Bank Loan Allocation Optimization

Problem Statement

A bank wants to distribute its funds among three types of loans to maximize total interest earnings while ensuring financial stability through certain constraints.

Decision Variables

Let:

- x_1 = Amount allocated to Home Loans (in million $)

- x_2 = Amount allocated to Car Loans (in million $)

- x_3 = Amount allocated to Business Loans (in million $)

Objective Function (Maximize Profit)

The bank earns different interest rates for each type of loan. The goal is to maximize total profit (Z):

$$Z = 2.9x_1 + 1.9x_2 + 2.5x_3$$

Where:

- 2.9% = Interest rate for Home Loans

- 1.9% = Interest rate for Car Loans

- 2.5% = Interest rate for Business Loans

Constraints

1. Risk Control

Since business loans are riskier than car loans, the bank imposes the following condition:

$3x_2 - x_3 >= 81$

2. Loan Distribution Limit

The total money allocated to Home and Car Loans cannot exceed $89M:

$x_1 + x_2 <= 89$

3. Total Loan Allocation

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The total loan amount (for all three loan types combined) should not exceed $400M:

$3x_1 + 2x_2 + 3x_3 <= 400$

4. Non-Negativity Constraint

Loan amounts cannot be negative:

$x_1, x_2, x_3 >= 0$

Conclusion

This model helps the bank maximize its interest earnings while ensuring that risk remains under control and loan distribution constraints are met effectively.