The Cost of Goods Transportation: Navigating through the Loss

Final report for the BDM capstone Project

Submitted by -

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1. Executive Summary:

Ganesh Transport, a small B2B transport company based in Kolkata and operated between Kolkata and Guwahati, faces significant operational challenges that are affecting its profitability. The company's fleet, consisting of a 6-wheeler and a 12-wheeler truck, has been plagued by issues such as goods damage during transit and delays in order fulfilment.

The root causes of these problems are linked to geographical areas prone to adverse weather conditions, leading to frequent goods damage, and operational inefficiencies contributing to transportation delays.

The Proposal Phase involved identifying key challenges: such as frequent goods damage in transit, delays in order fulfillment and skyrocketing operational costs. Metrics for data collection included trip duration, expenses, and number of goods damaged for five months, and insights from interviews with company's manager, Mr. Sujoy Sarkar. A draft was set up as a proposal to find the solutions of these core issues.

Data analysis in the Mid Term Phase started with presenting a fact that goods damage is often caused by adverse weather especially during a monsoon. Order fulfillment delays are a direct result of driver fatigue resulting from too many hours working and not stopping long enough for necessary breaks. Cost pressures, including especially fuel and tire price volatility, was identified by the group as a major factor impeding profitability. To accomplish this, ongoing efforts include generating insights and visualizing the data, to highlight key trends (weather related delays and cost patterns across time).

For the Final Submission Phase, we refined the analysis and suggest actionable solutions. Key recommendations include the use of route optimization tools for minimizing delays, the scheduling of breaks to minimize driver fatigue and strategies to reduce the impact of weather-related risks. Furthermore, forecasting of operational costs will assist the business in choice of competitive pricing strategy to manage changing expenses. The intent is to give the crew on Ganesh Transport certainty in their understanding of performance and direction to enable them to find efficiencies, lower costs, and increase reliability in service delivery to ultimately provide both, better service and higher profitability in the longer term.

2. Detailed Explanation of Analysis Process/Method

1. Line Graph for Cost Trends Over Time

This line graph will depict how the total cost - a sum of cost to go and cost to come - evolves. This graph has two variables date and total cost.

It helps in tracing any kind of trend whether cost is increasing or decreasing. If, for instance, the total cost of a business is increasing more than proportionately, it points to inefficiencies or external factors like the price of oil having increased affecting the transportation costs. For the above reasons, identifying such periods will help take prompt action like negotiating better rates of fuel, revising routing strategies, or improving operational efficiencies.

Why This Method: Line graphs are very useful for tracking variables over time. This will precisely and clearly illustrate cost behavior for several periods in such a fashion that trends will be followed easily.

2. Line Graph Illustrating Profit Trends Over Time

The second graph illustrates profit patterns over time. It can be used to monitor consistency, either increasing or declining profits and then compared against cost trends in the first graph. Ideally, a good comparison would then be of the profit trend against the total cost trend to understand how well the firm is balancing its revenue against rising or falling costs.

Benefit: The chart is effective in evaluating the financial health of the business over time. If the profits decline with an increasing cost, then it could be aligned with shrinking margins, hence requiring either cost-saving or revenue-enhancing strategies. Additionally, if profits increase even as costs rise, then the business has been successful at offsetting costs through revenue generation and thus points toward elements of success.

Why This Method: A line graph effectively shows continuous data like profit trends over time. It helps the business see how profits react to changing external conditions, like oil prices, or internal factors, like cost efficiency.

3. Scatter Plot of Oil Price Impact on Total Cost

This scatter plot will examine the relationship of oil prices with total cost. Fuel prices greatly affect transportation and logistics, so this plot will help determine if the increase in oil prices correlates with increases in the total cost of operations.

A high correlation coefficient value would imply a strong positive correlation, and the business is severely exposed to variations in fuel prices. The firm would then be willing to hedge fuel costs, acquire long-term contracts as futures, or adopt more fuel-frugal logistics operations. Knowing the relationship between the price of oil and total cost, the company can better plan on and control its expenses in uncertain markets.

Why This Method: The best way to represent the relationship of two continuous variables is with a scatter plot. Here it helps to express in quantitative terms how dependent the company's total costs are concerning movement in oil price.

4. Scatter Plot of the Relationship between Total Cost and Profit

This scatter plot will depict the relationship between total costs and profit. Logically, one would expect that as total costs increase, profits would decrease, assuming revenue holds constant. This graph will then help us visually assess the point at which changes in operational costs are affecting the company's profitability.

This graph benefits the company as it shows the relationship between the cost and the profit.

Why This Approach: It helps indicate where cost cuts could lead to a higher profit.

5. Histogram of the Distribution of Total Losses

The histogram will show the distribution of the total damages.

Benefit: This distribution may help the company understand what kind of risks it faces. If the histogram is such that the damages are infrequently occurring but very severe, then its efforts must go into reducing those rare but costly incidents. Conversely, if damages occur frequently but are small, then it may be worthwhile for the business to improve regular operational procedures so that the incidence of these minor damages is reduced.

Why This Method: Histograms are one of the standard ways to represent distributions, showing to the business what kinds of damages are happening how often they are, and how often they have severe or many damages. More particularly, by knowing the pattern of damages, the company can better target its risk management strategies.

6. Time Series Forecast for Date vs. Profit

With this method, we can go a step further and not just look at the past, but also predict the future. Time series forecasting uses the patterns we see in the data to estimate what might happen with profits in the coming months. This is really useful for planning because it helps us anticipate how changes in costs or other factors might impact future profits. By being proactive, Ganesh Transport can make adjustments ahead of time to avoid potential losses.

Why This Method: Time series forecasting is designed for exactly this kind of task—predicting future trends based on past data. While regular trendlines or simple averages might show general patterns, forecasting allows us to see potential ups and downs in profits, making it more actionable for business planning.

