Pricing Transparency Risk Assessment: A Data-Driven Governance Analysis

Objective

To evaluate whether pricing patterns demonstrate transparency, consistency, and logical structure using historical flight data.

Governance Focus

This assessment analyzes pricing behavior to determine whether patterns are predictable, explainable, and aligned with governance principles of fairness, consistency, and oversight.

Governance Context

Pricing transparency is essential for financial oversight and vendor governance. Opaque or inconsistent pricing structures increase financial unpredictability and weaken cost monitoring controls.

This analysis tests:

Whether pricing increases logically as departure approaches.

Whether premium services (e.g., non-stop, business class) justify higher costs.

Whether volatility levels indicate inconsistent pricing behavior.

Whether pricing patterns align with transparent governance expectations.

In [1]:
```
import sys
print(sys.executable)
```

```
C:\Users\uzodi\anaconda3\envs\grc\python.exe
```

In [2]:
```
import pandas as pd
import numpy as np
```

In [3]:
```
import pandas as pd

# Load dataset
```

```
df = pd.read_csv("airlines_flights_data.csv")

# Group by days_left and calculate average price
price_by_days = df.groupby("days_left")["price"].mean().reset_index()

price_by_days.head()
```

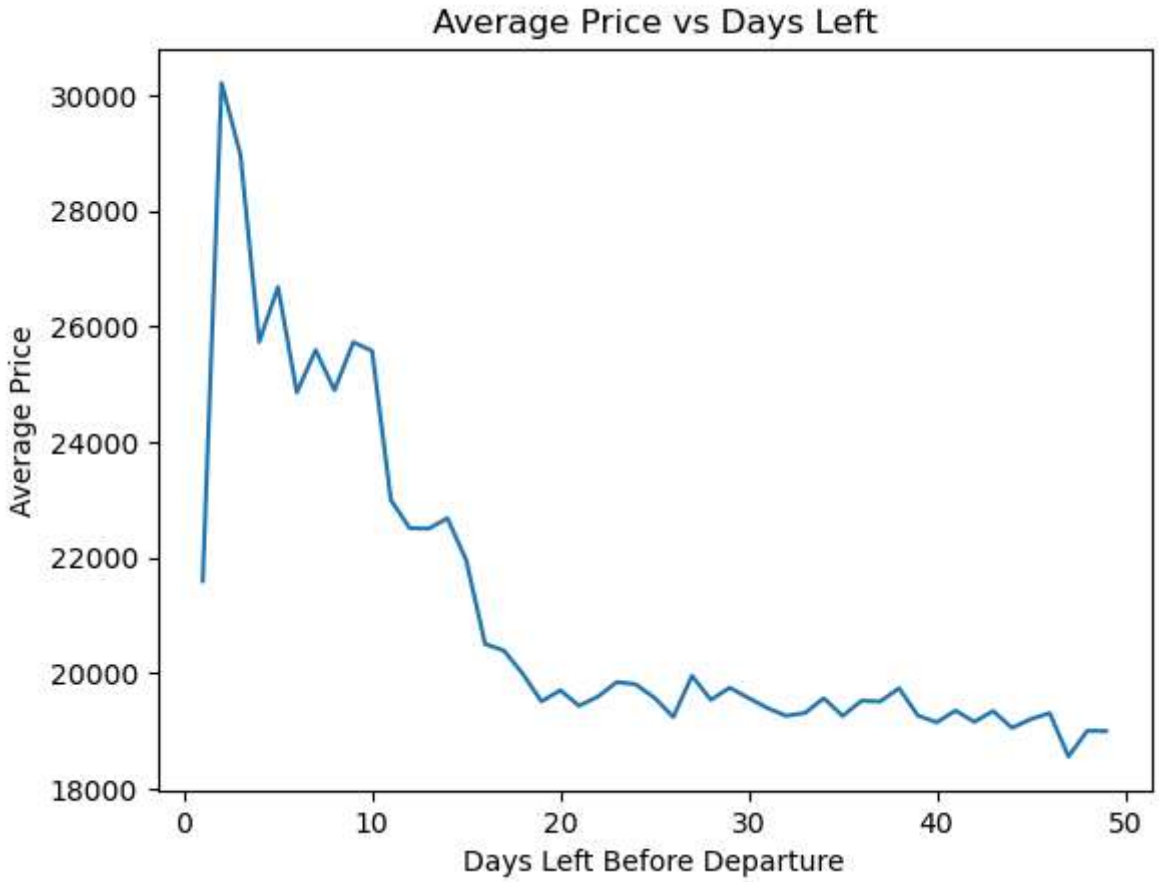
Out[3]:

	days_left	price
0	1	21591.867151
1	2	30211.299801
2	3	28976.083569
3	4	25730.905653
4	5	26679.773368

