AGARWAL AUTOMOBILES FUEL STATION

FORECASTING

AND

INVENTORY MANAGEMENT

ADSDS BATCH 3 - GROUP 15

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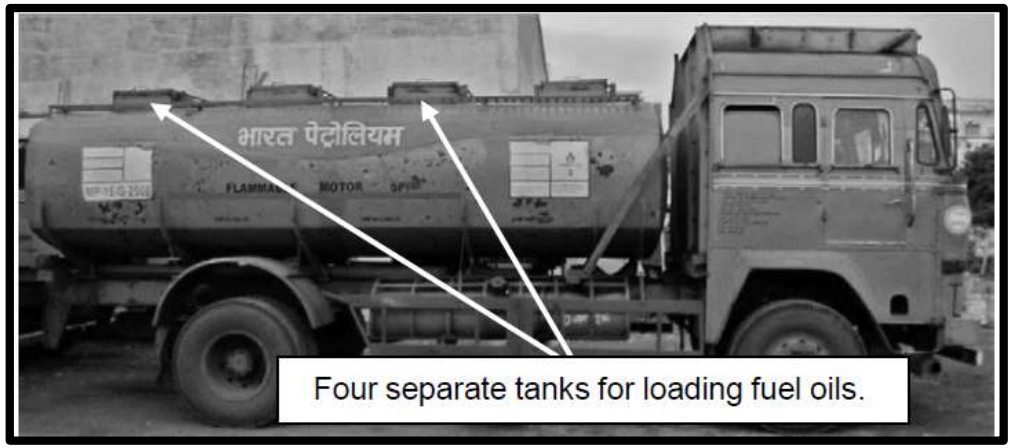
BACKGROUND OF CASE

- Agarwal Automobiles was an authorized fuel station for Bharat Petroleum Corporation Limited (BPCL), a major oil and gas company located in the Sagar district of Madhya Pradesh, India.
- It sold three main products at the fuel station: **Petrol, Diesel and High-Speed Petrol (HSP).**
- Agarwal Automobiles had three separate storage tanks, each with a different capacity, for each of the three fuel types. In March 2015, the fuel station was renovated to increase the inventory capacity.

DETAILS OF FUEL STORAGE TANKS AT THE FUEL STATION

Tank	Fuel Type	Capacity (Litres)
Tank 1	Diesel	20,000
Tank 2	Petrol	15,000
Tank 3	High-Speed Petrol (HSP)	10,000

- BPCL introduced an online automatic ordering system for its fuel stations, which Agarwal Automobiles used to place frequent orders.
- Essentially, the procedure required that an order be placed before 3:00 p.m. for the next day's requirements.
- The tanker that carried fuel from supplier to fuel station had **04 comp**artments, each with the capacity to store **3,000 litres**.



- The supplier would refuse to deliver fuel unless the order amounted to **exactly 12,000 litres**, either for an individual fuel or a combined order of the three different fuel type.
- Approximately **once each month, an order failed** to be placed and the tanker would be unable to load the required fuel, due to unforeseen technical glitches such as server failure on the supplier's end.
- To unload the fuel, sales had to be stopped for approximately 10 minutes. The fuel station manager estimated the **ordering cost at ₹150**, based on the approximate loss of potential sales during this time.

- On an average, if the company ordered 1,000 litres of any type of fuel, it was expected that approximately 996 litres would be the final quantity available for sale after the inventory had been replenished. The **loss of four litres per thousand** was incurred due to leakage or evaporation of that particular fuel, either in transit or while unloading.
- Inventory holding costs were not directly accounted for, in the above process, although the company confirmed that the cost of capital could be estimated at 10 per cent.
- ***Agarwal Fuel Station did not use any formal analytical techniques to govern ordering and inventory management policies.***
- ***Most of the operating decisions of the business were based on simple operating principles combined with managerial intuition.***

❖ DATA AVAILABLE

Monthly Sales data from April 2009 to May 2016

Daily Sales Data from 1st May 2015 to 31st May 2016

Daily Order Placed on BPCL from 31st Dec 2015 to 31st May 2016

❖ PRICE AND MARGIN FIGURES FOR THE PRODUCTS

Fuel Type	Unit Price (in ₹)	Contribution Margin (in ₹)
Diesel	60	1.50
Petrol	70	2.33
High-Speed Petrol	73	2.50

DESCRIPTIVE ANALYSIS ON THE DAILY SALES DATA

Mean and Standard Deviation (Central Tendency & Variability):

Pet has a mean of approximately **3605.94**, with a standard deviation of **706.32**. This indicates a relatively low variability compared to its mean.

Dies has a mean of **5365.89**, with a higher standard deviation of **1884.04**, indicating more variability in this data.

HSP has a mean of **361.05**, with a standard deviation of **171.64**, showing moderate variability relative to its mean.

	Day	Pet	Dies	HSP
count	0.0	427.000000	427.000000	397.000000
mean	NaN	3605.936768	5365.885246	361.045340
std	NaN	706.320844	1884.036840	171.640519
min	NaN	1430.000000	353.000000	21.000000
25%	NaN	3223.000000	4186.500000	254.000000
50%	NaN	3502.000000	4962.000000	352.000000
75%	NaN	3953.500000	6247.500000	441.000000
max	NaN	5940.000000	14579.000000	1116.000000

Range (Min and Max):

Pet ranges from **1430** to **5940**, a relatively wide range indicating significant differences in values.

Dies has the largest range, from **353** to **14579**, indicating extreme variability.

HSP ranges from **21** to **1116**, showing lower variability compared to the other variables.

	Day	Pet	Dies	HSP
count	0.0	427.000000	427.000000	397.000000
mean	NaN	3605.936768	5365.885246	361.045340
std	NaN	706.320844	1884.036840	171.640519
min	NaN	1430.000000	353.000000	21.000000
25%	NaN	3223.000000	4186.500000	254.000000
50%	NaN	3502.000000	4962.000000	352.000000
75%	NaN	3953.500000	6247.500000	441.000000
max	NaN	5940.000000	14579.000000	1116.000000

Percentiles (25%, 50%, 75%):

The interquartile range (IQR) can be observed for each variable:

Pet: Q3 (75%) is **3953.5**, and Q1 (25%) is **3223**, indicating an IQR of **730.5**

Dies: Q3 is **6247.5**, and Q1 is **4186.5**, giving an IQR of **2061**.

HSP: Q3 is **441**, and Q1 is **254**, resulting in an IQR of **187**.

