Class 2: Marketing Profitability Analysis

Dr. Wei Miao

UCL School of Management

October 1, 2025

Section 1

Overview

Learning Objectives

- How to conduct break-even analysis for a marketing campaign
- How to conduct net present value analysis for a marketing campaign
- Practise R basic calculations and vector operations in the case study

Section 2

Break-Even Analysis

Decisions for Data Scientists

- The ultimate goal of marketing (and other business activities) is to create value for and improve the profitability of firms.
- As any marketing activity comes with a cost, data analysts need to correctly evaluate whether a campaign creates or destroys value for the company.
- Such analyses are called *cost-benefit analyses*, sometimes referred to as *profitability analysis* or *break-even analysis*.

Break-Even Quantity

- To evaluate the financial feasibility of a marketing campaign, we use break-even analyses. A key metric in marketing is the **break-even quantity**.
- Break-even quantity is particularly useful when:
  - Evaluating short-term marketing campaigns with fixed costs
  - Comparing different marketing initiatives with similar time horizons
  - Making quick go/no-go decisions for promotional activities
  - Assessing campaigns where the primary goal is incremental sales volume

Definition

The break-even quantity (BEQ) calculates the number of ***incremental*** units the firm needs to sell to cover the cost of the marketing campaign.

- The intuition behind BEQ is that, if the company sells less than the BEQ, it will lose money. If the company sells more than the BEQ, it will make money. The BEQ is the minimum quantity that the company needs to sell to cover the cost of the marketing campaign.

Compute BEQ: Contribution Margin

- The difference between the **price per unit** and **variable costs per unit** is defined as the **contribution margin per unit**. That is,

Definition

Contribution Margin Per Unit = Price Per Unit - Variable Costs Per Unit

- **Price per unit**: retail price customers pay
- **Variable costs per unit:** Cost of Goods Sold (COGS)[1] + any other variable costs per unit

[1] Material and production labour costs for producing a unit of product, often represented in **percentage terms,** e.g., a COGS of 60% means the costs are 60% of retail prices. An iPhone with a retail price of £1,000 and a COGS of 30% means the COGS is £300.

Compute BEQ: Formula

This gives the formula for BEQ:

Definition

BEQ = Marketing Expenditure / Contribution Margin Per Unit

Break-Even Quantity: Steps and Decision Rule

- Steps to conduct break-even analysis
  - *Step 1*: Compute the BEQ based on the product's price and cost structure. This is the minimum quantity the company needs to sell to cover the costs of the marketing campaign.
  - *Step 2*: Evaluate whether the campaign can generate an incremental quantity larger than the BEQ
- The decision rule
  - If the incremental sales quantity $>$ BEQ, the company makes a profit, so the campaign should be accepted; otherwise, it should be rejected.

Section 3

Case Study: Profitability Analysis for Apple Inc

Background



Tom, a senior marketing manager at Apple UK, is looking to launch a series of marketing campaigns to promote the just-released iPhone 17 series. Tom is a proud graduate of the UCL MSc BA programme in 2020. He remembers from the Marketing Analytics module that break-even analysis helps to evaluate different types of marketing decisions.

Case objectives:

- Practise situation analysis and compare with Uber's case
- Practise how to conduct break-even analyses for a marketing campaign
- Practise R basic computations and vector operations

Apple Inc: Key Information

From the case: The marketing analytics team at Apple Inc had applied sales forecasting models to historical sales data and predicted that sales this year would reach **10** million units at the retail price of **£799**, without any additional marketing activities. The team had also collected information on the Cost of Goods Sold of the Apple 17, which is **47%**. The Research and Development (R&D) costs for the iPhone 17 are **100** million pounds.

- Open the .qmd answer sheet downloaded from Moodle for Week 1, and let's solve this case using the R basics we have learned!
- **Question 1 (after class):** Conduct a 5C analysis for Apple Inc. and compare it with Uber's case.

Apple Inc: BEA Question 2

- **Question 2:** Compute the contribution margin
  - Do we need to consider R&D costs?

Sunk Costs and Sunk Costs Fallacy

- **Sunk costs** are costs that have already been incurred in the past and cannot be recovered. They should **not** be considered when making decisions.
- However, behavioural economics research shows that people often fall victim to the **sunk cost fallacy**, where they consider sunk costs in their decision-making instead of focusing on future costs and benefits.
- When making decisions, you should focus only on future costs and benefits. In our case, the R&D costs are sunk costs and should not be considered in the break-even analysis.

Apple Inc: BEA Question 3

- **Question 3**: Based on the information at hand, should Tom approve the influencer marketing plan?

Section 4

Net Present Value

Definition of NPV

- When the effect of the marketing campaign is expected to have a long-term effect or **when the time value of money is an important consideration**, we need to take the future into account.

Definition

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time.

Formula of NPV

$$NPV = -I_0 + \frac{CF_1}{(1+k)} + \frac{CF_2}{(1+k)^2} + \cdots + \frac{CF_n}{(1+k)^n}$$

- I_0 is the initial marketing investment/expense
- CF_n is the **incremental** profit in period n: it must be the additional profit generated by the marketing campaign
- k (sometimes r or i) is the discount rate, which reflects the value of time: £1 today is worth $£1 * (1+k)$ in the next period.
- The decision rule
  - If NPV > 0, the marketing campaign adds value to the company, so it should be accepted.
  - If NPV < 0, the marketing campaign will decrease the company's value, so it should be rejected.

Apple Inc: NPV Influencer Marketing I

Question 4: Based on the information at hand, should Tom approve the influencer marketing plan based on the Net Present Value method?

1. Compute the sequence of monthly cash flows
   - Generate a sequence of incremental sales for 12 months (a vector with 12 elements)
     - Hint: use `rep()`, `c()`, and vector element-wise multiplication

The resulting monthly CFs are: 12.7041, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694, 8.4694

Apple Inc: NPV Influencer Marketing II

2. Compute the sequence of discount factors
   - Generate a sequence of WACC for 12 months (a vector with 12 elements)
   - Generate a sequence of discount rate for 12 months (a vector with 12 elements)
     - Hint: use `seq()` to generate geometric sequence with patterns

The resulting monthly discount factors are: 0.9917355, 0.9835394, 0.975411, 0.9673497, 0.9593551, 0.9514265, 0.9435635, 0.9357654, 0.9280319, 0.9203622, 0.9127559, 0.9052124

Apple Inc: NPV Influencer Marketing III

3. Compute the NPV
   - Generate a sequence of discounted CFs for 12 months
   - Sum up all discounted CFs across the 12 months using `sum()`
   - Subtract endorsement fee from the sum to get NPV

- The NPV is 0.5349641

After-class

- Review the coding practice from today's class and ensure you understand how to calculate NPV in R. Complete the R coding exercise for Week 1, and feel free to bring any questions to next week's class.