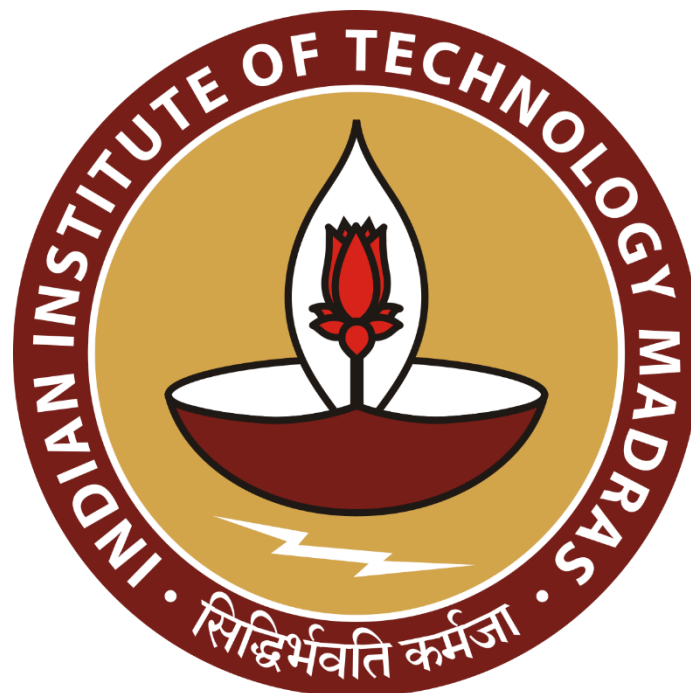


**Seasonal Inventory Patterns and Optimization Strategies for Sharma Paneer Bhandaar**  
**A Mid-term report for the BDM capstone Project**

Submitted by

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## **1 Executive Summary**

Data collected over 26 days on 6 products from Sharma Paneer Bhandaar provides valuable insights into sales, inventory, and profit metrics, with a focus on optimizing inventory and forecasting demand. The analysis, based on purchase, sales, and inventory data, will drive strategic decisions to improve stock management and profitability.

The descriptive analysis revealed that Cottage Cheese is the dominant product in sales, while Gulab Jamun Dough and Rasgulla Dough are generating losses.

Key metrics such as Stock Turnover Ratio (STR), Days Inventory Outstanding (DIO), and Correlation Coefficients were calculated to assess inventory efficiency, wastage, and product relationships. Dips in sales for both Gulab Jamun Dough and Rasgulla Dough on the same days suggest a possible correlation in their demand patterns, which could be further explored for bundling opportunities.

Through the application of descriptive statistics, we gained insights into the variability of stock levels, with an emphasis on optimizing inventory management by focusing on high-demand products like Cottage Cheese. While Gulab Jamun Dough and Rasgulla Dough have positive profit margins, their low sales and potential for spoilage indicate the need for a bundling marketing strategy to boost their profitability.

The combination of Stock Turnover Ratio and Days Inventory Outstanding offers actionable insights, ensuring better alignment of stock levels with sales demand. Visualization of these trends through pie charts and histograms further highlights the primary revenue drivers and helps in optimizing inventory stocking decisions.

The analysis revealed significant seasonal spikes for festive sweets, indicating the need for better forecasting during these periods. Meanwhile, staples like Cottage Cheese and Peas showed steady demand, suggesting consistent stock levels. Focusing on efficient inventory control for underperforming products and leveraging bundling strategies to boost sales of correlated products.

Descriptive statistics are especially valuable in this context as they help us understand the variability and trends within the dataset, which is essential for effective inventory management and sales optimization.

## 2 Proof of Originality

Video Link: [complete bdm vdo.mp4](#)

Letter from shop owner to share data: [letter.pdf](#)

All photos: [BDM Proof](#)



Shop

Informal Records

## 3 Metadata

Category	Details
Store Name	Sharma Paneer Bhandaar

<b>Data Collection Period</b>	26 days (1st August to 26th August)
<b>Festival</b>	15 <sup>th</sup> , 19 <sup>th</sup> , 26 <sup>th</sup> August
<b>Timings</b>	All days of week from 7AM to 9 PM, with lunch break from 12 PM to 4 PM
<b>Products</b>	Cottage Cheese, Peas, Soybean Nuggets, Gulab Jamun Dough, Rasgulla Dough, Cream
<b>Calculated Metrics</b>	Stock Turnover Ratio, Days Inventory Outstanding (DIO), Correlation Coefficient
<b>Data Format and Analysis tool</b>	Excel
<b>Total Revenue</b>	Rs 1568089
<b>Gross Profit</b>	Rs 204012
<b>Net profit</b>	Rs 152512
<b>Sheets</b>	Purchase, Sales, Inventory, Insights, P&L, assets