	Day	Pet	Dies	HSP
count	0.0	427.000000	427.000000	397.000000
mean	NaN	3605.936768	5365.885246	361.045340
std	NaN	706.320844	1884.036840	171.640519
min	NaN	1430.000000	353.000000	21.000000
25%	NaN	3223.000000	4186.500000	254.000000
50%	NaN	3502.000000	4962.000000	352.000000
75%	NaN	3953.500000	6247.500000	441.000000
max	NaN	5940.000000	14579.000000	1116.000000

Insights from the table of daily data

Dies Column: This has the highest variability (largest standard deviation and range), which suggests significant differences across observations.

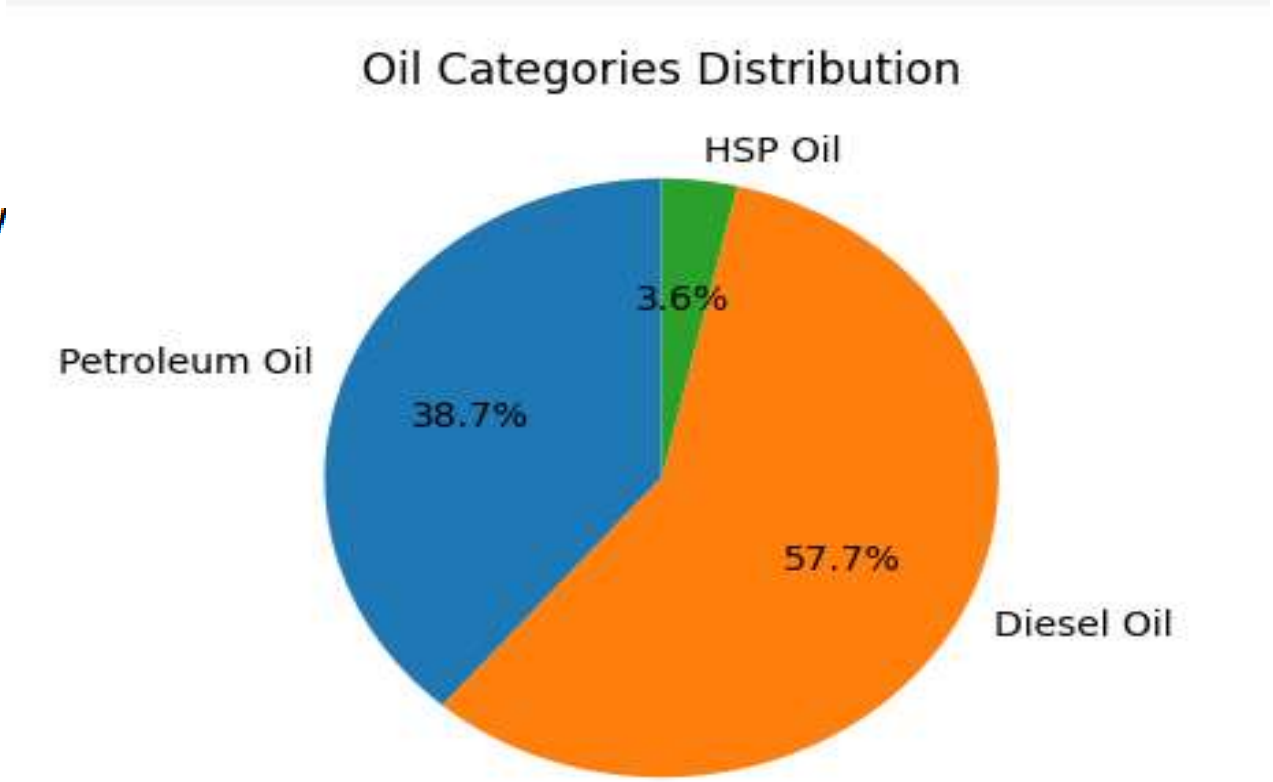
HSP Column: While it has relatively smaller variability, the presence of missing data should be addressed before analysis.

Potential Outliers: The extreme maximum values in **Dies** (14579) and **HSP** (1116) compared to the 75th percentile suggest potential outliers.

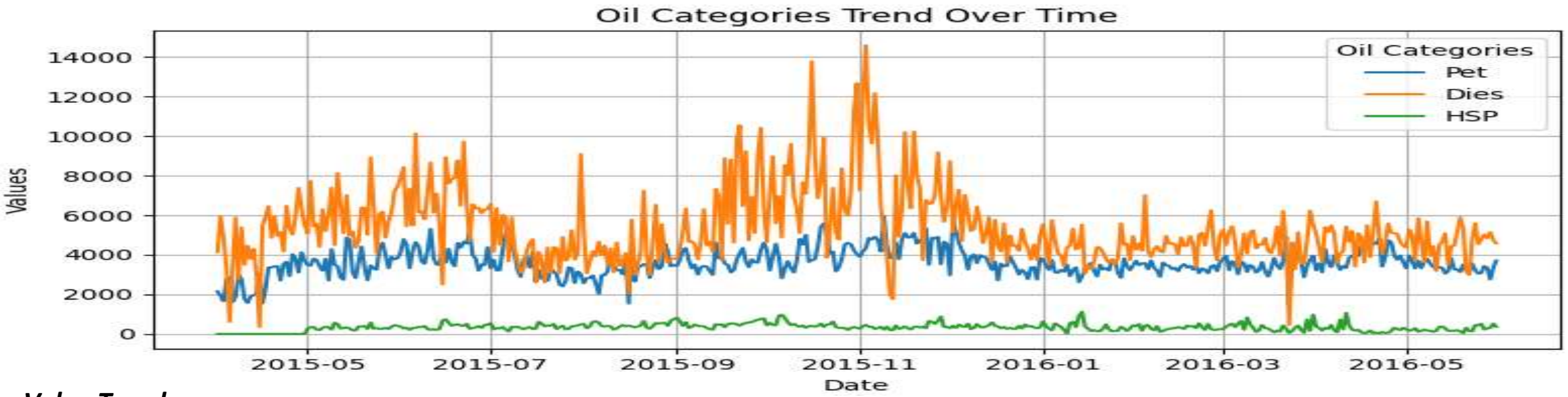
Oil Categories Breakdown: Diesel, Petroleum, and HSP“ visualization

Breakdown of Oil Categories by Total Quantity

1. Category Totals:
    - **Petroleum Oil**: 1,539,735 units
    - **Diesel Oil**: 2,291,233 units
    - **HSP Oil**: 143,335 units
2. **Grand Total**: 3,974,303 units



Trend Chart of Oil Category



***Value Trends*:**

Pet (Blue Line):

Values are relatively stable with slight fluctuations, averaging between 2,000 and 5,000. Indicates steady demand or consistent pricing over time.

