DEMAND AND SUPPLY ANALYSIS

The demand for a product or service is the quantity of that product or service the customers are willing to purchase at any given price during a particular period. And the supply for a product or service is the quantity the producers are willing to provide in the market at a particular price and a particular period.

Demand and Supply analysis means analyzing the relationship between the quantity demanded and the quantity supplied. It helps businesses understand the factors influencing consumer demand to maximize profits.

DEMAND AND SUPPLY ANALYSIS USING PYTHON

Importing the necessary Python libraries and the dataset

In [1]:
```
import pandas as pd
import plotly.express as px
import plotly.graph_objects as go
import plotly.io as pio
```

In [2]:
```
df = pd.read_csv("pysd.csv")
```

In [3]:
```
df.head(5)
```

Out[3]:

	Date	East Coast Production of Gasoline (Thousand Barrels per Day)	East Coast Production of Jet Fuel (Thousand Barrels per Day)	U.S. Production of Gasoline (Thousand Barrels per Day)	U.S. Gasoline Demand (Thousand Barrels per Day)	U.S. Production of Jet Fuel (Thousand Barrels per Day)
0	12/28/2018	3069	107	9533	8623	1897
1	12/21/2018	3332	92	10144	9348	1861
2	12/14/2018	3285	96	10334	9243	1849
3	12/07/2018	3289	94	10457	9036	1843
4	11/30/2018	3206	96	9666	8877	1725

Before moving forward, let's have a look if the dataset has null values or not :

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1329 entries, 0 to 1328
Data columns (total 6 columns):
 #   Column                                                Non-Null Count  Dtype 
---  ------                                                --------------  ----- 
 0   Date                                                  1329 non-null   object
 1   East Coast Production of Gasoline (Thousand Barrels per Day)  1329 non-null   int64 
 2   East Coast Production of Jet Fuel (Thousand Barrels per Day)  1329 non-null   int64 
 3   U.S. Production of Gasoline (Thousand Barrels per Day)  1329 non-null   int64 
 4   U.S. Gasoline Demand (Thousand Barrels per Day)       1329 non-null   int64 
 5   U.S. Production of Jet Fuel (Thousand Barrels per Day)  1329 non-null   int64 
dtypes: int64(5), object(1)
memory usage: 62.4+ KB
```

In [5]:
```
print(df.isnull().sum())
```

```
Date                                                  0
East Coast Production of Gasoline (Thousand Barrels per Day)    0
East Coast Production of Jet Fuel (Thousand Barrels per Day)    0
U.S. Production of Gasoline (Thousand Barrels per Day)          0
U.S. Gasoline Demand (Thousand Barrels per Day)                 0
U.S. Production of Jet Fuel (Thousand Barrels per Day)          0
dtype: int64
```

Now let's analyze the relationship between the U.S. Production of Gasoline and the U.S. Gasoline Demand:

In [6]:
```
# Demand and Supply Analysis
demand = df["U.S. Gasoline Demand (Thousand Barrels per Day)"]
supply = df["U.S. Production of Gasoline (Thousand Barrels per Day)"]

figure = px.scatter(df, x = "U.S. Gasoline Demand (Thousand Barrels per Day)",
                    y = "U.S. Production of Gasoline (Thousand Barrels per Day)", trendline="ols",
                    title="Demand and Supply Analysis")

figure.update_layout(
    xaxis_title="U.S. Production of Gasoline (Thousand Barrels per Day)",
    yaxis_title="U.S. Gasoline Demand (Thousand Barrels per Day)",
)

figure.show()
```

So there is a constant relationship between the U.S. Production of Gasoline and the U.S. Gasoline Demand

A constant relationship between the U.S. Production of Gasoline (Thousand Barrels per Day) and the U.S. Gasoline Demand (Thousand Barrels per Day) means that for every X number of Production, there is a consistent and predictable Y number of Demand, and this ratio remains constant over time.

Now let's calculate the elasticity of demand for rides concerning the number of active drivers per hour

In [7]:
```
# Calculate elasticity
avg_demand = df["U.S. Gasoline Demand (Thousand Barrels per Day)"].mean()
avg_supply = df["U.S. Production of Gasoline (Thousand Barrels per Day)"].mean()
pct_change_demand = (max(df["U.S. Gasoline Demand (Thousand Barrels per Day)"]) - min(df["U.S. Gasoline Demand (Thousa
pct_change_supply = (max(df["U.S. Production of Gasoline (Thousand Barrels per Day)"]) - min(df["U.S. Production of Ga
elasticity = pct_change_demand / pct_change_supply

print("Elasticity of demand with respect to the U.S. Production of Gasoline (Thousand Barrels per Day): {:.2f}".format
```

```
Elasticity of demand with respect to the U.S. Production of Gasoline (Thousand Barrels per Day): 0.89
```

It signifies a moderately responsive relationship between the Demand for Gasoline and the Production. Specifically, this means that a 1% increase in the U.S. Production of Gasoline would lead to a 0.89% decrease in the Demand, while a 1% decrease in the U.S. Production of Gasoline would lead to a 0.89% increase in the Demand.

This level of elasticity suggests that the U.S. Gasoline Demand is somewhat sensitive to changes in the

U.S. Production of Gasoline.

Now let's add a new column in the dataset by calculating the supply ratio:

In [8]:
```
# Calculate the supply ratio for each level of Gasoline activity
df['U.S. Gasoline Supply Ratio'] = round((df['U.S. Production of Gasoline (Thousand Barrels per Day)'] / df['U.S. Gaso
```

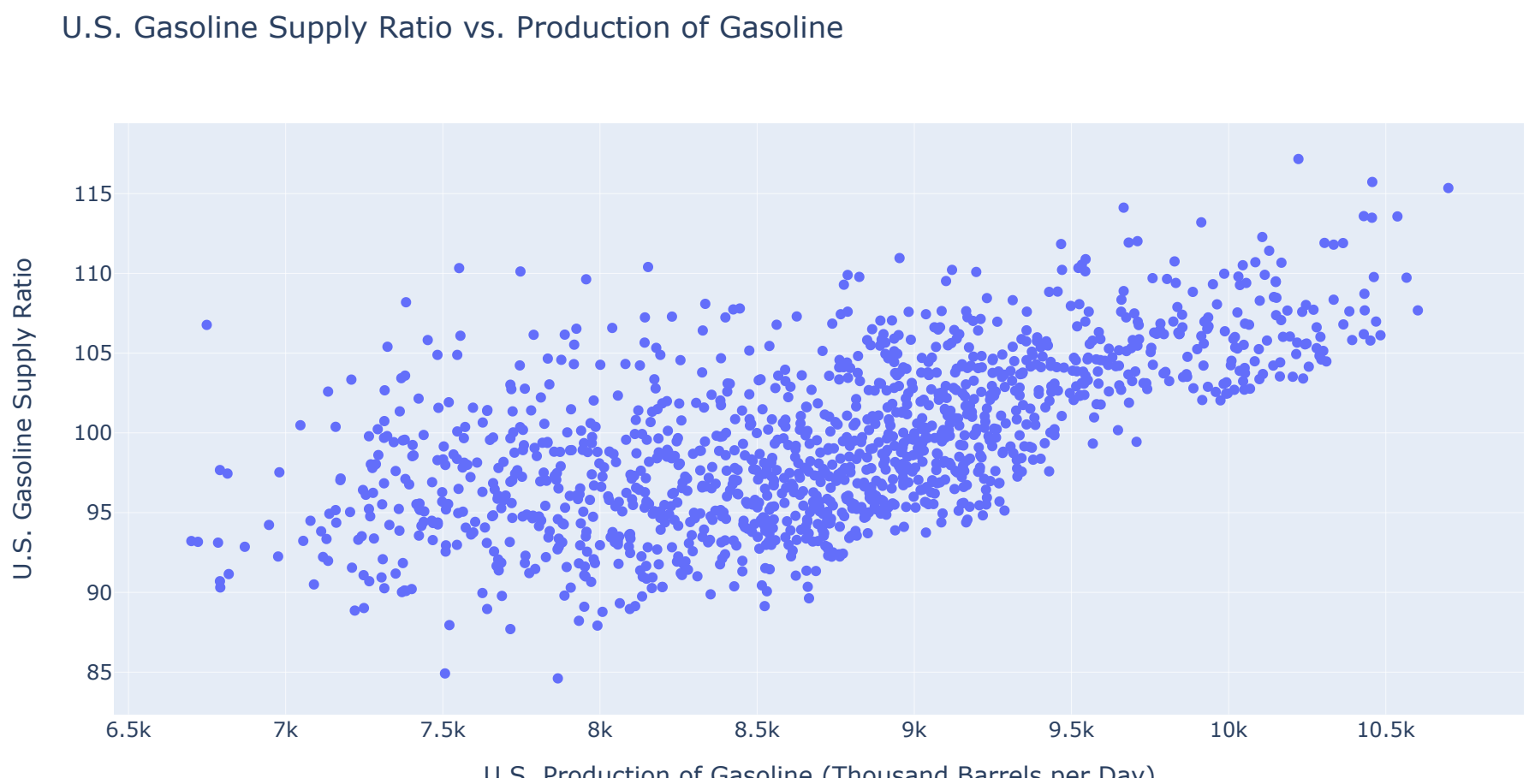
In [9]:
```
df.head(5)
```

Out[9]:

	Date	East Coast Production of Gasoline (Thousand Barrels per Day)	East Coast Production of Jet Fuel (Thousand Barrels per Day)	U.S. Production of Gasoline (Thousand Barrels per Day)	U.S. Gasoline Demand (Thousand Barrels per Day)	U.S. Production of Jet Fuel (Thousand Barrels per Day)	U.S. Gasoline Supply Ratio
0	12/28/2018	3069	107	9533	8623	1897	110.55
1	12/21/2018	3332	92	10144	9348	1861	108.52
2	12/14/2018	3285	96	10334	9243	1849	111.80
3	12/07/2018	3289	94	10457	9036	1843	115.73
4	11/30/2018	3206	96	9666	8877	1725	108.89

Now let's visualize the supply ratio:

In [10]:
```
fig = go.Figure()
fig.add_trace(go.Scatter(x=df['U.S. Production of Gasoline (Thousand Barrels per Day)'],
                         y=df['U.S. Gasoline Supply Ratio'], mode='markers'))
fig.update_layout(
    title='U.S. Gasoline Supply Ratio vs. Production of Gasoline',
    xaxis_title='U.S. Production of Gasoline (Thousand Barrels per Day)',
    yaxis_title='U.S. Gasoline Supply Ratio'
)
fig.show()
```



So this is how we can analyze demand and supply using the Python programming language.

Summary

Demand and Supply analysis means analyzing the relationship between the quantity demanded and the quantity supplied. It helps businesses understand the factors influencing consumer demand to maximize profits.