Capital One Case: Deliverables

Team 3

July 10, 2024

Hypothesis

Introducing a new 20k credit line product will increase overall profitability and attract a higher number of Super Prime customers compared to the existing 10k credit line product, due to higher utilization rates and associated fees, despite potential risks and higher charge-off rates.

*****Qualitative Analysis is explained after the questions*****

Question Answers

- **QUESTION ONE: Is the current 10k product profitable?**
    a. **Yes**, the current $10,000 Product is indeed profitable, generating Capital One, on average, $27,000,000 per 100,000 accounts opened.
- **QUESTION 2A: What parts of the economics will change if we move from 10k to 20k lines?**
    a. If we move from 10k to 20k credit lines, the **profit is projected to almost double** when compared to the 10k credit line. This figure is predicted with even smaller utilization (40%) than the 10k's 50%.
- **QUESTION 2B: What would the utilization need to be with the 20k line product in order to make the same amount of profit as the 10k line profit, assuming everything else stays the same?**
    a. Checking with the profit calculator, half the utilization of the 10k's utilization **(25%)** would reach an equilibrium with 20k's profits.
- **QUESTION 3A: Initial testing is showing that for the 20k line, balance is coming in at $8000, would you recommend launching the 20k Product?**
    a. A final balance of $8000, would bring out **utilization to 40%** for the 20k product. Even with this, the profit is ~88.89% higher! With this discovered, we would launch this product.
- **QUESTION 3B: How many more accounts would we need from the 20k like product to make the same amount of profit as the 10k product?**
    a. To make the 20k product make the same amount of profit as the 10k product, at 40% utilization, we would need at least 52,942 accounts or **47058 less accounts**.

Quantitative Analysis

The model: For this section of the project we performed arithmetic on paper, and transformed it into python code as a function that could easily take different products as input and tell you the profitability based on the given parameters.

$IR = Annual\ Interest\ Rate$ $CL = Credit\ Line$ $Util = Utilization$ $F = Annual\ Fee$

$AC = Annual\ Cost$ $FC = Funding\ Cost$ $CO = Charge\ Off$ $B = Bookings$

1. **CALCULATE REVENUE**

   $$Interest\ Revenue\ per\ Account = (CL \times Util \times IR) + F$$

   $$\approx \$540\ /\ ACCOUNT$$

2. **CALCULATE LOSS**

   $$Delinquent\ Accounts = CO \times B$$

   $$Delinquent\ Loss\ (DL) = Delinquent\ Accounts \times Remaining\ Balance$$

   $$Annual\ Cost = AC$$

   $$Funding\ Cost = Util \times FC$$

   $$Loss = DL + (AC \times FC \times CL \times Util)$$

   $$Loss = Loss \times B$$

   $$\approx \$270$$

3. **CALCULATE PROFIT**

   $$Profit = B(Revenue - Loss)$$

   $$\approx \$12,000,000$$

This approach has been used to calculate the profit of the credit line given certain parameters. This has been translated into the Calculate() function in Python which takes nine parameters.

The Code:

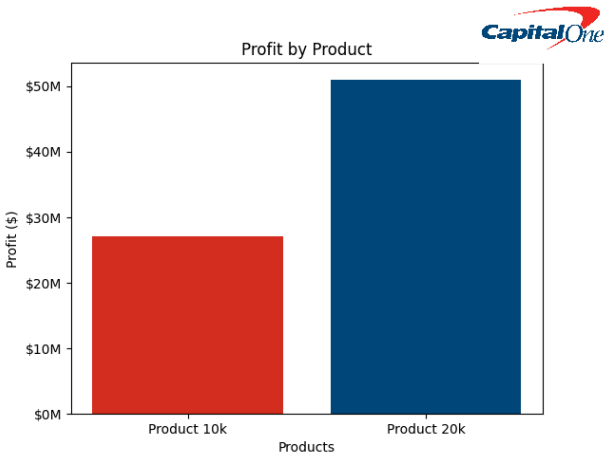
```
import urllib.request
import matplotlib.pyplot as plt
from matplotlib.ticker import FuncFormatter
from matplotlib.offsetbox import OffsetImage, AnnotationBbox
from io import BytesIO

# Fetch image from URL with user-agent header
def fetch_image_from_url(url):
    headers = {'User-Agent': 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like
Gecko) Chrome/58.0.3029.110 Safari/537.3'}
    request = urllib.request.Request(url, headers=headers)
    with urllib.request.urlopen(request) as response:
```

```
        image_data = response.read()
    return image_data

# URL of the image
image_url = 'https://1000logos.net/wp-content/uploads/2018/11/Capital-One-Logo.jpg'

# Fetch and open the image
image_data = fetch_image_from_url(image_url)

# Open image using matplotlib
image = plt.imread(BytesIO(image_data), format = 'jpg')

# Ensure the image is properly resized for better fit
imagebox = OffsetImage(image, zoom=0.025)

# Interest Revenue
def calculate(product):
    # Extracting values from the dictionary
    creditLine = product["creditLine"]
    utilization = product["utilization"]
    interestRate = product["interestRate"]
    annualFee = product["annualFee"]
    annualOpsCost = product["annualOpsCost"]
    fundingCost = product["fundingCost"]
    chargeOff = product["chargeOff"]
    bookings = product["bookings"]
    remainingBalance = product["remainingBalance"]

    # Revenue
    revenuePerAccount = creditLine * utilization * interestRate # Credit Line * Utilization * Annual
Interest Rate
    revenuePerAccount += annualFee # Add Annual Fee
    totalRevenue = revenuePerAccount * bookings # Multiply by Annual Bookings

    # Loss
    numberOfCustomersWhoArentPaying = chargeOff * bookings # Number of customers who don't pay
    loss = numberOfCustomersWhoArentPaying * remainingBalance # Loss from customers who don't pay their
balance
    loss += fundingCost * utilization * creditLine * bookings # Funding Cost = Funding Cost Rate *
Utilization * Credit Line * Bookings
    loss += annualOpsCost * bookings # Add Annual Ops Cost

    # Profit
    profit = totalRevenue - loss # Profit = Total Revenue - Total Loss
    return profit

def millions(x, pos):
    'The two args are the value and tick position'
    return '$%1.0fM' % (x * 1e-6)

def printProduct(product):
    pro = calculate(product)
    formatted_pro = '{:,}'.format(int(pro))
    print(f"Product {product['name']} profit: ${formatted_pro}")
    return pro

# Calculation for a 10k product
product_10k = {
    "creditLine": 10000,
```

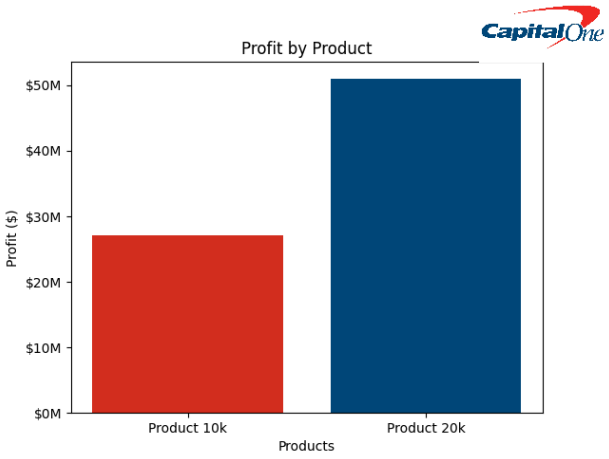
```
    "utilization": 0.50,
    "interestRate": 0.10,
    "annualFee": 40,
    "annualOpsCost": 20,
    "fundingCost": 0.02,
    "chargeOff": 0.03,
    "bookings": 100000,
    "remainingBalance": 5000,
    "name" : "10k"
}

# Calculation for a 20k product
product_20k = {
    "creditLine": 20000,
    "utilization": 0.40,
    "interestRate": 0.10,
    "annualFee": 40,
    "annualOpsCost": 20,
    "fundingCost": 0.02,
    "chargeOff": 0.03,
    "bookings": 52942,
    "remainingBalance": 5000,
    "name" : "20k"
}

# 10k
pro10k = printProduct(product_10k)

# 20k
pro20k = printProduct(product_20k)

# Plot data
colors = ['#D22E1E', '#004878']
plt.bar(("Product 10k", "Product 20k"), (pro10k, pro20k), color = colors)

# Set y-axis to start at 0
plt.ylim(bottom=0)

# Add labels and title
plt.xlabel('Products')
plt.ylabel('Profit ($)')
plt.title('Profit by Product')

# Format the y-axis to show dollar amounts in millions
formatter = FuncFormatter(millions)
plt.gca().yaxis.set_major_formatter(formatter)

# Add logo image to the plot
ab = AnnotationBbox(imagebox, (1, 1.1), frameon=False,
                    xycoords='axes fraction', boxcoords="axes fraction",
                    pad=0.0)

plt.gca().add_artist(ab)

# Display the graph
plt.show()

# %%
```

Questions Supporting Evidence:

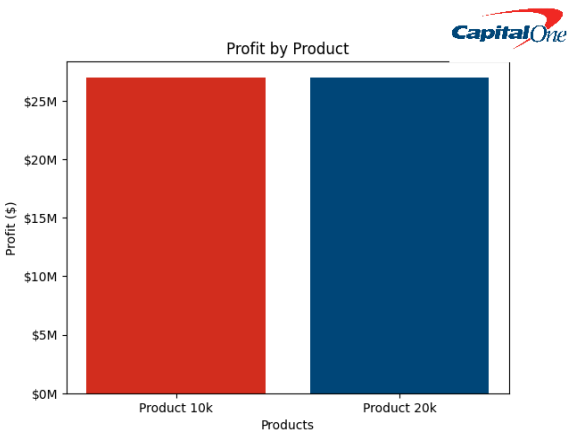
- **QUESTION ONE: Is the current 10k product profitable?**



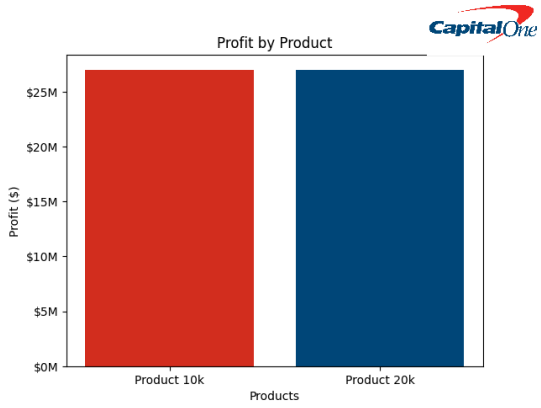
- **QUESTION 2A: What parts of the economics will change if we move from 10k to 20k lines?**



- **QUESTION 2B: What would the utilization need to be with the 20k line product in order to make the same amount of profit as the 10k line profit, assuming everything else stays the same?**

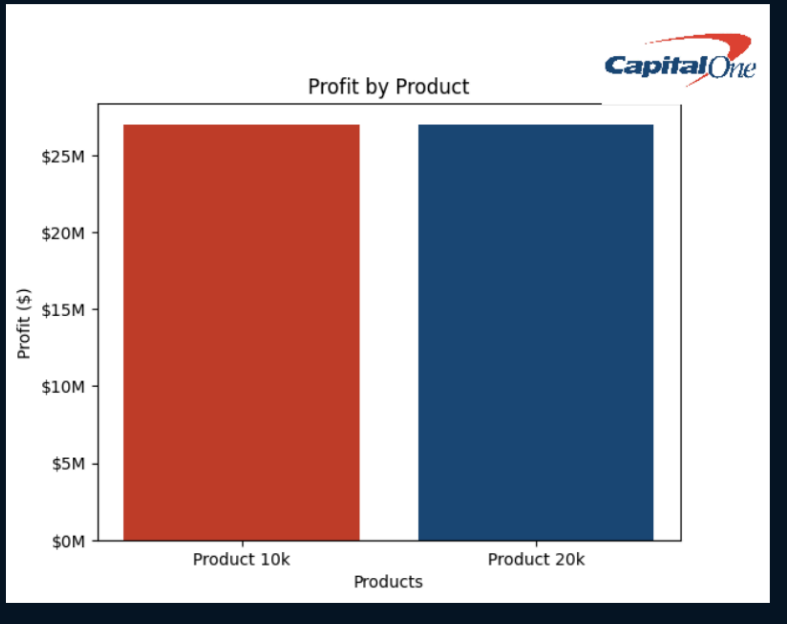


- **QUESTION 3A: Initial testing is showing that for the 20k line, balance is coming in at $8000, would you recommend launching the 20k Product?**



