

UK Commute Cost Efficiency Analysis Report

Objectives

1. Data Cleaning and Structuring (SQL)

Remove missing values

Ans: From the result none of the column is empty.

Standardize commute types and routes

All the columns are rename in excel for easier access in SQL.

Categorize distance and cost ranges

Ans: To categorize distance, commute distance miles < 10 is categorized as short, between 10 and 25 is categorized as medium while miles > 25 is categorized as long.

To categorize monthly cost, monthly cost < 150 is categorized as low, between 150 and 350 is categorized as medium while cost > 350 is categorized as high.

2. SQL-Based Trend Analysis

Find average cost per mode of transport

Ans:

Driving

- **Avg Daily Cost:** ₦13.31
- **Avg Monthly Cost:** ₦292.92
- **Cost per Mile:** ₦0.73

Driving is moderately expensive. It costs more than the bus but less than the train. This includes fuel and possibly parking or maintenance.

Train

- **Avg Daily Cost:** ₦24.62
- **Avg Monthly Cost:** ₦541.61
- **Cost per Mile:** ₦1.39 Train is the most expensive mode. While it may be faster for long distances, it comes at a high financial cost.

Bus

- **Avg Daily Cost:** ₦4.82
- **Avg Monthly Cost:** ₦106.02
- **Cost per Mile:** ₦0.26

Bus is the most affordable paid option. It's a good budget choice, especially for short to medium commutes.

Cycling

- **Avg Daily/Monthly Cost:** ₦0
- **Cost per Mile:** ₦0

Cycling has no cost it's free and also environmentally friendly, but may not be suitable for long distances or all weather conditions.

Walking

- **Avg Daily/Monthly Cost:** ₦0
- **Cost per Mile:** ₦0

Walking is also completely free and healthy, best for short distances within the city or town.

Identify cities with the highest carbon impact or longest average delays

Ans:

City with the highest carbon impact: Nottingham (10.85)

City with the longest average delays: Edinburgh (9.74 minutes)

Determine top 5 routes by best value rank

Ans: From the result, the top 5 commute route by best value rank are:

Bath - Bristol

Beeston - Nottingham

Birkenhead - Liverpool

East Kilbride - Glasgow

Bradford - Leeds

Compare daily vs monthly commute costs by city

Ans:

Nottingham	17.38	382.33
Glasgow	16.13	354.81
Edinburgh	15.81	347.77
Liverpool	14.55	320.08
Sheffield	14.42	317.23
Manchester	14.39	316.52
London	14.3	314.62
Bristol	13.93	306.36
Birmingham	13.54	297.93
Leeds	12.97	285.45

Nottingham has the highest daily and monthly commute costs.

Leeds has the lowest among the listed cities.

Cities like **Glasgow**, **Edinburgh**, and **Liverpool** also have high commute costs.

Overall, commuting is most expensive in Nottingham and cheapest in Leeds on average.

EXCEL ANOVA INTERPRETATION

1. Hypothesis Testing (Excel)

- **Hypothesis 1:** Train commutes are significantly more expensive than driving across UK cities.

Statistical test: t-test or ANOVA comparing Daily Cost (£) by Mode of Commute

Ans: Using ANOVA (Analysis of Variance)

Hypothesis

- **H₀ (Null Hypothesis):** There is no significant difference in daily commute cost across modes of transport.
- **H₁ (Alternative Hypothesis):** There is a significant difference, especially that train is more expensive than driving.

I created a new sheet to have the two filtered columns for the Anova (using Train & Driving information alone).

What Each Value Means:

- **SS (Sum of Squares):**
 - **Between Groups SS** (22,378.12): Variation between Train and Driving costs.
 - **Within Groups SS** (33,897.58): Variation within each group (how spread out costs are inside Train and Driving separately).
 - **Total SS** = Total variation in all data.
- **df (Degrees of Freedom):**
 - 1 between groups (2 groups – 1).
 - 708 within groups (total rows – number of groups).
 - 709 total.
- **MS (Mean Square):**
 - **MS = SS ÷ df** (used to calculate F-statistic)
- **F = 467.40:**
 - Compares variance between groups to variance within groups.
 - A high F = big difference between Train and Driving costs.
- **P-value = 5.52E-80** (which means 0.000...0552 — almost 0):
 - Extremely small very strong evidence of a difference.
- **F crit = 3.85:**
 - This is the threshold. If $F > F_{crit}$ - significant result.

Final Interpretation:

Since $F = 467.40$ is much greater than $F_{crit} = 3.85$, **and** $P\text{-value} < 0.05$, we reject the null hypothesis and accept alternative hypothesis that there is a significant difference in daily commute costs between Train and Driving.

And since the average cost for Train is higher, this supports the hypothesis.