Why These Methods Fit the Data –

The dataset provided consists of various metrics like cost, damage, oil price, and profit, recorded over a period of time. The main objective is to analyze and visualize these relationships and trends using graphs and statistical methods. Additionally, a time series forecasting approach will be applied to predict future costs, profits, and oil prices.

Detailed and Consistent Data: Since we have gathered such thorough data over five months, these methods can give you the insights you need. The data collected from Mr. Sujoy Sarkar includes everything from daily expenses to trip durations, making it ideal for both visual analysis and forecasting.

Understanding the Challenges: The methods were chosen because they align with the key challenges we are looking to solve—goods damage, rising costs, and fluctuating profits. By using these tools, we will be able to visualize these issues and forecast future trends, helping us make informed decisions.

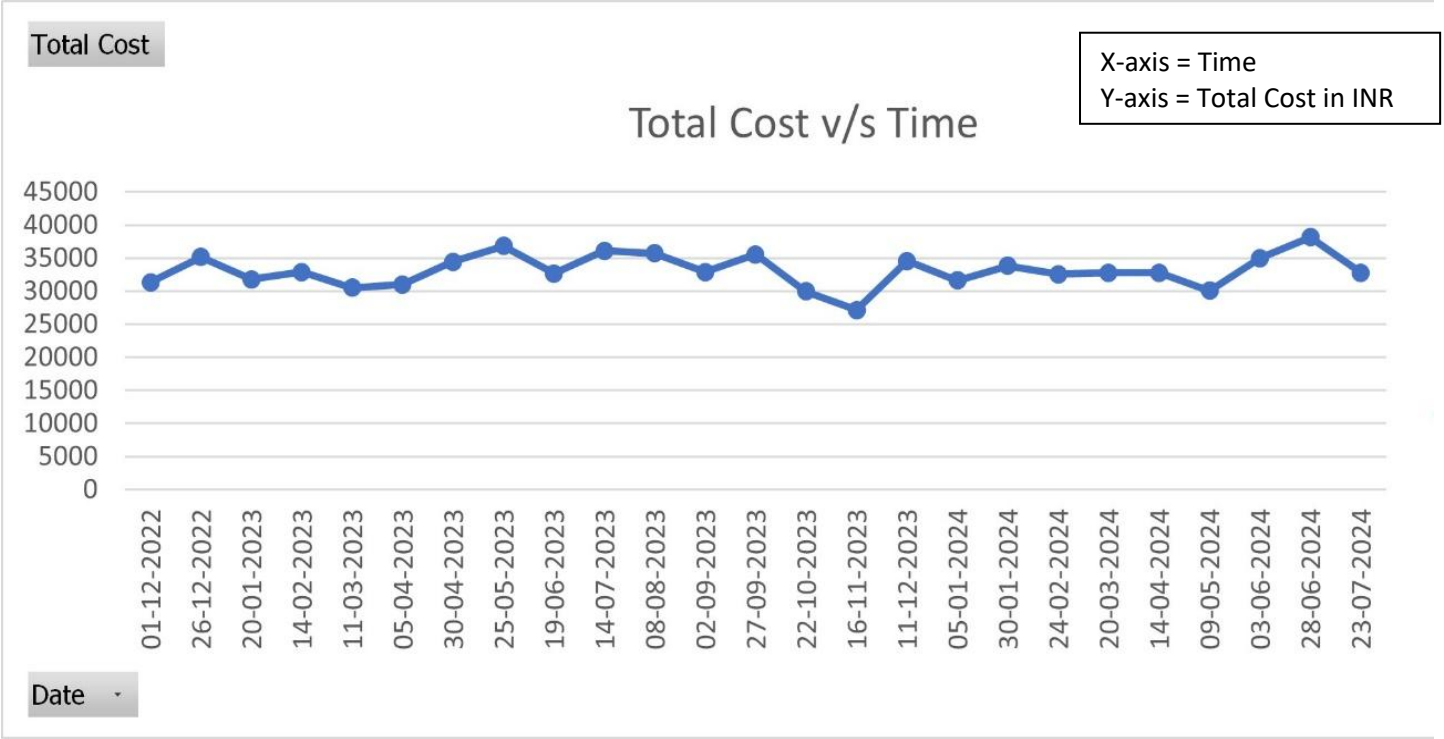
Turning Data into Action: Each method serves a different purpose—whether it's highlighting operational inefficiencies or forecasting profits—and together, they provide a full picture of the business's performance. This gives us actionable data to address inefficiencies and improve profitability for Ganesh Transport.

By using these methods, we are not just collecting data—but also turning it into useful insights that can directly improve the way Ganesh Transport operates, helping the business run more efficiently and profitably.

These visualizations and forecasts provide a comprehensive understanding of how costs, profits, oil prices, and damages interact in your business operations. The data-driven insights gained from this analysis will assist in identifying cost-saving opportunities, mitigating risks, and maximizing profitability.