<b>Purchase</b>	Quantity (Kg), Cost Price per quantity (Rupees), Total Purchase Cost
<b>Sales</b>	Quantity (Kg), Selling Price per quantity (Rupees), Total Sales Revenue
<b>Inventory</b>	Quantity Left (Kg), Wastage (Kg)
<b>P &amp; L</b>	Total Profit
<b>Insights</b>	Sales: Purchase Ratio
<b>Assets</b>	Additional Costs, Assets

#### 4 Descriptive Analysis

The dataset consists of inventory data for six key products, with daily measurements of stock levels. Descriptive statistics were computed to understand the average stock levels, variations, and demand fluctuations for each product.

Descriptive Analysis		Products					
	Metrics	Cottage cheese	Peas	Soybean Nuggets	Gulab Jamun Dough	Rasgulla Dough	Cream

Sales (Qt)	Min	140	10	0	0	0	0
	Max	414	48	43	25	12	6
	Mean	242.00	26.81	18.19	12.35	6.19	3.69
	Total	6292	697	473	321	161	96
	Std Dev.	17.28	5.75	3.56	2.16	1.52	1.48

Sales (Price)	Min	200	90	90	230	260	205
	Max	220	95	90	250	280	205
	Mean	210.00	92.27	90.00	239.62	265.38	205.00
	Total	39159	4616	4500	11970	13250	10250
	Standard Deviation	8.00	1.82	0.00	7.20	6.47	0.00

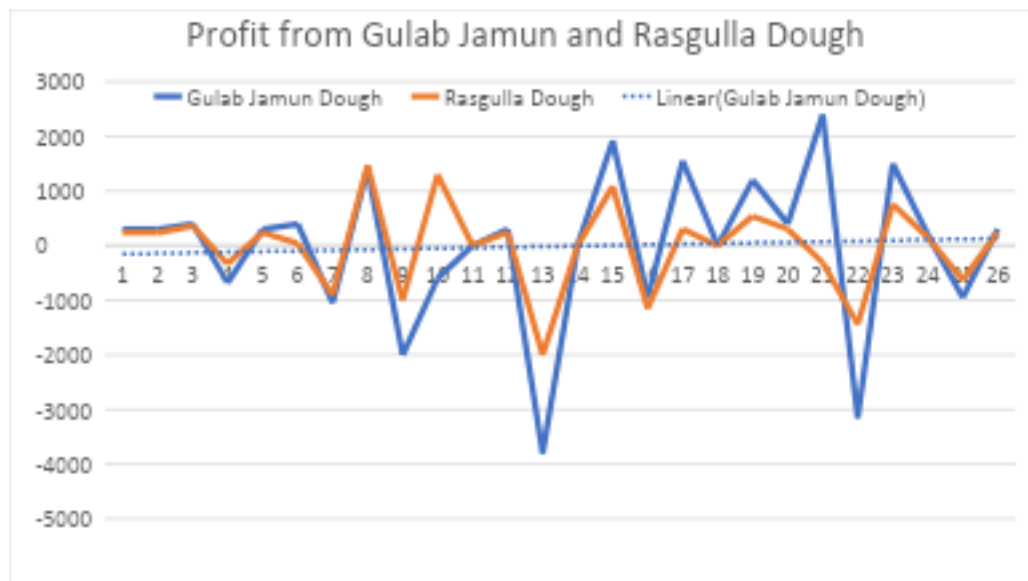
84.29% of the sales revenue is derived by Cottage Cheese. Soybean Nuggets and Rasgulla Dough have the least contribution of 2.71% and 2.73%, respectively, in sales revenue.