In [4]:

```
import matplotlib.pyplot as plt

plt.figure()
plt.plot(price_by_days["days_left"], price_by_days["price"])
plt.xlabel("Days Left Before Departure")
plt.ylabel("Average Price")
plt.title("Average Price vs Days Left")
plt.show()
```



While pricing demonstrates a general demand-aligned structure, volatility persists across all booking windows, with the highest unpredictability observed within 0–7 days. This indicates that pricing stability improves with earlier booking but does not eliminate variance entirely, suggesting moderate transparency risk.

In [5]:
```python
# Create booking window categories

def booking_window(days):
    if days <= 7:
        return "0-7 Days"
    elif days <= 21:
        return "8-21 Days"
    else:
        return "22+ Days"
```

```
df["booking_window"] = df["days_left"].apply(booking_window)

# Calculate volatility (standard deviation) by booking window
volatility = df.groupby("booking_window")["price"].agg(["mean", "std", "count"]).reset_index()

volatility
```

Out[5]:

	booking_window	mean	std	count
0	0-7 Days	26451.234827	23308.502665	32113
1	22+ Days	19386.316280	22683.030842	180084
2	8-21 Days	21937.109350	22119.981723	87956

While pricing demonstrates a general demand-aligned structure, volatility persists across all booking windows, with the highest unpredictability observed within 0–7 days. This indicates that pricing stability improves with earlier booking but does not eliminate variance entirely, suggesting moderate transparency risk.

In [6]:
```
class_analysis = df.groupby("class")["price"].agg(["mean", "std", "count"]).reset_index()

class_analysis
```

Out[6]:

	class	mean	std	count
0	Business	52540.081124	12969.314606	93487
1	Economy	6572.342383	3743.519517	206666

Business class consistently commands a significantly higher premium compared to economy class, indicating clear price differentiation aligned with service level. However, the magnitude of the premium suggests the need for further evaluation of proportionality and volatility behavior across classes.

That's balanced. Not accusatory. Analytical.

In [7]:
```
# Volatility comparison by class
class_volatility = df.groupby("class")["price"].std().reset_index()
```

```
class_volatility
```

Out[7]:

	class	price
0	Business	12969.314606
1	Economy	3743.519517

In [8]:
```
class_analysis["cv"] = class_analysis["std"] / class_analysis["mean"]
class_analysis
```

Out[8]:

	class	mean	std	count	cv
0	Business	52540.081124	12969.314606	93487	0.246846
1	Economy	6572.342383	3743.519517	206666	0.569587

Business pricing is expensive but relatively stable proportionally.

Economy pricing is cheaper but proportionally more unpredictable.

That suggests:

Pricing transparency risk is higher in economy class when evaluated relative to price level.

In [9]:
```
stops_analysis = df.groupby("stops")["price"].agg(["mean", "std", "count"]).reset_index()
stops_analysis
```

Out[9]:

	stops	mean	std	count
0	one	22900.992482	23626.066584	250863
1	two_or_more	14113.450775	17664.332033	13286
2	zero	9375.938535	10623.008293	36004

Non-stop flights (zero stops) are the cheapest on average.

That is counterintuitive.

Normally, we expect:

Non-stop > One stop > Two+ stops

Because:

Faster

More convenient

Higher demand

Premium service value

But here, the data shows:

One stop is most expensive. Non-stop is cheapest.

In [10]:
```
# Calculate price per hour
df["price_per_hour"] = df["price"] / df["duration"]

stops_duration_analysis = df.groupby("stops")["price_per_hour"].mean().reset_index()

stops_duration_analysis
```

Out[10]:

	stops	price_per_hour
0	one	1940.006586
1	two_or_more	1107.152330
2	zero	4210.259297

Although non-stop flights appeared cheaper in aggregate, normalization by flight duration reveals that non-stop flights command the highest price per hour. This suggests pricing aligns with time-efficiency value rather than raw ticket cost, reducing concerns of structural inconsistency.

Pricing Transparency Risk Rating

After reviewing how prices change over time, how they differ by service level, and how much they fluctuate, the overall pricing transparency risk is rated as Moderate.

Prices generally follow logical patterns based on demand and service type. However, prices become more unstable close to departure, and economy class shows higher relative fluctuations. These areas should be monitored regularly, but there is no evidence of major structural pricing issues.

In [ ]: