Mathematical Model

Parameters

- N: Number of different shares (constant)

- $Bought_i$: Amount of each share i initially bought, for $i = 1, 2, \ldots, N$

- $BuyPrice_i$: Purchase price of each share i, for $i = 1, 2, \ldots, N$

- $CurrentPrice_i$: Current market price of each share i, for $i = 1, 2, \ldots, N$

- $FuturePrice_i$: Expected future market price of each share i, for $i = 1, 2, \ldots, N$

- $TransactionRate$: Transaction cost rate per share sold (constant)

- $TaxRate$: Capital gains tax rate on the profit from selling shares (constant)

- K: Amount of money the investor needs to raise (constant)

Decision Variables

- x_i: Number of shares i sold, for $i = 1, 2, \ldots, N$

Objective Function

Maximize the expected value of the investor's portfolio next year:

$$\text{Maximize} \quad \sum_{i=1}^{N} (Bought_i - x_i) \cdot FuturePrice_i$$

Constraints

$$x_i \geq 0 \quad \text{for } i = 1, 2, \ldots, N \quad \text{(Non-negativity constraint)} \tag{1}$$
$$x_i \leq Bought_i \quad \text{for } i = 1, 2, \ldots, N \quad \text{(Cannot sell more than bought)} \tag{2}$$
$$\sum_{i=1}^{N} [x_i \cdot CurrentPrice_i - x_i \cdot (CurrentPrice_i - BuyPrice_i) \cdot TaxRate - x_i \cdot CurrentPrice_i \cdot Transactio$$
$$\tag{3}$$