Dies (Orange Line):

Shows the most significant variations and peaks around 10,000 in late 2015. Suggests a spike in demand, pricing, or other external factors during this period.

HSP (Green Line):

Values remain low and stable, consistently under 1,000. Likely indicates low usage, demand, or availability compared to other categories.

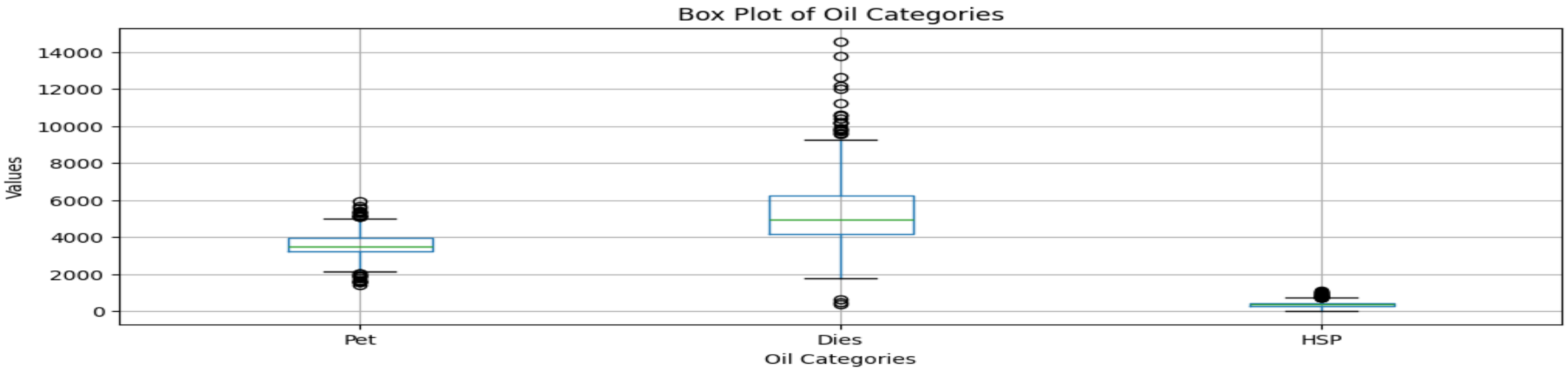
Key Events and Anomalies:

Late 2015: A notable spike in the "Dies" category may indicate a significant external factor like increased demand, policy changes, or market disruptions.

Pet Category Stability: Reflects consistent performance, possibly due to predictable consumption patterns.

Low Values of HSP: Indicates minimal significance or niche usage compared to "Pet" and "Dies."

"Box Plot Analysis of Oil Categories: Petrol, Diesel, and HSP"



Insights from the Diagram:

Petro(Pet):

The distribution is relatively compact, with a smaller interquartile range (IQR), indicating low variability.

There are outliers above the upper whisker, suggesting occasional higher values.

Diesel (Dies):

The box plot shows the widest IQR, indicating high variability in diesel values.

Significant outliers above the upper whisker, with some values exceeding **14,000**, highlight extreme cases or unusual patterns.

HSP:

The distribution is very narrow, with a small IQR, indicating consistency in values.

A few minor outliers are visible, but the range of variation is minimal compared to other categories.

Comparative Insights:

Diesel has the highest variability and most extreme outliers, suggesting it is the most unpredictable category.

Petroleum shows moderate variability with some outliers, but it is more stable than diesel.

HSP is the most stable category, with minimal spread and fewer outliers.

Observation:

The presence of outliers, especially in diesel, might require further investigation to identify reasons for extreme values (e.g., operational inefficiencies or demand spikes).

"Scatter Plot of Outliers in Oil Categories Over Time”

Insights from the Scatter Plot of Outliers:

Diesel (Blue Points):

Diesel exhibits the most extreme outliers, with values exceeding **14,000** observed between **October 2015** and **early 2016**.

It has the widest range of variability, indicating significant fluctuations in production, consumption, or data irregularities.

Petroleum (Red Points):

Petroleum outliers are moderate, ranging between **3,000** and **6,000**.

These outliers are distributed more evenly over time compared to Diesel, reflecting moderate irregularities.

HSP (Orange Points):

HSP has the smallest and most consistent outliers, primarily below **2,000**.

The sparse distribution of HSP points indicates a relatively stable category with limited variability.

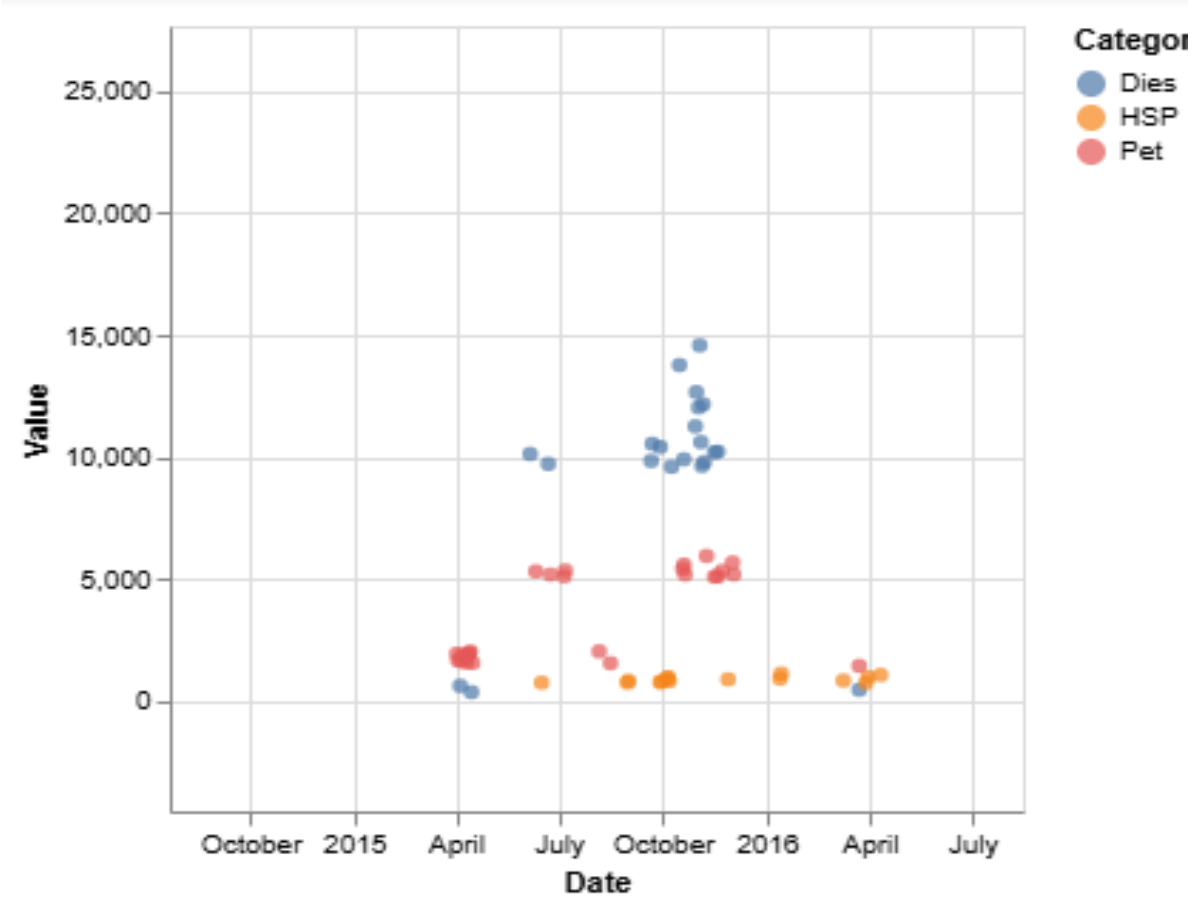
Temporal Trends:

Most extreme outliers occur between **July 2015 and March 2016**, suggesting an unusual period for all categories.

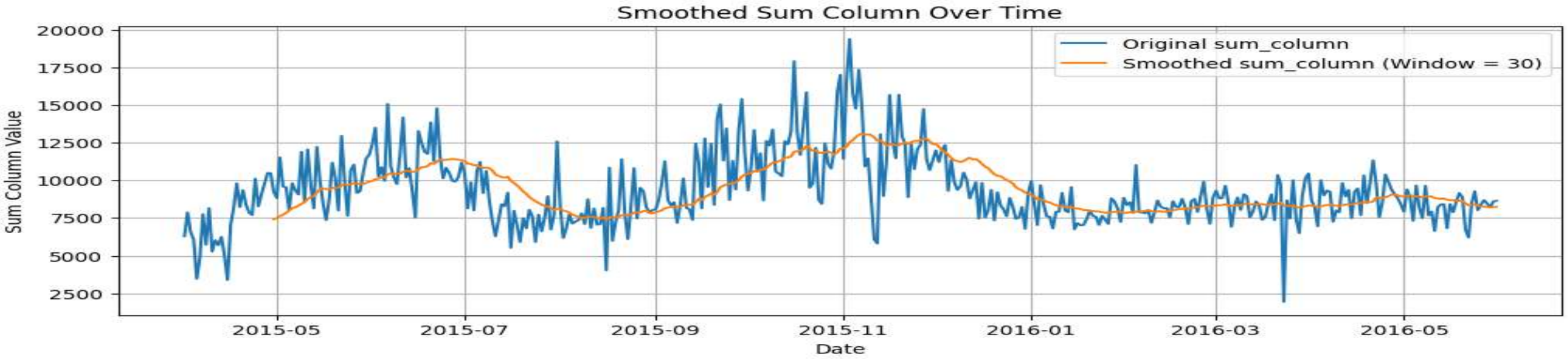
Outside this time frame, the values for all categories appear more stable.

Key Observation:

Diesel’s extreme variability requires deeper investigation into its underlying causes, while HSP remains the most stable category.



Trend Chart of total daily sales data (Petrol+Diesel+HSP)



Insights and Interpretations on the daily basis

a. **Seasonality** The peak from September to November 2015 suggests a potential seasonal pattern or a period of high demand/activity. For example: Increased sales or activity during a holiday season. Annual events or trends driving higher values.

b. Decline Post-November The decline from November 2015 to March 2016 could indicate: A return to normal levels after a period of high activity. Potential impacts of market trends, seasonal slowdowns, or reduced demand.

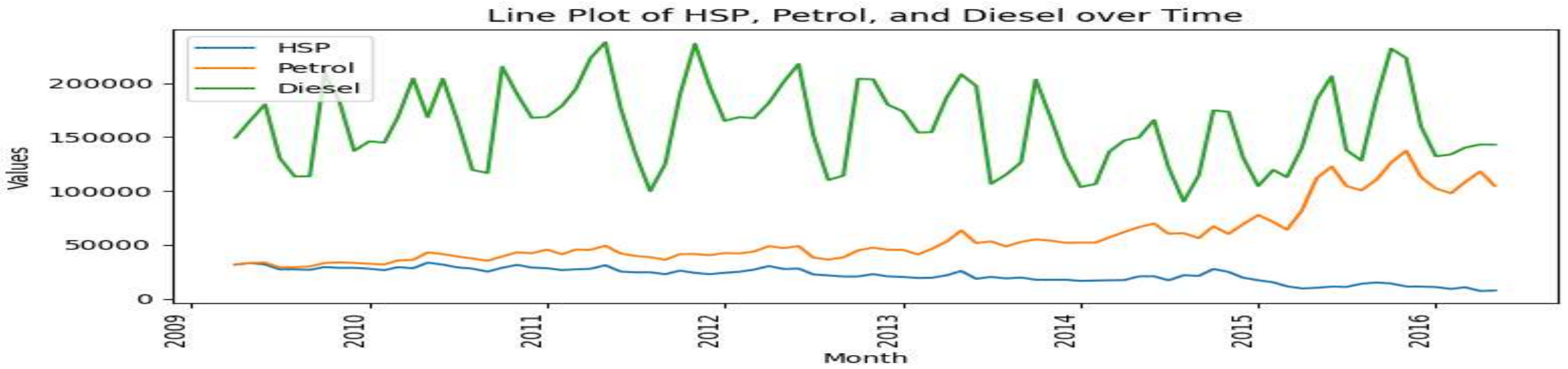
c. Consistent Fluctuations The frequent spikes and dips throughout the timeline suggest: High sensitivity to external factors. Possible anomalies in the data or irregular activities influencing the values.

d. Stabilization in 2016 The stabilization around April 2016 may reflect the system returning to a predictable and steady state

DESCRIPTIVE ANALYSIS ON BASIS OF MONTHLY DATA

	Month	HSP	Petrol	Diesel	total_consumption
count	86	86.000000	86.000000	86.000000	86.000000
mean	2012-10-15 18:41:51.627907072	21964.290698	56683.220930	160313.686047	238961.197674
min	2009-04-01 00:00:00	7158.000000	28994.000000	90240.000000	162810.000000
25%	2011-01-08 18:00:00	17365.250000	39308.500000	130671.750000	200468.500000
50%	2012-10-16 12:00:00	22630.000000	46526.000000	164990.500000	240077.500000
75%	2014-07-24 06:00:00	27594.000000	63020.500000	186438.000000	267223.250000
max	2016-05-01 00:00:00	33479.000000	137375.000000	238000.000000	372575.000000
std	NaN	6751.811642	26355.393519	36822.863237	45245.734615

DESCRIPTIVE ANALYSIS ON BASIS OF MONTHLY DATA



1. Diesel (Green Line):
Dominates the Plot: Diesel consistently has the highest values among the three categories, ranging between 150,000 and 250,000.