6. Results and Findings-

a. Line Graph for Cost Trends Over Time



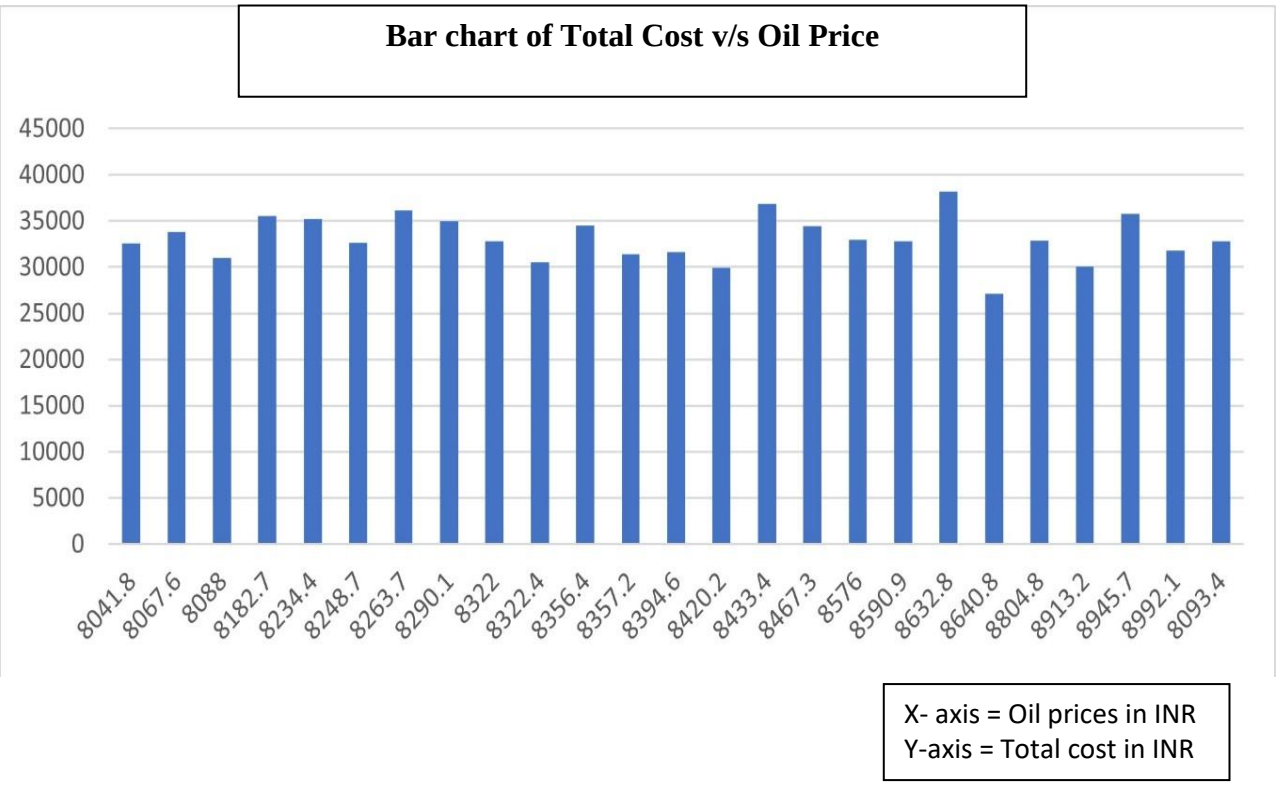
Results and Findings:

The graph shows total costs swinging between about 25,000 and 40,000.
The costs are trending but within a predictable range, and there is no spiking or crashing over time. Small peaks appear at intervals. Troughs also occur but do not have a visible downward trend.

Interpretation:

The cost fluctuations imply that the cost structure for the period is more or less stable. The peaks and valleys might indicate some infrequent outside influences such as a market change or lumpy expenditures which accounted for those spikes.
This stability would imply that unwarranted surprise costs are perhaps minimal. This can be interpreted as cost management.

b. Bar chart of Oil Price Impact on Total Cost



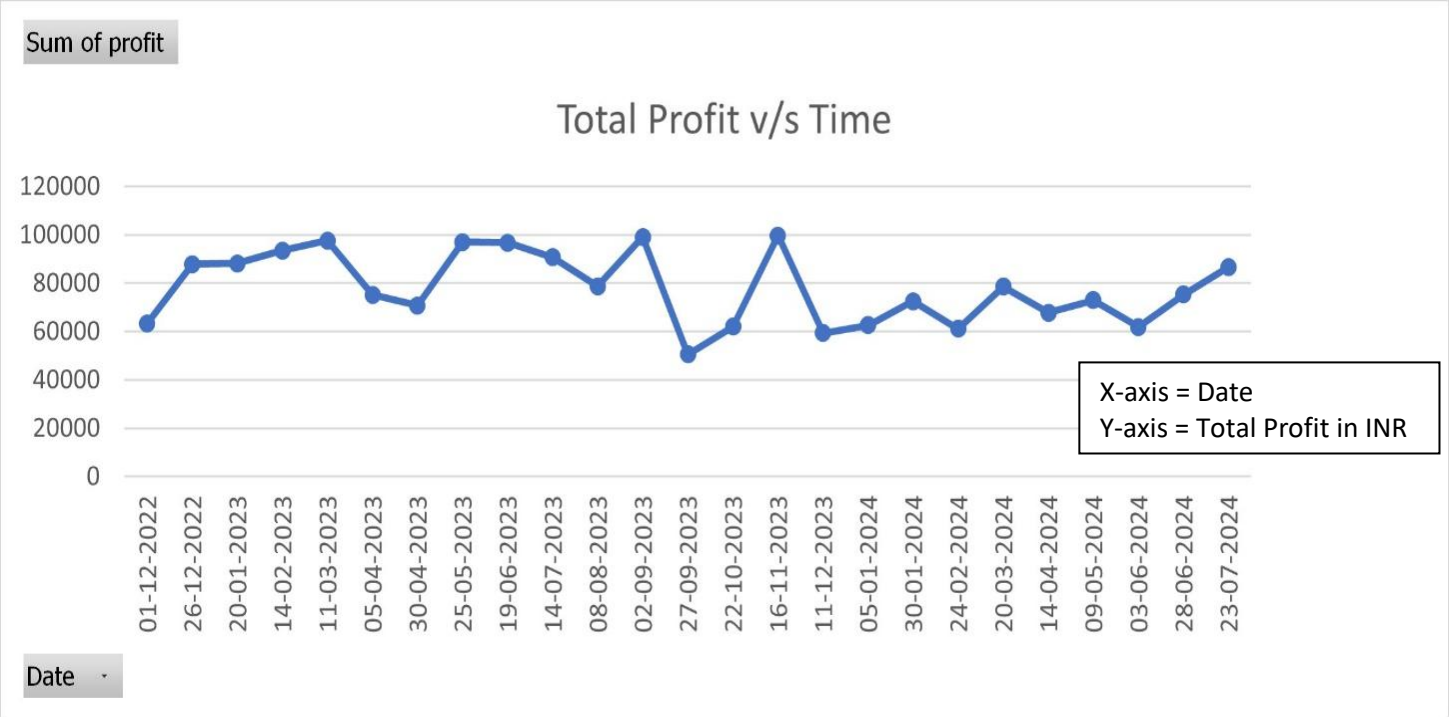
Results and Findings:

From the var chart, it can be seen how the oil prices (horizontal axis) are in correlation with the total costs (vertical axis). No specific pattern of increase or decrease in costs with the change in oil prices can be seen. The volume of the bars is similar and largely around the same constant value; costs change by no significant margin according to fluctuations in oil prices.

Interpretation:

This implies that oil prices may not directly influence total costs in a linear fashion. Costs seem to be decoupled from the volatile fluctuations in oil prices, implying that either the business is well hedged against the volatility in oil prices or oil is not a significant component of the total cost.

c. Line Graph Illustrating Profit Trends Over Time



Results and Findings:

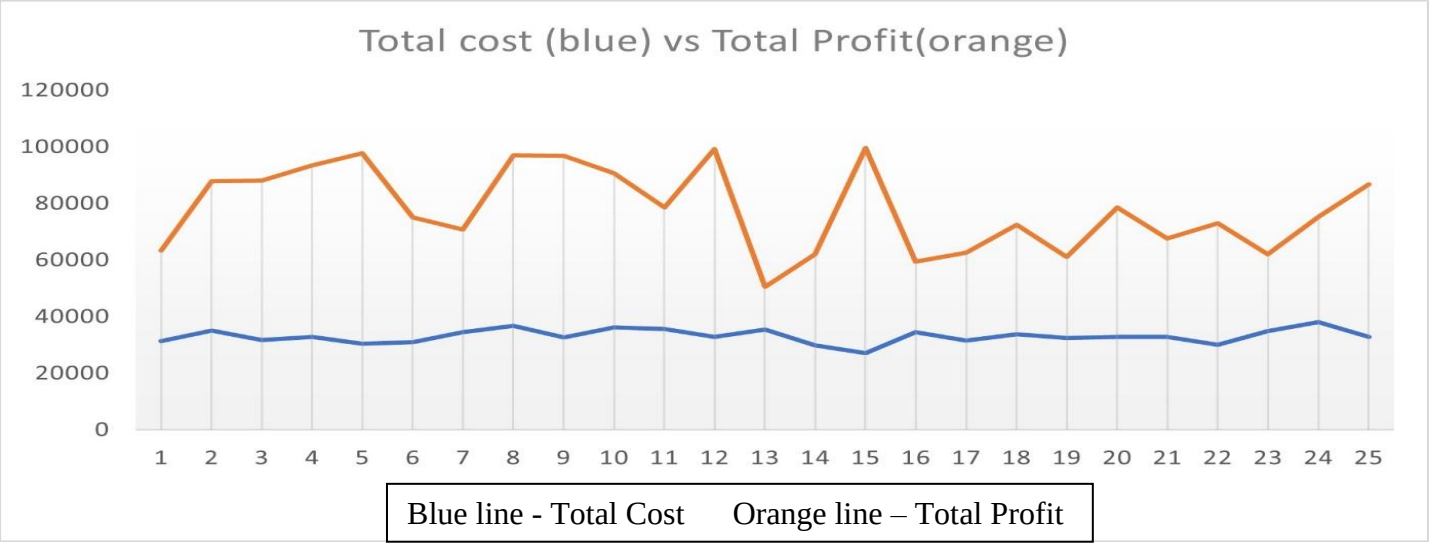
This graph shows the fluctuations in profit that had ups and downs over time, mostly in the area of 60,000 and more than 100,000. It can be depicted that the graph indicates ups and downs and profits kept spiking more than the costs. The steepness in decline than the sharp rise shows volatility.

Interpretation:

Profit volatilities reflect fluctuating profit margins that may be caused by factors such as demand and pricing power, market conditions, or internal inefficiencies.
This is not a certain signal of a downtrend as the business continues to remain profitable on the whole but shows inefficiency in certain areas.

d. Line graph for the Relationship between Total Cost and Profit

X-axis = Amount in INR
Y-axis = Total Profit in INR



Findings and Results:

The blue line of the total cost does not have many fluctuations within the 25 periods. This outcome suggests that this company has been able to maintain a stable cost of operations with slight variations.
The orange line of the total profit has had several extreme highs and lows, with a considerable swing. It shows that the profit is sensitive to massive swings through the influences of changes in demand and due to the occurrences of late transport and damage incidents.