	Metrics	Cottage cheese	Peas	Soybean Nuggets	Gulab Jamun Dough	Rasgulla Dough	Cream
Purchase (Qt)	Min	140	15	0	0	0	0
	Max	400	60	40	40	20	8

	Mean	242.15	29.73	20.12	13.54	7.04	3.42
	Total	6296	773	523	352	183	89
	Std Dev	8.00	1.82	0.00	7.20	6.47	0.00

Purchase (Price)	Min	170	70	70	210	230	195
	Max	190	75	70	230	250	195
	Mean	180.00	72.27	70.00	219.62	235.38	195
	Total	4680	1879	1820	5710	6120	5070
	Std Dev	8.00	1.82	0.00	7.20	6.47	0.00

	Metrics	<b>Cottage cheese</b>	<b>Peas</b>	<b>Soybean Nuggets</b>	<b>Gulab Jamun Dough</b>	<b>Rasgulla Dough</b>	<b>Cream</b>
Profit (Rupees)	Min	-300	-1560	-1000	-3800	-2000	-750
	Max	15650	2256	1200	2400	1470	1230
	Mean	7226.53	322.96	229.23	-11.53	-10	89.42
	Total	187890	8397	5960	-300	-260	2325
	Std Dev	4288.15	854.56	538.02	1422.47	807.80	496.05
	Profit margin	14.28	22.23	22.22	8.33	11.11	4.87



Gulab jamun Dough and Rasgulla dough are producing loss. There are 3 dips in the graph of both, on 3 same days, indicating that they might be correlated.

	Metrics	Cottage cheese	Peas	Soybean Nuggets	Gulab Jamun Dough	Rasgulla Dough	Cream
Inventory	Mean	161.50	31	17.5	14.5	8	8.50
Profit	Total	187890	8397	5960	-300	-260	2325
Wastage	Total	41	30	25	12	12	6

Calculated Metrics:

1. STR (Stock Turnover Ratio): Indicates how efficiently inventory is sold or used over a period.
2. Days Inventory Outstanding (DIO): Represents the average number of days inventory remains unsold.
3. Correlation Coefficient: A statistical measure that shows the strength and direction of a relationship between two variables, ranging from -1 (perfect negative) to +1 (perfect positive).



## 5 Detailed Explanation of Analysis process

Descriptive statistics was used to summarize and analyze performance metrics. Descriptive statistics provide a clear snapshot of central tendencies, dispersions, and overall distributions within the data set. This method is particularly effective for understanding variability and identifying trends, which are crucial for optimizing inventory management and sales strategies.

Analysis Process:

1. Data Collection: We collected inventory data for a range of products from Sharma Paneer Bhandar over 26 days, capturing quantities, costs and stocks.
2. Data Cleaning: The dataset was preprocessed to handle missing values and outliers to ensure accurate calculations.
3. Descriptive Analysis: Summary statistics (mean, median, standard deviation) were computed to understand the distribution of stock levels. Excel functions like SUM, AVERAGE, MIN, MAX, STDEV.S and CORR were used.

Cost of Goods Sold per day = opening inventory - closing inventory + purchase qt

Stock Turnover Ratio = Cost of Goods Sold / Average Inventory

Days Of Inventory = Average Inventory / COGS per Day

Usage of correlation coefficients for product bundling will involve analyzing the relationship between different product purchases to determine which products are most often bought together. For example, if there is a high correlation between purchases of paneer and cream, we can create a bundle offer for these two products. This analysis will be conducted using customer purchase data, where we will apply statistical methods to identify pairs of items with high purchase co-occurrence.

