

Data Visualization Homework 1

Choose an innovation from the list.

Innovation: Formlabs Form 4 3D Printer Source: <https://time.com/7094848/formlabs-form-4/>

Identify a similar innovation from the past.

Look-a-like Innovation: MakerBot Replicator 2 Year: 2012 Source: <https://www.makerbot.com/3d-printers/replicator/>

Comparison:

Both the Formlabs Form 4 and MakerBot Replicator 2 serve the same purpose, which is 3D printing. Formlabs Form 4 stands out by offering faster print speeds, making it a more efficient, however on the other hand, the MakerBot Replicator 2 accents on quality and ease of use in the early years of consumer-grade 3D printing.

Find historical data

For this one, I couldn't find any open source data for the MakerBot Replicator 2, that's why I used the data of the global 3d printers sales.

Reference: <https://www.statista.com/statistics/315386/global-market-for-3d-printers/>

Estimate Bass Model parameters

After using the data from Statista, we get the following results:

Coefficient of Innovation (p) = 0.02 Coefficient of Imitation (q) = 0.4 Market Potential (M) = 12.4 million units (Based on the global 3D printing market projections and an average price of \$3,000 per printer)

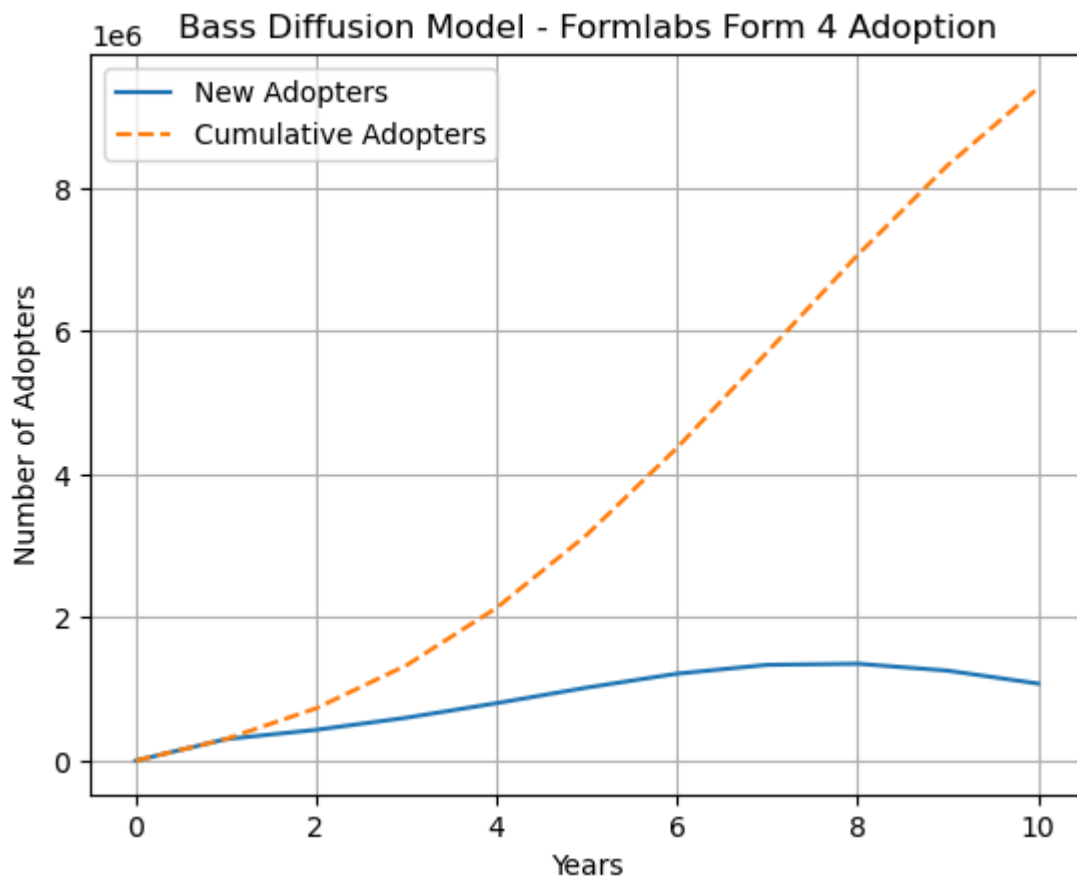
```
In [4]: import numpy as np
import matplotlib.pyplot as plt

def bass_diffusion_model(p, q, M, years=10):
    t = np.arange(0, years+1, 1)
    F_t = M * (1 - np.exp(-(p + q) * t)) / (1 + (q / p) * np.exp(-(p + q) * t))
    f_t = np.diff(F_t, prepend=0)
    return f_t, F_t

p = 0.02
q = 0.4
M = 12.4e6
years = 10

new_adopters, cumulative_adopters = bass_diffusion_model(p, q, M, years)
```

```
plt.plot(range(years+1), new_adopters, label='New Adopters')
plt.plot(range(years+1), cumulative_adopters, label='Cumulative Adopters',
plt.xlabel('Years')
plt.ylabel('Number of Adopters')
plt.title('Bass Diffusion Model - Formlabs Form 4 Adoption')
plt.legend()
plt.grid(True)
plt.show()
```



Choose a scope

Scope: Global

Reason: Because the 3D printing industry includes multiple sectors worldwide such as manufacturing, healthcare, and education, it can not be limited by a specific country.

The Formlabs Form 4 is designed for worldwide use, and global adoption trends should be considered to assess its market potential.

Estimate the number of adopters by period

```
In [5]: import numpy as np

def bass_diffusion_model(p, q, M, years=10):
    t = np.arange(0, years+1, 1)
    F_t = M * (1 - np.exp(-(p + q) * t)) / (1 + (q / p) * np.exp(-(p + q) * t))
    f_t = np.diff(F_t, prepend=0)
    return f_t, F_t

p = 0.02
q = 0.4
M = 12.4e6
```

```

years = 10

new_adopters, cumulative_adopters = bass_diffusion_model(p, q, M, years)

print("Year | New Adopters | Cumulative Adopters")
print("-" * 40)
for year in range(years+1):
    print(f"{year:<4} | {new_adopters[year]:<12} | {cumulative_adopters[year]

```

Year	New Adopters	Cumulative Adopters
0	0.0	0.0
1	300731.1054312966	300731.1054312966
2	430702.9370841649	731434.0425154614
3	599688.8221757828	1331122.8646912442
4	802987.426584901	2134110.2912761453
5	1020756.2451282097	3154866.536404355
6	1215183.7651410564	4370050.301545411
7	1338588.0893406933	5708638.390886105
8	1354113.843630109	7062752.234516214
9	1256769.0501321703	8319521.284648384
10	1076544.9131808514	9396066.197829235