profit margins. Select products notably contribute significantly to our overall profit. However, further data is needed to track revenue trends for different locations and assess the stability of making cost across SKUs. This holistic view guides our strategic decisions for sustained profitability and growth.