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

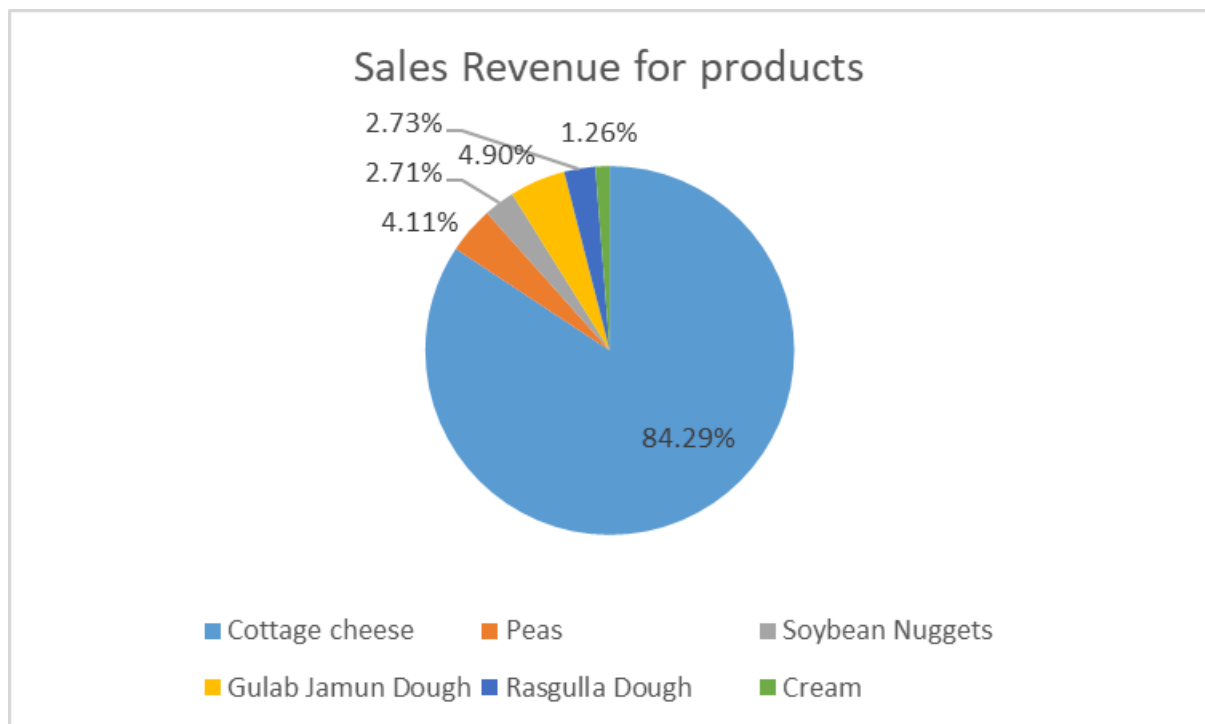
$r$  = correlation coefficient  
 $x_i$  = values of the x-variable in a sample  
 $\bar{x}$  = mean of the values of the x-variable

*Correlation coefficient formula*

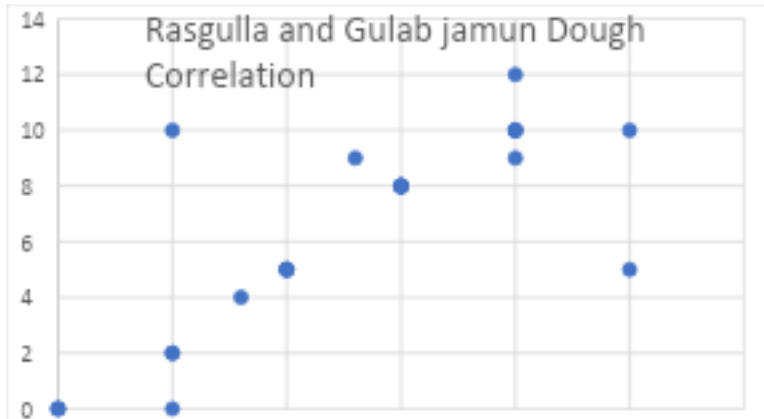
	Cottage cheese	Peas	Soybean Nuggets	Gulab Jamun Dough	Rasgulla Dough	Cream
STR	1.45	1.35	1.94	0.98	1.02	0.32
DOI	0.82	0.11	1.02	0.19	0.88	2.74
Profit Margin	14.29	22.22	22.22	8.33	11.11	4.88

Even though Gulab jamun dough and Rasgulla dough are producing loss, in the given period, their profit margins are good.

4. Visualization: Trends were visualized using stacked column charts, histograms and pie charts to identify patterns. It allows for an in-depth look at trends and patterns within the data.



Here, the pie chart indicates that Cottage Cheese is the primary revenue driver, which aligns with the Pareto Principle stating that a majority of outcomes stem from a minority of causes. Both B2B clients (like restaurants) and B2C customers contribute consistently to the demand for Cottage Cheese, making it the shop's most sold product. Other items like dough and cream may spoil quickly if not sold promptly, leading to less emphasis on stocking these items compared to paneer.