Results Interpretation:

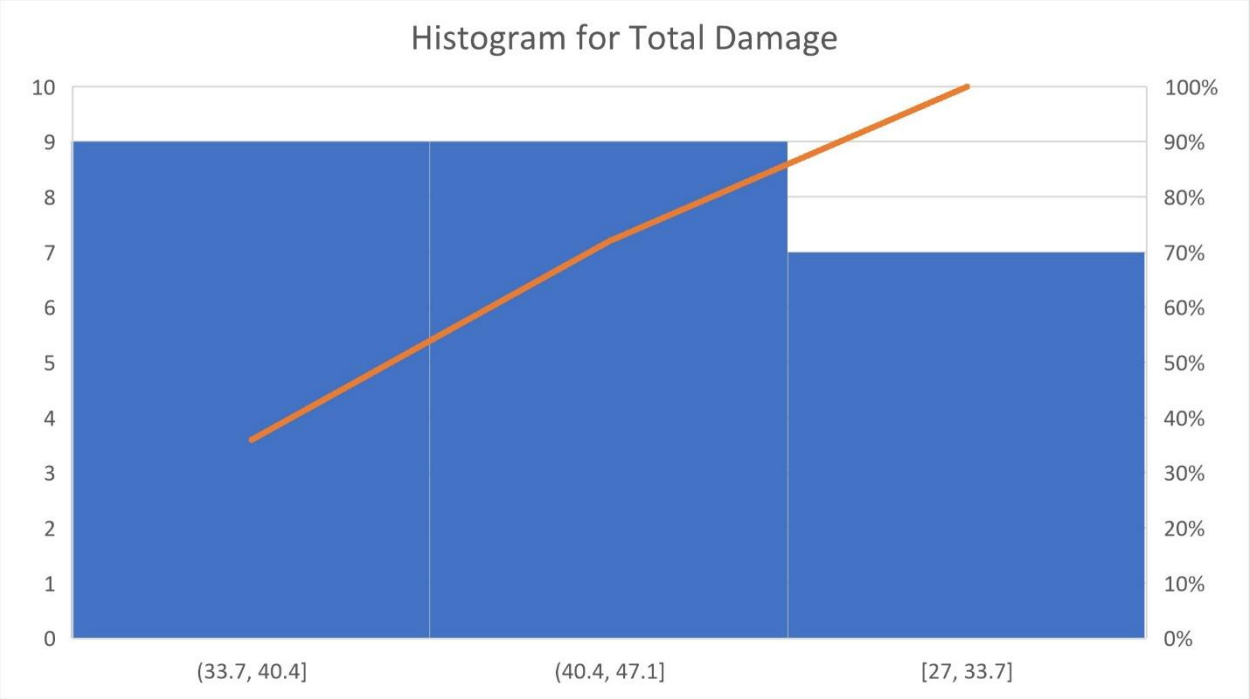
Total Cost: This constancy in the trend shows that costs related to fuel, maintenance, and operation haven't faced any significant disturbance or increase over time.
Total Profit: The variables are so volatile that they indicate the revenues are highly variable and possibly disturbed by factors like some damage during transit, delayed trips, or sudden seasonal fluctuations in demand. In some months, there is a lot of profit, while others see almost nothing, indicating the business is quite susceptible to these variables.
Recommendations:

Cost Control: The cost is stable, but there is room for further improvement in the margin of profit. For instance, further optimization may be achieved through a decline in oil prices or an improvement in route efficiency.

Profit Volatility: Causes of profit volatility should be addressed. For instance, delivery reliability and goods damage may be caused by working in such areas. A better tracking system with predictive analytics would foresee and control events limiting profits.

Revenue Growth: Ease the trend of profit by diversifying the goods type transported or adding a premium service that could deliver goods quicker or more reliable during peak hours.

e. Histogram of the Distribution of Total Losses



X-axis = Total Damage
Y-axis = Frequency

Observation: The histogram shows total damage over three ranges of values

(33.7, 40.4]
(40.4, 47.1]
[27, 33.7]

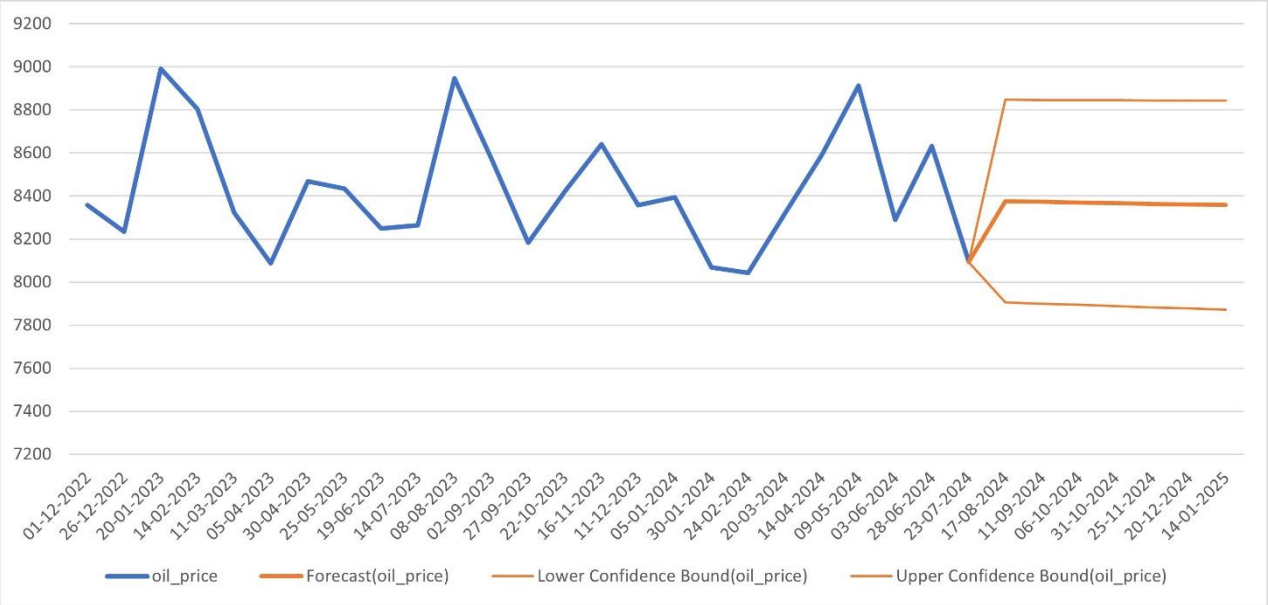
Blue is the frequency of counts (or data points) for each bin, and the orange line is the cumulative percentage.

