Charging Infrastructures for EVs and Fuel prices in France

Introduction

Is the fuel price in France affecting the number of charging stations for electric vehicles?

Electric vehicles (EVs) are becoming more and more popular in the world thereby resulting in an increase in demand for charging stations. We already know that fuel prices are one of the driving factors for the adaptation of electric vehicles but is it also affecting the number of charging stations ? In this notebook, we will try to dig deeper into this question by analyzing the fuel prices and the number of charging stations in France.

We will use the data generated by data pipeline in the previous notebook to analyze the relationship between the fuel prices and the number of charging stations in France.

Used Data

Although the data from previous pipeline is generated, it had the following problems:

- Too many columns to work with
- Column names were in French
- The data was not clean

Therefore, changes to existing pipeline were made to extract, transform and load the data in a more structured way. The data was cleaned and the columns were reduced to only the necessary ones. The column names were also changed to English for better understanding. And finally, the timestamp was converted to a more readable format of year and month and date.

Load the data

In [3]:
```
ev_infra_data.head(3)
```

Out[3]:

	station_name	station_id	station_service_start_date	date_modified	last_modified	created_at
0	Hotel saint alban	FR000011062174	2022-03-02 00:00:00	2022-04-25 00:00:00	2024-01-19 00:00:00	2022-05-12 00:00:00
1	Hôtel Restaurant Campanile Nogent-sur-Marne	FR000012292701	2022-02-22 00:00:00	2022-05-12 00:00:00	2024-01-19 00:00:00	2022-05-12 00:00:00
2	Résidence les calanques	FR000012308585	2022-04-15 00:00:00	2022-04-19 00:00:00	2024-01-19 00:00:00	2022-05-12 00:00:00

In [4]:
```
fuel_prices_data.head(3)
```

Out[4]:

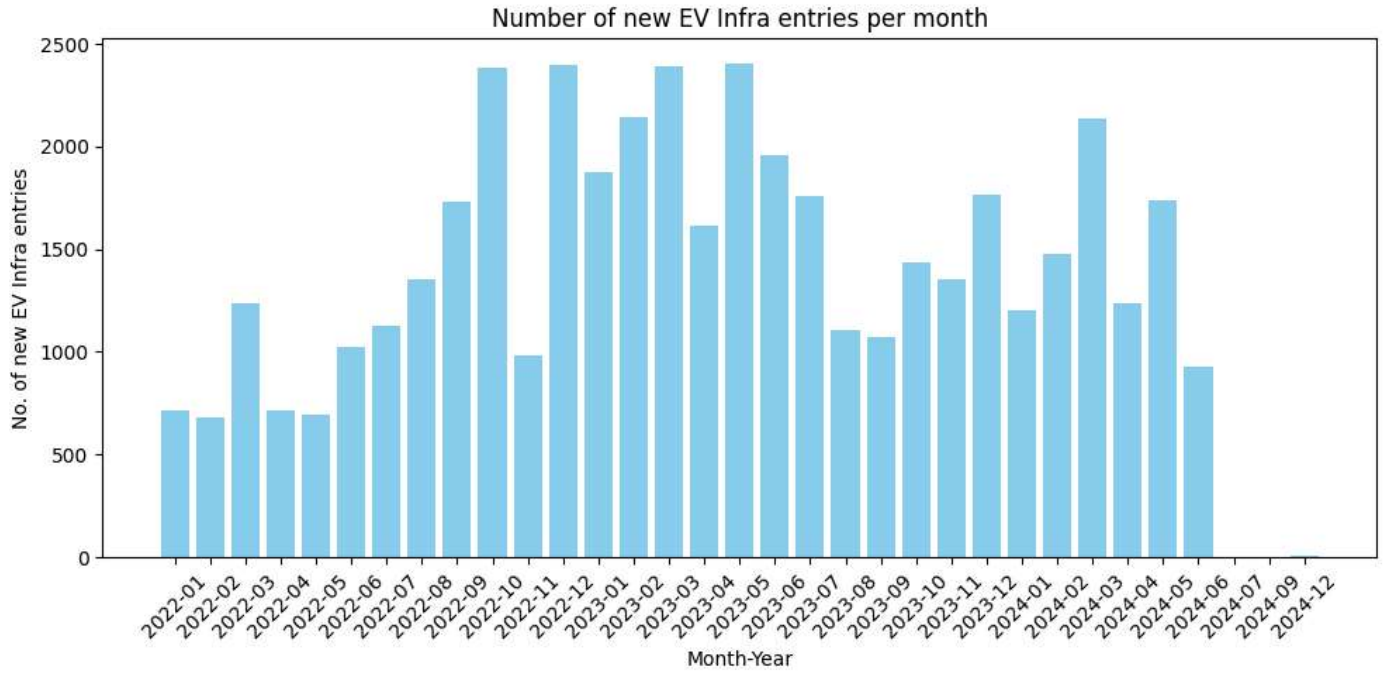
	date_modified	price_id	price_value	price_name
0	2024-06-29 00:00:00	2.0	1.795	SP95
1	2024-06-21 00:00:00	6.0	1.869	SP98
2	2024-06-30 00:00:00	2.0	1.849	SP95