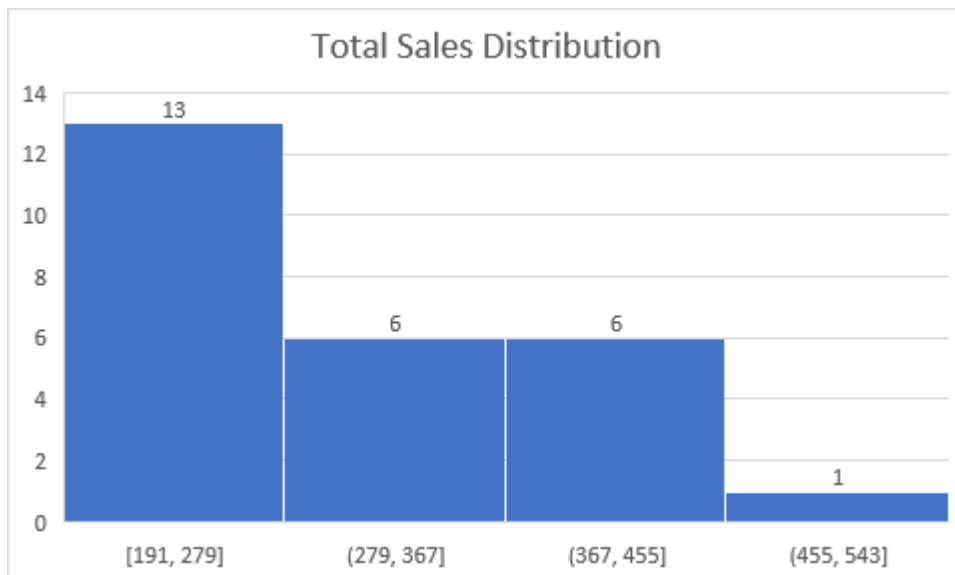


Rasgulla Dough and Gulab jamun dough should have a bundling marketing strategy to increase their portion of profit.

The chosen approach leverages both descriptive and trend analysis techniques, which are suitable for understanding inventory management efficiency. The Stock Turnover Ratio and DIO are widely accepted metrics in inventory analysis as they provide actionable insights into how quickly inventory is sold.

## 6 Results and Findings

### 1. Sales Trends:



50% of total sales quantity are distributed in the range of [191, 279]. 53% of sales quantity of cottage cheese is distributed in range [140,220].



Most of the sum of sales quantity of all products, except Cottage Cheese, lies between [27,83] suggesting, Cottage Cheese consistently dominates daily sales compared to the combined sales of other products. Higher total sales are less frequent, possibly influenced by spikes in the sales of specific products like Cottage Cheese on certain days.

## 2. Inventory and Wastage:

Products with low STR and high DOI (e.g., Cream) require better inventory control., while high-performing products (e.g., Peas, Soybean Nuggets) should focus on sustaining demand and ensuring consistent supply. Overstocking of slow-moving items like Soybean Nuggets resulted in higher holding costs. Cream generated lower profit margins, likely due to limited sales.

Product	STR	DOI	Analysis
Cottage Cheese	1.45	0.82	Moderate turnover, decent inventory management.

Peas	1.35	0.11	High efficiency, low inventory holding period.
Soybean Nuggets	1.94	1.02	High turnover, slightly longer holding period.
Gulab Jamun Dough	0.98	0.19	Low turnover, but inventory clears quickly.
Rasgulla Dough	1.02	0.88	Balanced turnover and holding period.
Cream	0.32	2.74	Low turnover, high holding period—inefficient.

### 3. Correlation and Bundling Opportunities:

Gulab Jamun and Rasgulla Dough showed a balanced profit margin but experienced inconsistent demand. Strong correlation between Gulab Jamun Dough and Rasgulla Dough suggests potential bundling opportunities. Weak negative correlations (like Cottage Cheese & Rasgulla Dough) indicate that these products might appeal to distinct customer segments, so marketing efforts should be tailored accordingly.

<b>Purchase</b>		<b>Correlation Coff</b>
Gulab Jamun Dough	Rasgulla Dough	0.72
Peas	Cottage Cheese	0.79
Cottage Cheese	Rasgulla Dough	-0.20
<b>Sales</b>		
Gulab Jamun Dough	Rasgulla Dough	0.8
Cottage Cheese	Rasgulla Dough	-0.27