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& Business Strategy

Chapter 1
The Fundamentals of Managerial Economics

McGraw-Hill/Irwin
Michael R. Baye, Managerial Economics and Business Strategy

Time Value of Money

- Rs 1 today is worth more than Rs 1 received in the future
- Opportunity cost (OC) of money received in future: forgone interest that could be earned if Rs 1 was received today
- PV of an amount received in the future is the amount that **would have to be invested today at the prevailing interest rate** to generate the given future value.

Formula (Present Value). The present value (PV) of a future value (FV) received n years in the future is

$$PV = \frac{FV}{(1+i)^n} \qquad (1\text{-}1)$$

where i is the rate of interest.

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Present Value Analysis

- Higher the interest rate, the lower the present value of a future amount

$$PV = \frac{FV_1}{(1+i)^1} + \frac{FV_2}{(1+i)^2} + \frac{FV_3}{(1+i)^3} + \cdots + \frac{FV_n}{(1+i)^n}$$

Formula (Present Value of a Stream). When the interest rate is i, the present value of a stream of future payments of $FV_1, FV_2, \ldots, FV_n$ is

$$PV = \sum_{t=1}^{n} \frac{FV_t}{(1+i)^t}$$

- PV of a future payment : difference between the future value (FV) and the opportunity cost of waiting (OCW): PV = FV – OCW ➔ PV < FV as long as OCW > 0

- Higher the interest rate, lower the PV needed to generate the same FV in future.

- Net present value (NPV) of a project is simply the present value (PVt) of the income stream generated by the project minus the current cost (C0) of the project: NPV = PVt - C0.

Present Value of Indefinitely Lived Assets

$$PV_{Asset} = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \cdots$$

- Sum1: the value of a perpetual bond that pays the owner Rs 1000 at the end of each year when the interest rate is fixed at 5 percent is given by?

Value of a firm

- Value of a firm is the present value of the stream of profits (cash flows) generated by the firm's physical, human, and intangible assets including its current profit

$$PV_{Firm} = \pi_0 + \frac{\pi_1}{(1+i)} + \frac{\pi_2}{(1+i)^2} + \frac{\pi_3}{(1+i)^3} + \cdots$$

Marginal (Incremental) Analysis

- Control Variable Examples:
  - Output
  - Price
  - Product Quality
  - Advertising
  - R&D
- Basic Managerial Question: How much of the control variable should be used?
- Firm solves this by finding out the level of control variable that maximizes net benefits. This optimal Y is denoted as **Y***
- Net benefits are maximized when, the marginal change in total benefits (*MB*) equals the marginal change in total costs (*MC*).
- So we have to study when we increase the control variable by a small amount, how the benefits and costs increase . In discrete case, we consider increasing the control variable Y by 1 unit. In continuous variable case, we consider increasing the control variable Y by an infinitesimally small amount denoted by ΔY or dY

Net Benefits

- Net Benefits = Total Benefits (B) - Total Costs (C)
- Benefits vary with Y | B is a function of Y B(Y)
- Costs vary with Y | C is a function of Y C(Y)
- Objective of manager: Maximize net benefits by choosing optimum Y
- N(Y) = B(Y) – C(Y)
- Suppose we increase Y by ΔY unit, then B increases by ΔB and C increases by ΔC
- When $\Delta B > \Delta$C, it pays to increase Y, since NB will increase
- When ΔB < ΔC, it pays to decrease Y, since NB will now decrease if Y is increased
- So max is at ΔB = ΔC or MB = MC

Marginal Benefit (MB)

- Change in total benefits arising from a change in the control variable, Q:

$$MB = \frac{\Delta B}{\Delta Q}$$

- This is the Slope (calculus derivative) of the total benefit curve.