Seasonal Pattern: A clear cyclic pattern is observed, indicating periodic rises and falls over time. Peaks appear approximately every year.

Decline in Later Months: There is a gradual decrease in peak values toward the end of the timeline (2015–2016).

2. Petrol (Orange Line): *Moderate Growth:* Petrol shows a steady upward trend over time, with values gradually increasing.

Less Variability: Unlike Diesel, Petrol does not exhibit significant peaks or troughs, suggesting stable growth without seasonal fluctuations. Range: Values consistently remain between 30,000 and 60,000.

3. HSP (Blue Line): *Lowest Values:* HSP has the lowest values among the three categories, consistently below 50,000.

Flat Trend: There is minimal variation over time, indicating little to no growth or decline.

*Stable Demand:*The flat line suggests a steady but limited demand for HSP compared to Petrol and Diesel.

Box Plot on The Basis of the Monthly Data

Interpretation from the Box Plot

HSP (Top Left Box)

Median: The median value lies near 25,000, indicating this is the central tendency for HSP.

IQR (Box Width): The middle 50% of data (IQR) ranges from approximately 20,000 to 30,000, showing moderate variability.

Range: The data ranges from 10,000 to 35,000, with no outliers. Interpretation: HSP consumption is stable with minimal variability and no extreme values.

b. Petrol (Right Box)

Median: The median value lies around 60,000, suggesting this is the central tendency for Petrol.

IQR (Box Width): The middle 50% of data ranges between 40,000 and 80,000, indicating moderate variability.

*Outliers:*There are several outliers beyond 120,000, indicating occasional extreme consumption.

Interpretation: Petrol shows moderate variability with occasional high-consumption periods.

c. Diesel

Median: The median value is near 175,000, indicating higher central consumption compared to other categories.

IQR (Box Width): The IQR spans from 125,000 to 225,000, showing significant variability.

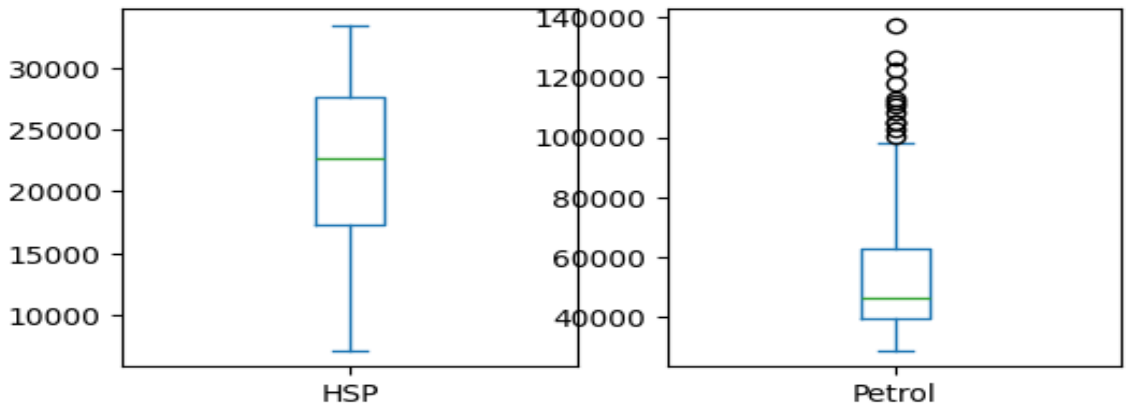
Range: Values range from approximately 100,000 to 250,000, with no outliers. Interpretation: Diesel has the highest consumption and variability among the three fuels but no extreme outliers.

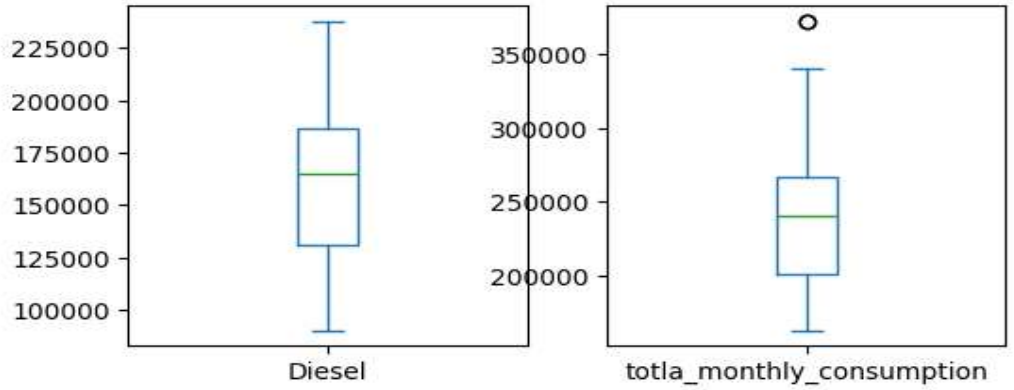
d. Total Monthly Consumption (most Right Box) Median: The median value is near 275,000, representing the central total consumption.

IQR (Box Width): The IQR ranges between 200,000 and 300,000, indicating moderate variability in total monthly consumption.

Outliers: There is one outlier beyond 350,000, suggesting a period of exceptionally high total consumption.

Interpretation: Total monthly consumption is generally consistent, with occasional spikes.