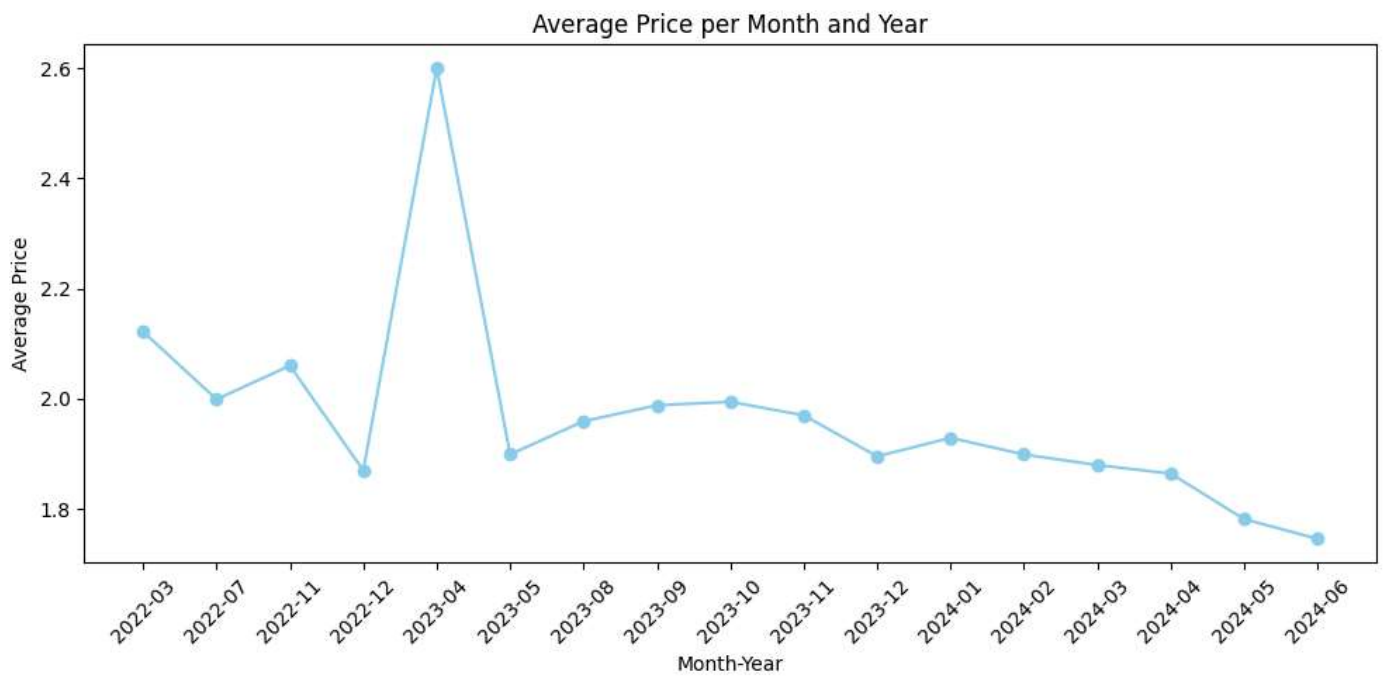
We are currently using 2 different datasets, one for the fuel prices and the other for the charging stations.

```
- The charging stations dataset contains the station_name, id and dates.
- The fuel prices dataset contains the fuel prices at different times in
France.
```

Upon exploratory data analysis, from the ev infra dataset only the count of charging station and station service start date were found to be useful for the analysis. From the fuel prices dataset, only the date and the fuel prices were found to be useful for the analysis.

So bringing both the datasets together, we will have to restrict the time period to the common time period in both the datasets. This can be done by grouping the data by year and month and then plotting the combined data to see if there is any relationship between the fuel prices and the number of charging stations. We try to restrict the fuel prices to only gasoline which is indicated as 'Gazole' in the data.





Analysis

We have the data for the number of charging stations and the fuel prices in France for the years 2022 - 2024. We will try to analyze the relationship between the fuel prices and the number of charging stations in France by plotting the data on a common time period.

