# Financial Forecasting – Recursive with Memoization

## 1. Understand Recursive Algorithms

Recursion is a programming technique where a method calls itself to solve a problem. It simplifies problems by breaking them into smaller parts. Recursive calls continue until a base case is reached, which stops further calls.

Advantages of Recursion:

* Simpler and often more readable code.

Disadvantages of Recursion:

* Higher memory usage due to call stack.
* May perform redundant computations if not optimized.

## 2. Setup

We implement a method to calculate the future value of an investment using a recursive approach. The formula used is:

Future Value = Present Value × (1 + growth rate) ^ years

Recursive breakdown:  
- Base Case: If years = 0, return present value.  
- Recursive Case: Multiply current value by (1 + growth rate) and reduce years by 1.

## 3. Implementation

The Java implementation of the recursive method to predict future values based on past growth rates

## 4. Analysis

• Time Complexity: O(n) – One recursive call per year.  
• Space Complexity: O(n) – For the recursion stack and memoization map.

Optimization: Memoization is used to store previously calculated results in a HashMap, reducing redundant calculations and improving performance, especially for larger inputs.