DESCRIPTIVE ANALYSIS OF THE ORDERS PLACED ON BPCL

	Day	pet	Dies	HSP	Total
count	153	153.000000	153.000000	153.000000	153.000000
mean	2016-03-16 00:00:00	3470.588235	4529.411765	294.117647	8294.117647
min	2015-12-31 00:00:00	0.000000	0.000000	0.000000	0.000000
25%	2016-02-07 00:00:00	0.000000	0.000000	0.000000	0.000000
50%	2016-03-16 00:00:00	3000.000000	6000.000000	0.000000	12000.000000
75%	2016-04-23 00:00:00	6000.000000	6000.000000	0.000000	12000.000000
max	2016-05-31 00:00:00	9000.000000	9000.000000	3000.000000	12000.000000
std	NaN	2645.897578	3320.706218	895.032732	5546.314984

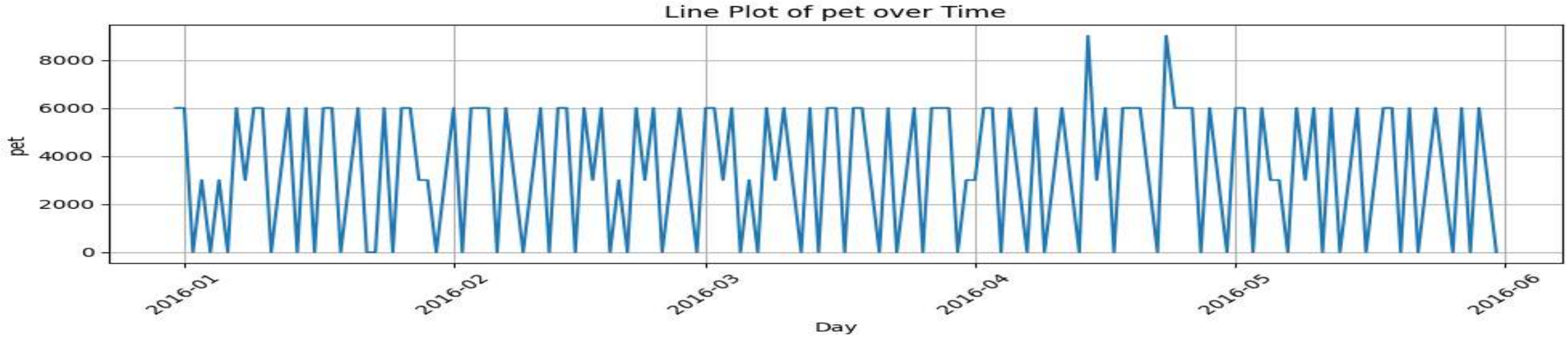
Observations:

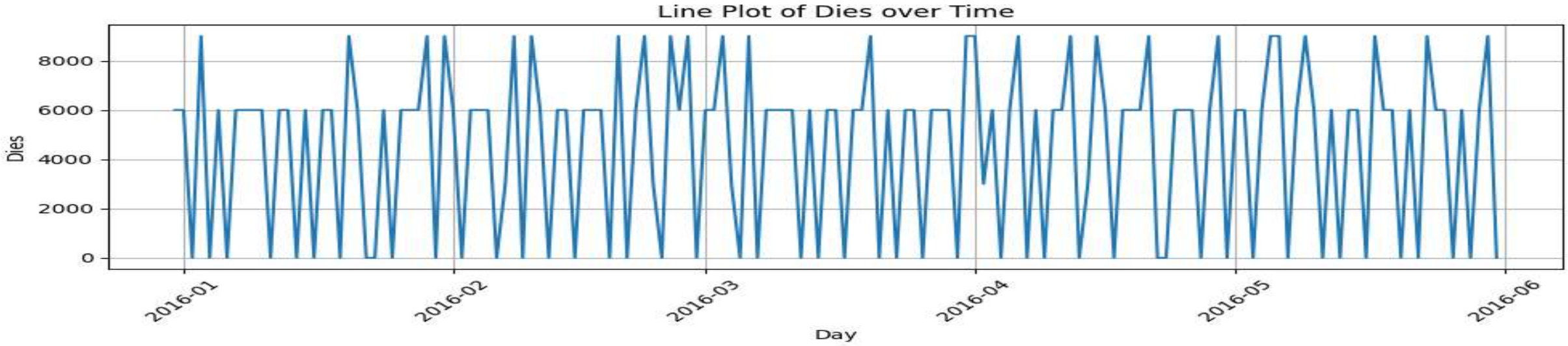
Diesel exhibits the highest mean and variability, likely due to demand or production fluctuations.

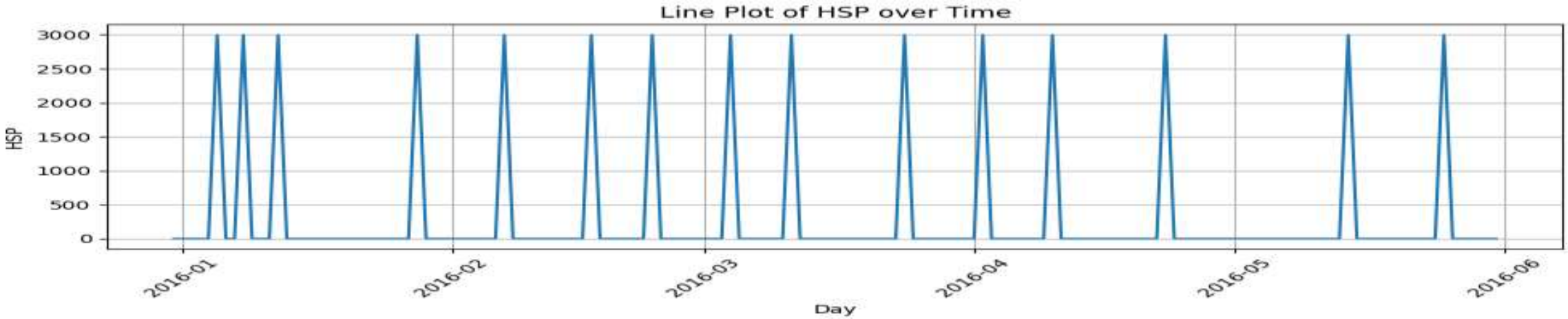
HSP has minimal contributions and variability, indicating a more stable pattern.

Most of the dataset's values are concentrated in the upper range for Petroleum and Diesel.

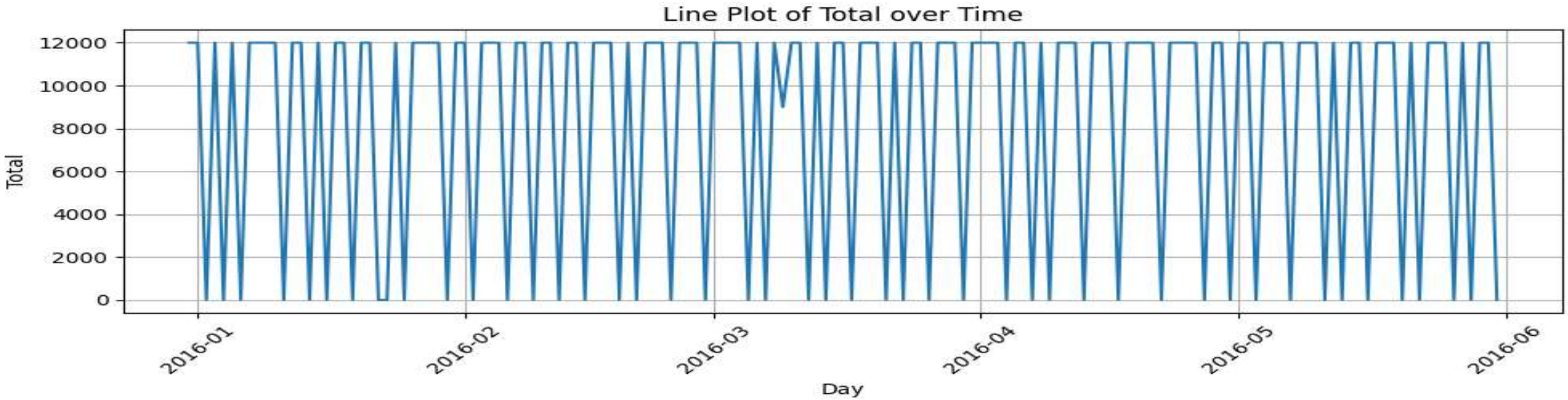
Trend of The Order Placed on BPCL







Line Plot of Total over Time



PREDICTIVE STATISTICS

- **Forecasting Techniques** used
  - Moving Average (window length)
  - Weighted Moving Average (window length, weights)
  - Exponential Smoothing (alpha)
  - Double Exponential Smoothing (alpha, beta)
  - Triple Exponential Smoothing (season length, alpha , beta, gamma)
- Calculated errors **ME, MAD, MAPE, RMSE** for all the techniques
- Technique with **minimum MAPE** selected
- Analysis done on **MS-EXCEL and Python**

Prescriptive Analytics used to arrive at optimized value of various parameters

MOVING AVERAGE - PETROL

PETROL	MFE	MAD	MAPE	RMSE
1 MA	1	464	13.22%	652
2 MA	0	454	12.82%	605
3 MA	-1	437	12.31%	588
4 MA	-2	424	11.92%	569
5 MA	-2	424	11.92%	565
6 MA	-1	421	11.88%	559
7 MA	-3	411	11.58%	547
8 MA	**-1**	**405**	**11.39%**	**542**
9 MA	-3	406	11.43%	542
10 MA	-4	410	11.55%	545

WEIGHTED MOVING AVERAGE - PETROL

PETROL	MFE	MAD	MAPE	RMSE
3 WMA	-0.94	425.56	12.05%	579.87
4 WMA	-1.71	409.89	11.61%	558.07
5 WMA	-1.19	405.13	11.50%	557.58
6 WMA	-0.59	403.67	11.49%	548.43
7 WMA	-1.89	393.85	11.18%	536.24
8 WMA	-0.21	390.30	11.06%	532.36
9 WMA	**-3.07**	**384.00**	**10.93%**	**528.92**
10WMA	-2.07	386.08	10.98%	529.74
11WMA	-2.05	387.46	11.01%	528.43

3 WMA	4 WMA	5 WMA	6 WMA	7 WMA	8 WMA	9 WMA	10 WMA	11 WMA
0.30	0.31	0.09	0.14	0.13	0.15	**0.002**	0.00	0.04
0.16	0.14	0.26	0.00	0.09	0.09	**0.065**	0.00	0.00
0.54	0.13	0.13	0.21	0.01	0.09	**0.235**	0.08	0.00
	0.42	0.04	0.12	0.16	0.01	**0.082**	0.19	0.11
		0.48	0.08	0.15	0.17	**0.013**	0.06	0.17
			0.45	0.07	0.08	**0.123**	0.07	0.08
				0.40	0.07	**0.026**	0.09	0.02
					0.34	**0.028**	0.01	0.11
						0.427	0.08	0.04
							0.41	0.05
								0.38

COMPARISON OF ALL THE FORECASTING TECHNIQUES - PETROL

PETROL	Mean Error	MAD	MAPE	RMSE	Parameters	Forecasted Value
Moving Avg	-2.57	405	11.41	542	8 Days	3240
Weighted Moving Avg	**-3.07**	**384**	**10.93**	**528**	**9 Days**	**3390**
Exponential Smoothing	-1.83	402	11.35	536	alpha = 0.23	3315
Double Exponential Smoothing	-1.83	397	11.28	532	alpha = 0.18 beta = 0.99	3392
Triple Exponential Smoothing	5.04	416	11.7	564	alpha = 0.2 beta = 0.1 gamma = 0.1 season length = 4	3327

BEST TECHINIQUE WITH MINIMUM MAPE

9 DAYS WIGHTED MOVING AVERAGE

MOVING AVERAGE - DIESEL

DIESEL	MFE	MAD	MAPE	RMSE
1 MA	-1	1366	27.50%	1833
2 MA	-8	1210	25.30%	1648
3 MA	-7	1117	23.60%	1541
4 MA	-7	1099	23.58%	1525
5 MA	-5	1095	23.49%	1554
6 MA	-8	1087	23.41%	1572
7 MA	-7	1072	23.12%	1563
8 MA	-9	1082	23.38%	1586
9 MA	-15	1078	23.42%	1604
10 MA	-13	1064	23.16%	1598
11 MA	**-21**	**1052**	**23.05%**	**1584**
12 MA	-24	1060	23.24%	1597

WEIGHTED MOVING AVERAGE - DIESEL

Diesel	MFE	MAD	MAPE	RMSE
3 WMA	-7.17	1113.25	23.51%	1537.29
4 WMA	-7.02	1094.94	23.35%	1519.94
5 WMA	-3.05	1084.41	23.12%	1528.79
6 WMA	-6.45	1072.48	22.98%	1529.24
7 WMA	**-6.24**	**1058.33**	**22.66%**	**1510.82**
8 WMA	-7.73	1059.16	22.68%	1508.81
9 WMA	-11.45	1057.93	22.69%	1511.34

3 WMA	4 WMA	5 WMA	6 WMA	7 WMA	8 WMA	9 WMA
0.41	0.13	0.12	0.13	**0.15**	0.00	0.02
0.26	0.35	0.08	0.09	**0.07**	0.13	0.00
0.33	0.24	0.33	0.09	**0.07**	0.06	0.12
	0.28	0.22	0.30	**0.06**	0.06	0.06
		0.25	0.13	**0.28**	0.05	0.07
			0.26	**0.14**	0.30	0.04
				0.23	0.15	0.30
					0.25	0.15
						0.24

COMPARISON OF ALL THE FORECASTING TECHNIQUES - DIESEL

DIESEL	Mean Error	MAD	MAPE	RMSE	Parameters	Forecasted Value
Moving Avg	-20.95	1052	23.05	1583	11 Days	4560
Weighted Moving Avg	-6.24	1058	22.66	1510	7 Days	4814
Exponential Smoothing	-5.87	1032	22.46	1508	alpha = 0.15	4730
Double Exponential Smoothing	**-5.28**	**1031**	**22.44**	**1509**	**alpha = 0.14 beta = 0.05**	**4728**
Triple Exponential Smoothing	293	1144	23.27	1587	alpha = 0.4 beta = 0.0 gamma = 0.2 season length =14	3934

BEST TECHINIQUE WITH MINIMUM MAPE

DOUBLE SMOOTHING

MOVING AVERAGE - HSP

HSP	MFE	MAD	MAPE	RMSE
1 MA	0	121	41.97%	176
2 MA	0	120	43.43%	163
3 MA	0	120	44.42%	161

MOVING AVERAGE - HSP

HSP	MFE	MAD	MAPE	RMSE
3 WMA	0.13	114.18	40.65%	164.54
4 WMA	0.46	112.98	40.46%	161.95
5 WMA	**0.55**	**113.14**	**40.44%**	**162.30**
6 WMA	0.30	113.53	40.53%	163.14
7 WMA	0.18	113.91	40.64%	163.07

3 WMA	4 WMA	5 WMA	6 WMA	7 WMA
0.18	0.16	**0.05**	0.00	0.01
0.04	0.04	**0.08**	0.07	0.00
0.78	0.05	**0.09**	0.12	0.03
	0.75	**0.02**	0.03	0.13
		0.76	0.01	0.01
			0.77	0.06
				0.77

COMPARISON OF ALL THE FORECASTING TECHNIQUES - HSP

HSP	Mean Error	MAD	MAPE	RMSE	Parameters	Forecasted Value
Moving Avg	-0.36	121	42.32	177	1 Day	361
Weighted Moving Avg	0.55	113	40.44	162	5 Days	347
Exponential Smoothing	0.43	114	40.82	161	alpha = 0.73	388
Double Exponential Smoothing	**0.43**	**113**	**40.43**	**162**	**alpha = 0.39 beta = 0.99**	**369**
Triple Exponential Smoothing	65.39	133	41.52	181	alpha = 0.8 beta = 0.0 gamma = 0.2 season length = 8	331

BEST TECHINIQUE WITH MINIMUM MAPE
DOUBLE SMOOTHING

FORECASTED VALUE USING THE BEST TECHNIQUE

0.002
0.065
0.235
0.082
0.013
0.123
0.026
0.028
0.427

	Petrol	Diesel	HSP
Forecasting Method	9 Days WMA	Double Smoothing (0.14 , 0.05)	Double Smoothing (0.39 , 0.99)
Forecasted Value on 1/Jun/16 Wed	3390	4728	369

EXCEL FILE

PYTHON

INVENTORY PLANNING

	PETROL	DIESEL	HSP
Selling Price / Litre	₹ 70.00	₹ 60.00	₹ 73.00
Margin / Litre	₹ 2.33	₹ 1.50	₹ 2.50
Cost Price / Litre [Selling Price – Margin]	₹ 67.67	₹ 58.50	₹ 70.50
Ordering Cost	₹ 150.00	₹ 150.00	₹ 150.00
Holding Cost / Litre [10% of Cost Price]	₹ 7.00000	₹ 6.00000	₹ 7.30000
Cost Price [(Holding Cost * Inventory) + (Cost Price * Order Placed) + Ordering Cost]	X	Y	Z
TOTAL COST PRICE	(X+Y+Z) (MINIMIZE)		

CONSTRAINTS

- Total Order Placed has to be 12000 litres
- Order can be placed in multiples of 3000 litres
- Storage Capacity for Petrol, Diesel, HSP is 15000, 20000 & 10000 respectively
- For every 1000 litres purchased, 4 litres is lost in transit (0.4 %)

INVENTORY PLANNING

Minimize Total Cost :

$$\mathbf{TC_1 = (7\, I_{p0} + 6\, I_{d0} + 7.3\, I_{h0}) + (67.67\, Q_{p1} + 58.5\, Q_{d1} + 70.5\, Q_{h1}) + 150}$$

(0 = on T0 ; 1 = on T1)

Subject to

$Q_{p1} + Q_{d1} + Q_{h1}$ = 12000 litres or 0 litres

Q_{p1} , Q_{d1} , Q_{h1} <= Storage Capacity Left (Rounded down to Multiple of 3000)

Q_{p1} , Q_{d1} , Q_{h1} >= Q_{rp1} , Q_{rd1} , Q_{rh1} (Rounded down to Multiple of 3000)

$Q_{rp} = FV_{p1} - [\,(I_{po} - FV_{po}) - R_{op}\,]$ (RO = Reorder Point (Litres) ; FV = Forecast Value)

$Q_{rd} = FV_{d1} - [\,(I_{do} - FV_{do}) - R_{od}\,]$ (I = Inventory)

$Q_{rh} = FV_{h1} - [\,(I_{ho} - FV_{ho}) - R_{oh}\,]$

INVENTORY PLANNING

PARAMETER	FORMULA
Average Daily Sales	From Descriptive Analysis
Lead Time (Days)	2 Days
Re Order Point (Litres)	[Average Daily Sales * Re Order Point]
Inventory on T0 (Litres)	Initially Assumed
Forecast for T0 (Litres)	From Forecasting Technique
Inventory on T1 morning (Litres)	[Inventory on T0 - Forecast for T0]
Forecast for T1 (Litres)	From Forecasting Technique
Quantity Required on T1 (Litres)	[Forecast on T1 - (Inventory on T1 – Re Order Point)]
Minimum Quantity Required on multiples of 3000 #	Calculated by rounding down the values (A)
Maximum Quantity Required on multiples of 3000	Calculated by rounding up the values
Storage Capacity (Litres)	Given
Capacity Left on T1 morning	[Storage Capacity – Inventory on T1 morning]
Minimum in Capacity as multiple of 3000 *	Calculated by rounding down the values (B)
Upper Limit for Order *	B
Lower Limit for Order #	A
Optimized Quantity to be ordered on T0 for T1 (Litres)	Calculated using Solver (C)
Order to be refilled on T1 (Litres)	96.6% of C

INVENTORY PLANNING

EXCEL FILE INVENTORY PLANNING

THANK YOU