- **QUESTION 3B: How many more accounts would we need from the 20k like product to make the same amount of profit as the 10k product?**

```
Product 10k profit: $27,000,000
Product 20k profit: $27,000,420
```



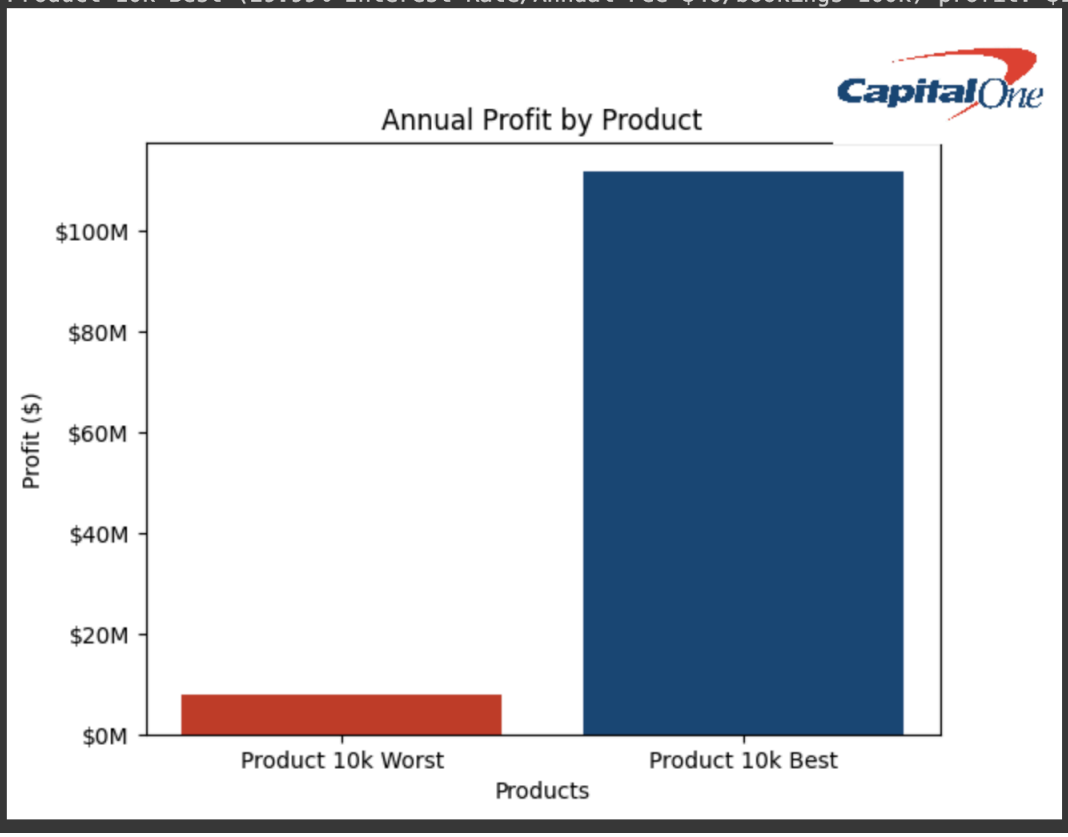
Product1 - $10k currently $12M profit:

1. *No annual fee? - Profit = $8m*
    a. Overall, 16.3 percent of cards have an annual fee. Meanwhile, credit card swipe fees totaled $126.4 billion in 2022, more than doubling from $51.5 billion a decade earlier, according to the Nilson Report. With debit cards included, swipe fees totaled $160.7 billion in 2022, up from $66.5 billion 10 years earlier.
2. *Rewards-*
    a. The average credit card interest rate is over 20%, so interest charges alone will take up a large chunk of your payments.
3. *Cash back options*
4. *Authorized user*

Product2 - $20k currently $12M profit:

Product3 - New product? Profit?:

```
Product 10k Worst (10% Interest Rate/Annual Fee $0/bookings 100k) profit: $8,000,000
Product 10k Best (29.99% Interest Rate/Annual Fee $40/bookings 100k) profit: $111,950,000
```



```
Product 20k Worst (10% Interest Rate/Annual Fee $40/bookings 100k) profit: $6,000,000
Product 20k Best (29.99% Interest Rate/Annual Fee $0/bookings 100k) profit: $81,920,000
```