Conclusion:

Most of the total damage values lie in the range of 33.7 and 40.4.
The data is left-skewed since the leftmost bin is the most frequent bin, and it reduces as we move higher.
70% of the data lies in the first two bins.

f. Oil Price Forecast -

X-axis = Date
Y-axis = Oil Price forecast (INR)



Observation:

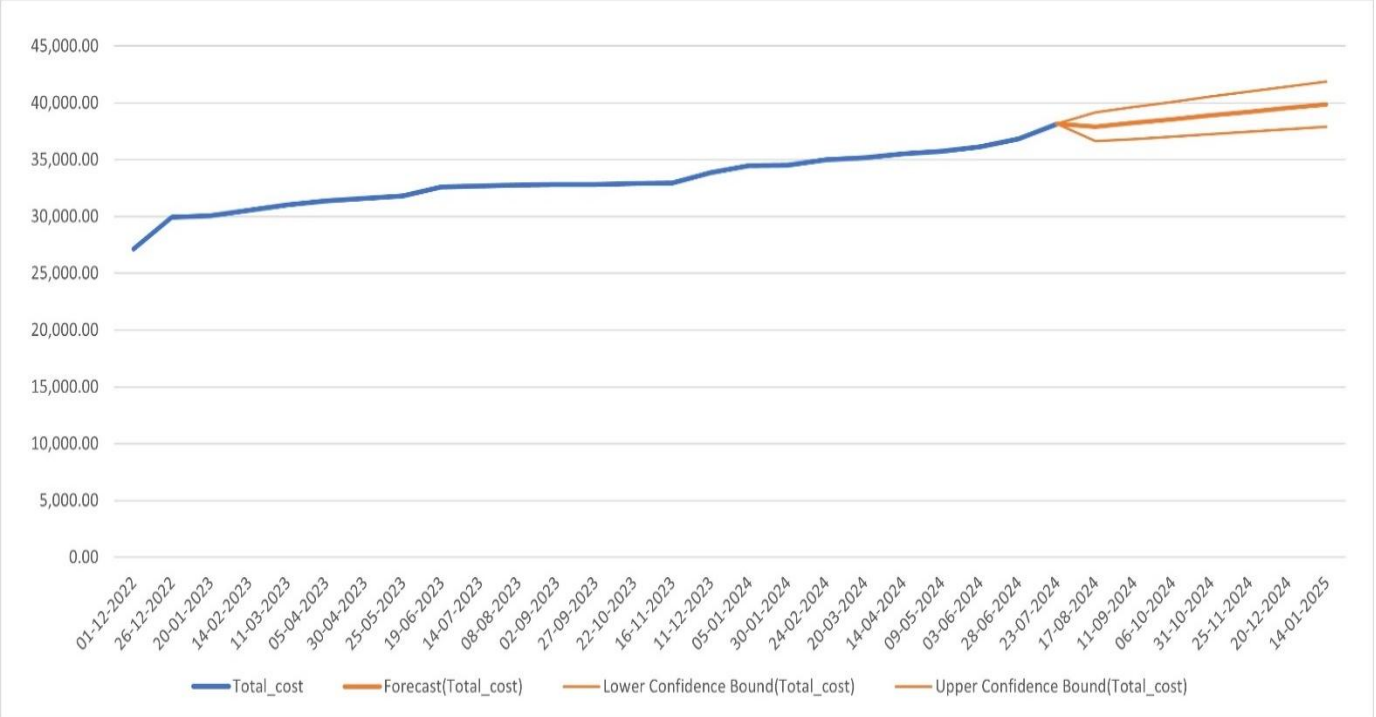
This graph shows the historical trend of oil prices in blue and the forecasted trend in orange along with the lower and upper confidence bounds in yellow.
Historical data illustrates a volatile nature with robust peaks at the start and middle portions of 2023, along with a downtrend towards the end of the same year.
The oil price projection goes on softly dropping but levels shortly
Interval bounds stay within a possibility of the oil price range and show that probably there is a chance of falling below 7800 and nearly to 8600 in the case of the upper ones.

Interpretation:

The constant fluctuation of oil prices will carry on but be likely to level shortly.
The forecast does offer some degree of confidence that the price will not rally above 8600 in the near term but surely not below 7800.

g. Total Cost Price Forecast –

X-axis = Date
Y-axis = Total Cost Price forecast



Results and Findings:

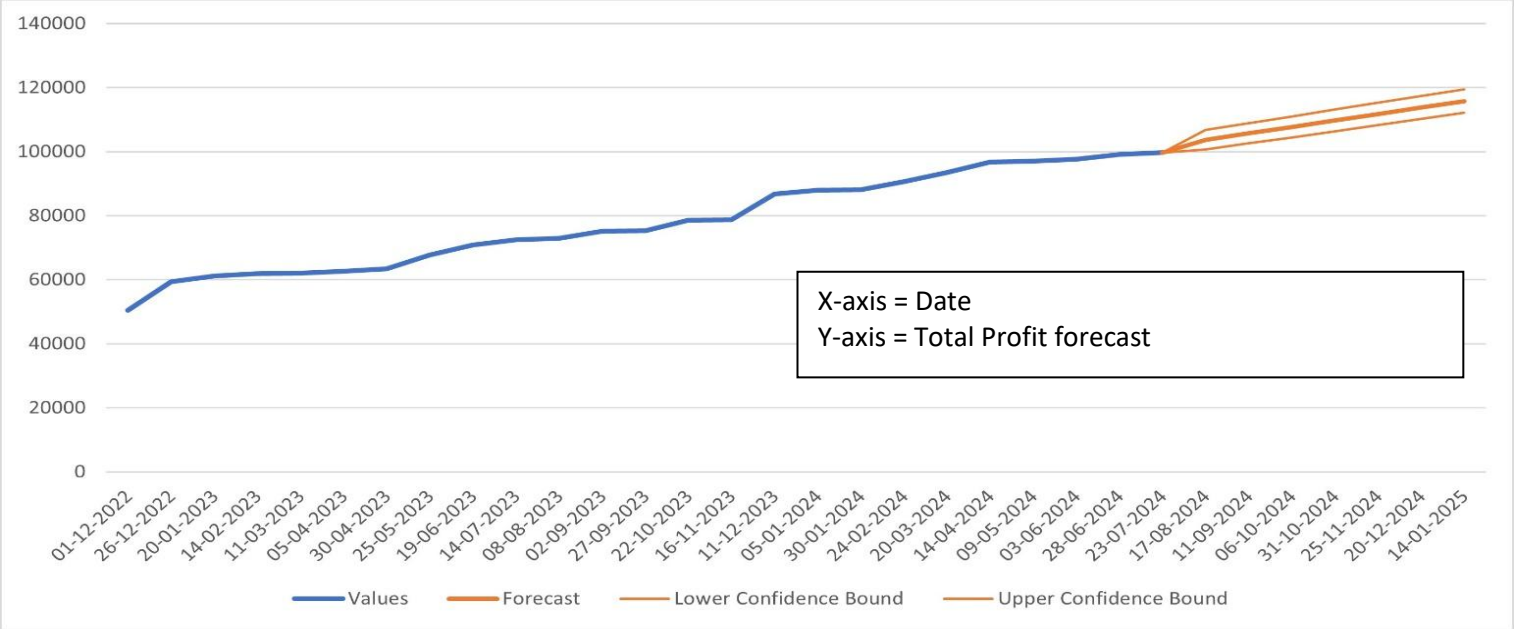
The total cost projection is increasing in general as the confidence bounds mildly narrow up, yet still highly consistent at periods. The projection implies that future costs would moderately increase.

Interpretation of Results:

Total Cost Forecast: The trend of total cost is upward, so if the firm doesn't change anything, the running cost will just slightly go up. The limits of confidence indicate that, although the predicted values are reliable, there is still place for little fluctuations in cost.

Business Impact: The cost curve may go up, thereby reducing the profit margins unless the revenues are highly growth-oriented. Maybe the increasing cost is due to high oil prices or operational inefficiencies.

h. Total Profit Forecast



Results and Findings:

Just like the projected cost, the profit projection is taking the pattern upwardly increasing. The confidence intervals have expanded just a little bit, signifying some level of uncertainty in the forecast but are generally pointing to higher levels of profit over time.

Profit Growth: The positive direction is promising in that the expectation would be that there was a level of profit growth from the periods in question, but with variance allowed for. It is constructive that confidence bounds are increasing as it speaks to a level of unpredictability concerning profit over time probably due to factors in revenue streams and having to do with unreliability due to variations in demand or damage to goods.

Business Potential: The business is likely to remain on uncertain grounds as the profits will be only rising in anticipation and not steady growth conditions will prevail. There are non-disturbances that will take place to a large extent against the environment, and hence risks have to be taken into consideration accordingly.

7. Interpretation of Results and Recommendations -

Interpretations

1. Cost Stability with Occasional Spikes:

   Overall, Ganesh Transport's cost structure remains relatively stable, with periodic fluctuations arising due to short-term inefficiencies. The observed cost spikes may be attributed to maintenance issues, labor overtime, and occasional fuel price volatility. Despite generally effective cost control, these fluctuations indicate areas where operational efficiency can be improved during high-stress periods to maintain a smoother cost trajectory.

2. Weak Correlation between Oil Prices and Total Costs:

   Analysis reveals only a weak correlation between oil prices and total operating costs, suggesting that either oil expenses are well-managed (possibly via hedging) or form a smaller fraction of overall costs. Given this elasticity of total costs to oil prices, the company can focus on optimizing other cost drivers, such as labor and maintenance, for better margin stability.

3. Profit Volatility:

   Profit margins exhibit significant volatility, with fluctuations likely influenced by external factors (e.g., varying demand, market conditions) and internal inefficiencies (e.g., delayed shipments, goods damage). This sensitivity to external and operational factors suggests that the firm would benefit from more stable revenue streams or enhanced risk management strategies to ensure more consistent profit levels.

4. Frequent Moderate Damage:

   The company often experiences moderate levels of damage to goods, though severe cases are rare. This repeated mid-level damage offers a window for improvement in this case as reduction of these incidents will provide great savings. Although such cases are rare, damage levels to goods at the company are moderate. Addressing this problem proactively could offer both more effective and cost-efficient cost management and operational efficiency over time.

5. Volatile Oil Prices, but Stable Projections:

   The company's cost structure is likely affected by the historic unpredictability of oil prices. But oil prices could settle out in the future, according to projections. This could provide an opportunity for a more stable approach to the longer-term fuel costs that is less susceptible to the problems of price spikes that typically occur.

6. Manageable Costs, Unpredictable Profits:

   Profit is a great deal more unpredictable than costs, but profit seems to be something the company has got the hang of. The company seems to have a good handle on its costs, but profits are more unpredictable. Likely, these are simply due to some external factors, such as changing demand or delays due to transportation or damage-related expenses. However, because profits can vary so much, it's tough for the company to figure out how to plan for long-term growth and financial stability.

Recommendations

1. Operational Efficiency Improvements:

   - Reduce Cost Spikes: This can involve better vehicle maintenance scheduling, reducing overtime for employees, or optimizing routes to save fuel and also cutting overtime for employees. Taking these areas on will lead to more streamlined, controlled cost structures. Tackling these areas will help create more consistent and manageable cost structures.

