**Exercise 7: Financial Forecasting**

**Scenario:**

You are developing a financial forecasting tool that predicts future values based on past data.

**Step 1: Understand Recursive Algorithms**

**Concept of Recursion:** Recursion is a method of solving a problem where the solution depends on solutions to smaller instances of the same problem. A recursive function calls itself with a smaller or simpler input. It consists of two main parts:

1. **Base Case:** The condition under which the recursion stops.
2. **Recursive Case:** The part of the function where the function calls itself with a smaller or simpler input.

Recursion can simplify problems that have a natural recursive structure, like tree traversals, factorial calculation, Fibonacci sequence, etc. It can lead to elegant and concise code, but it may also cause excessive computation or memory usage if not implemented carefully.

**Step 2: Setup**

**Method to Calculate Future Value Using Recursion:**

Suppose we want to predict the future value of an investment given an initial value, a growth rate, and a number of periods. We can define a recursive function to calculate this.

**Analysis**

**Time Complexity:** The time complexity of this recursive algorithm is O(n), where n is the number of periods. This is because each recursive call processes one period until the base case is reached.

**Optimizing the Recursive Solution:** To avoid excessive computation, especially in cases where overlapping subproblems occur, we can use memoization or an iterative approach. Memoization involves storing the results of expensive function calls and reusing them when the same inputs occur again.