Marginal Cost (MC)

- Change in total costs arising from a change in the control variable, Q:

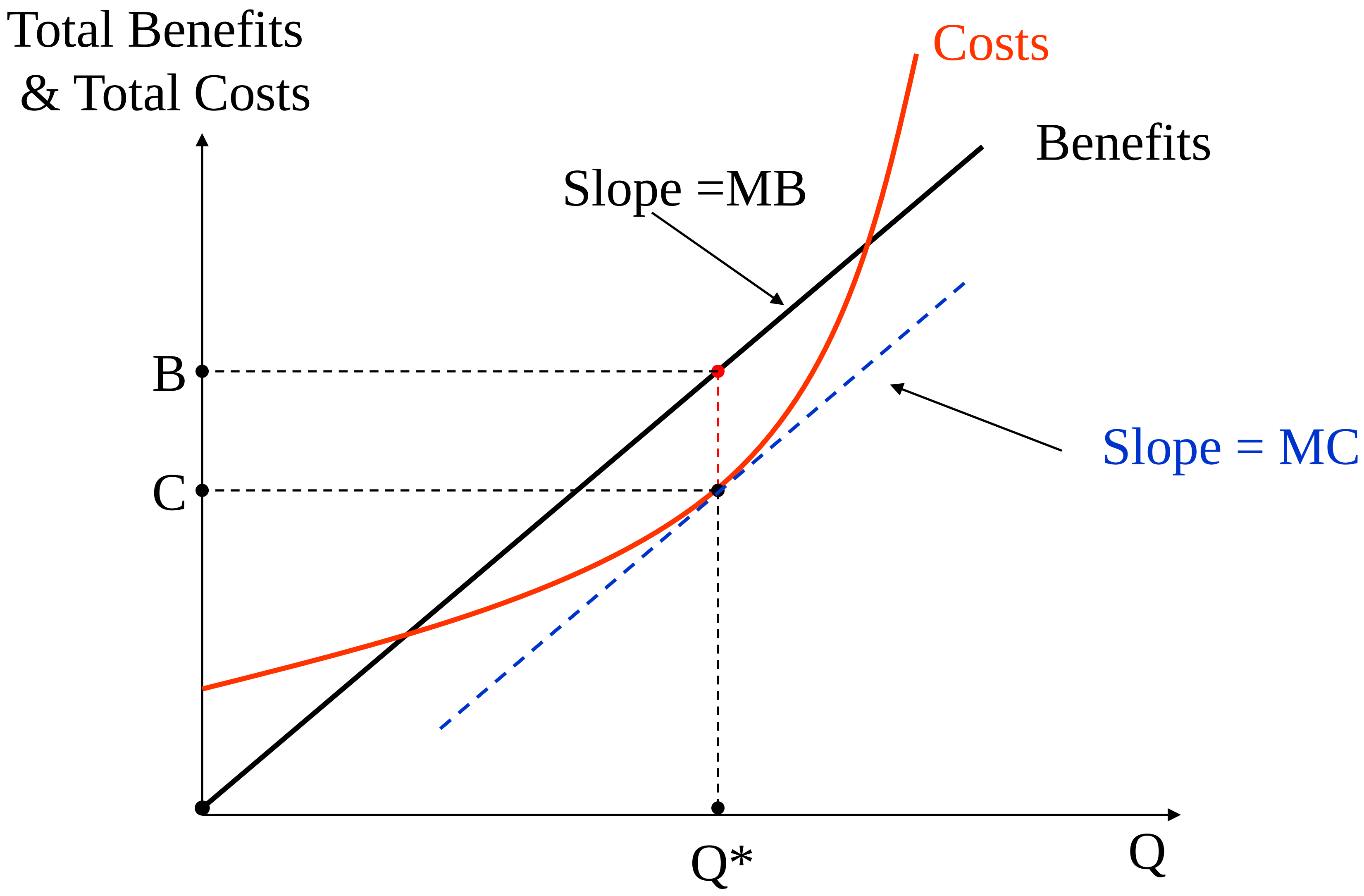
$$MC = \frac{\Delta C}{\Delta Q}$$

- Slope (calculus derivative) of the total cost curve

Marginal Principle

- To maximize net benefits, the managerial control variable should be increased up to the point where $MB = MC$.
- $MB > MC$ means the last unit of the control variable increased benefits more than it increased costs.
- $MB < MC$ means the last unit of the control variable increased costs more than it increased benefits.
- Sum

The Geometry of Optimization: Total Benefit and Cost



The Geometry of Optimization: Net Benefits