   - Fleet Optimization: Maximize the value of each vehicle by focusing on predictive maintenance and route planning. Using technology to anticipate maintenance needs can prevent breakdowns, keeping the fleet in better condition and reducing repair costs. Optimizing routes will cut down on unnecessary mileage, saving both time and fuel. Target a higher level of value including predictive maintenance and route planning for each.

2. Optimize Non-Oil Costs:

   Since oil prices don't seem to have a huge impact on overall costs, the company should focus on other areas where savings can be made. This could include improving vehicle maintenance to prevent costly repairs, increasing the efficiency of labour, and reducing administrative overhead. With proper fine-tuning of this essence, the company could achieve better profitability.

3. Damage Prevention:

   Determines the point at which total revenue equals total costs, meaning no profit or loss is made. This analysis helps the business understand the minimum number of trips or units needed to cover all costs.

   By calculating the break-even point, Ganesh Transport can better understand the minimum operational levels required to remain profitable.

This model can help identify profitable routes by analysing fixed and variable costs associated with each route, which is critical when making decisions on fleet expansion or operational scale adjustments.

4. Profit Stability:

   - To counteract fluctuations in profit, the company should implement cost-control measures during periods of lower demand. Make adjustments to fleet operations in line with demand. Make sure to use alternative paths specially during rainy season on the rough terrains. Implement lean operational adjustments aligned with demand forecasts, helping avoid unnecessary expenses during off-peak times. Techniques like seasonal adjustment models could fine-tune operations based on demand cycles, minimizing costs in low-demand periods.

   - Route and Handling Optimization: Use GPS and listen to weather forecast to predict beforehand, the areas which are prone to flooding/landslides, etc that can cause delay or damage to goods. This will reduce the number of goods damaged as well as reduce the delay incurred. The fine of Rs. 200 per bag damaged or Rs. 1000 per day delayed could hence be avoided or minimized.

5. Activity-Based Costing (ABC):

- Allocates costs to specific activities based on actual resource usage, allowing a more precise understanding of which activities or routes contribute most to costs and which may be under- or over-utilized.

- ABC would enable Ganesh Transport to accurately assign costs to specific routes, types of cargo, or periods. This insight helps to identify costly inefficiencies, such as high-maintenance routes or cargo types that are more damage-prone. The company could then make data-driven adjustments, such as focusing more resources on profitable routes and minimizing activities with high costs relative to revenue.

6. Predictive Cost Management

   - Plan for Cost Increases: Use data to forecast rising costs and adjust the company's pricing strategy accordingly. This allows the company to be proactive by keeping themselves out of the dark, and maintaining reasonably healthy profit margins, free from unexpected expenses. Using the recommendations of future increase of costs, the company should make bid accordingly from the dealers to deliver the goods in order to minimize this risk of higher costs and lower profits.
     Profit = Revenue – Cost. So, if cost increases and revenue does not, then profit will fall and can even lead to losses. Hence amount asked from the dealer (Revenue) should be made carefully.

   - Price Adjustments: Make sure the company's prices reflect fluctuating costs. Implement economic model like Cost-Plus Pricing to determine the selling price of a product or service based on the total cost of production plus a desired profit margin. Calculate the Total Cost and add the desired profit margin based on

standards, competitive benchmarks, or specific financial goals for profitability. Determine the target accordingly.
Selling Price = Total Cost + (Total Cost × Profit Margin)
This is the scenario analysis

By following these steps, the company can reduce inefficiencies, lower costs, and create a more stable and profitable future.

Conclusion and Key Action Points:

To improve profitability, Ganesh Transport should focus on several key areas:

1. **Optimize Costs**: Continue maintaining stable costs but explore additional ways to reduce operational expenses, especially fuel and maintenance costs.

2. **Increase Revenue**: Diversify services, improve customer satisfaction, and apply seasonal pricing strategies to stabilize and grow revenue.

3. **Reduce Profit Volatility**: Improve reliability through better route optimization, handling practices, and damage control.

4. **Proactively Plan for Future Costs**: Use data forecasting to anticipate rising costs and adjust pricing and budgets accordingly.

5. **Enhance Workforce Efficiency**: Manage driver schedules and reduce fatigue to improve trip efficiency and reduce delays or goods damage.

Implementing these strategies will help reduce operational inefficiencies, increase revenues, and ultimately lead to more consistent and higher profitability for Ganesh Transport.

8. Acknowledgement

I would like to express my deepest gratitude to Mr. Sujoy Sarkar, the manager of Ganesh Transport, for his invaluable support throughout the course of this project. His generosity in providing the entire dataset and his cooperation during my data collection efforts made this research possible. The dataset, which I meticulously gathered over a period of five months through a combination of daily and alternate-day visits, allowed me to compile comprehensive cumulative data, forming the backbone of this study.

I would also like to extend my sincere thanks to my esteemed professors,
Dr. Ashwin J. Baliga and Dr. Aaditya, whose guidance and expertise were instrumental in shaping the direction and quality of my work. Their insightful feedback and constant encouragement have been vital in the successful completion of this project. I am truly grateful for the opportunity to work under their mentorship and for the knowledge I have gained through their instruction.

Finally, I would like to thank all those who supported me during this research, providing assistance, feedback, and encouragement along the way.

9. Proof Of Originality:

To substantiate my claims, I have included a visual documentation comprising images showcasing the establishment itself.

The link for folder containing proof of originality (video and images) –

https://drive.google.com/drive/folders/13pHCo6Wr-QM-HLNpLgoDaJR47ZkLkCQd?usp=sharing

Video link - https://drive.google.com/file/d/1h24l6gyuRv-yfbYU8c7mcf2yOZoWr_eg/view?usp=drive_link

The link for dataset is –

https://docs.google.com/spreadsheets/d/1WnMl8rjChSZ9chIWMwJf9deeVbJ2mDCr/edit?usp=sharing&ouid=117958901382199749450&rtpof=true&sd=true