SUMMARY

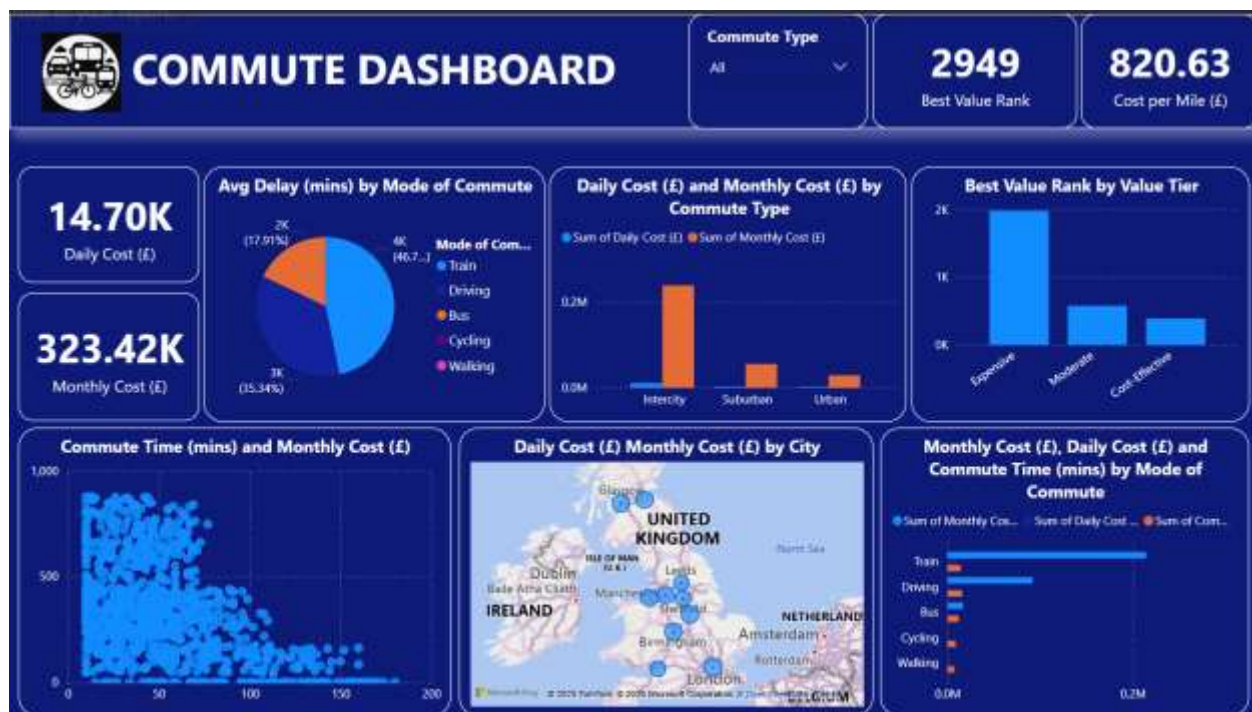
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Driving	314	4180.77	13.31455414	16.53599165
Train	396	9748.91	24.6184596	72.71345155

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	22378.1158	7	22378.1158	467.39934	5.52361E-80	3.85462655
Within Groups	33897.5787	5	47.8779360			
Total	56275.6946	2	709			

POWER BI INTERPRETATION

This Commute Dashboard shows detailed insights about commuting patterns, cost, and time across different modes of transport and locations in the UK. Here's a simple explanation of each section:



Top Summary Boxes

- **Commute Type Filter:** You can select different commute types and mode of commute to filter the dashboard.
- **Best Value Rank:** The current rank is 2949, indicating how cost-effective a commute is compared to others.

- **Cost per Mile:** Average cost per mile is £820.63, showing how expensive commuting is.

Cost Overview

- **Daily Cost (£):** The total daily commuting cost is £14.70K.
- **Monthly Cost (£):** The total monthly commuting cost is £323.42K.

Pie Chart - Average Delay by Mode of Commute

Shows how much delay (in minutes) people face on average depending on the transport mode:

- **Train:** 46.7% (around 4K minutes)
- **Driving:** 35.34%
- **Bus:** 17.91%
- Other modes like Cycling and Walking have minimal or no delay.

Bar Chart - Cost by Commute Type

Compares daily and monthly costs based on commute types:

- Intercity commutes are the most expensive daily and monthly costs.
- Suburban and Urban commutes cost significantly less.

Bar Chart - Best Value Rank by Value Tier

Shows how commutes are ranked by value:

- Expensive commutes have the highest count.
- Moderate and Cost-effective are fewer in comparison.

Scatter Plot - Commute Time vs Monthly Cost

Each dot represents a journey:

- It shows that longer commute times often result in higher monthly costs.
- There's a spread up to 200 minutes and £1000+.

Map - Cost by City

A UK map showing where commuting is more or less expensive. Cities like London, Manchester, Birmingham etc., have varying levels of cost intensity.

Bar Chart - Cost and Time by Transport Mode

This compares monthly cost, daily cost, and commute time:

- Train has the highest cost and commute time.
- Driving is next.
- Cycling and Walking are much cheaper.

Conclusion:

The analysis reveals significant differences in commute costs and efficiency across UK cities and transport modes. Train travel is the most expensive and delay-prone, while walking and cycling are free and time-efficient. Nottingham has the highest overall costs, while Leeds is the most affordable. ANOVA results confirm that train commutes are significantly more expensive than driving.

Recommendation:

To improve cost-efficiency and reduce delays, cities should invest in affordable and reliable public transport alternatives, promote cycling and walking for short distances, and optimize intercity train pricing. Commuters should consider cost-effective routes like Beeston-Nottingham or Birkenhead-Liverpool for better value.