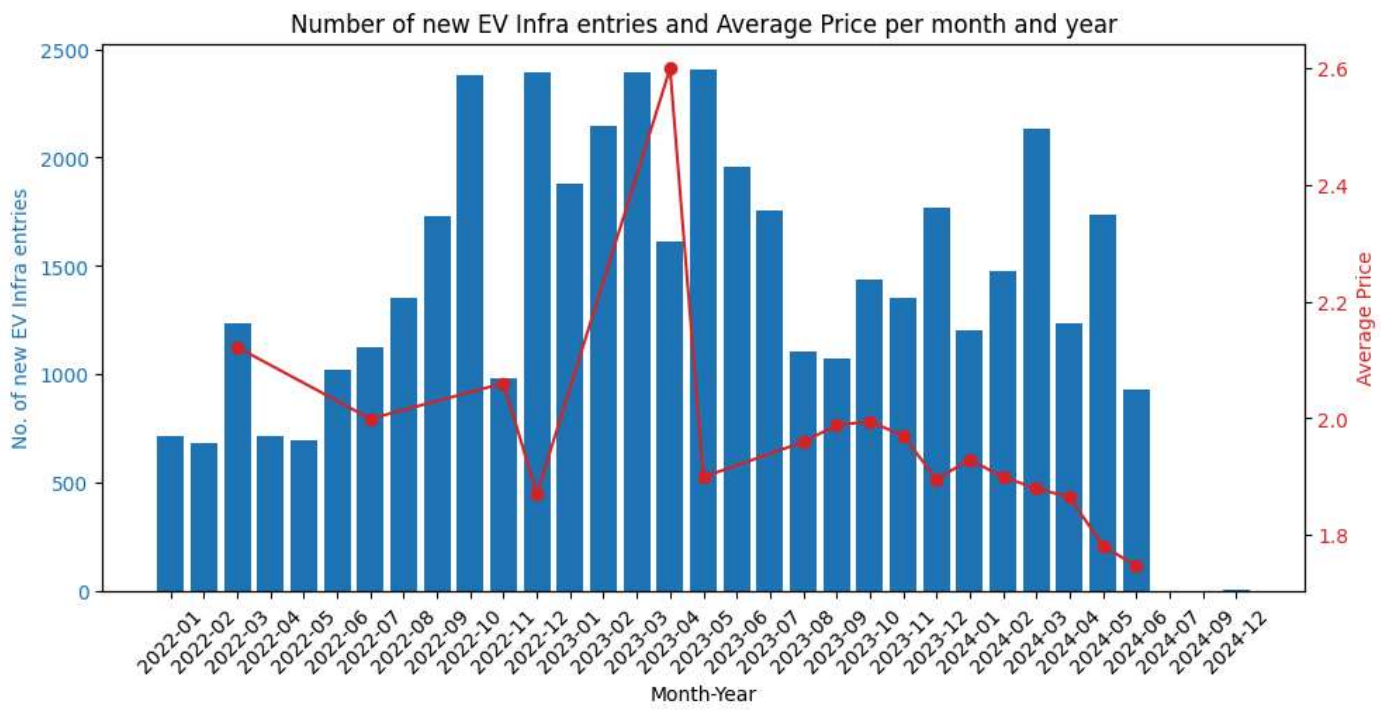
We have used data visualization techniques to plot the data and analyze the relationship between the fuel prices and the number of charging stations in France. This will help us to understand if the fuel prices are affecting the number of charging stations in France or not.

In [7]:
```
# Overlapping the two plots
fig, ax1 = plt.subplots(figsize=(10, 5))

color = 'tab:blue'
ax1.set_xlabel('Month-Year')
ax1.set_ylabel('No. of new EV Infra entries', color=color)
ax1.bar(entry_counts['year_month'], entry_counts['count'], color=color)
ax1.tick_params(axis='y', labelcolor=color)
ax1.set_xticklabels(entry_counts['year_month'], rotation=45)

ax2 = ax1.twinx()
color = 'tab:red'
ax2.set_ylabel('Average Price', color=color)
ax2.plot(average_prices['year_month'], average_prices['price_value'], marker='o', linestyle='-',
ax2.tick_params(axis='y', labelcolor=color)

fig.tight_layout()
plt.title('Number of new EV Infra entries and Average Price per month and year')
plt.show()
```



Conclusion

From the analysis, we can see that the fuel prices in France are not affecting the number of charging stations for electric vehicles. Although it may appear that at some point the trend is similar, the correlation between the fuel prices and the number of charging stations is very low. Therefore, we can conclude that the fuel prices are not affecting the number of charging stations in France.

Future Work and Limitations

It is important to note that correlation does not imply causation. Therefore, we cannot say that the fuel prices are affecting the number of charging stations in France. But we can say that there is a relationship between the two. Further research is needed to establish a causal relationship between the fuel prices and the number of charging stations in France.

In the future, we can try to analyze the relationship between the fuel prices and the number of charging stations in other countries as well. This will help us to understand if the relationship is the same in other countries as well. We can also try to extend the time frame from 2022 - 2024 to a longer period to see if the relationship holds over a longer period of time.