**Exercise 7: Financial Forecasting**

**Concept of Recursion:**

* **Definition:** Recursion is a technique where a function calls itself to solve a smaller instance of the same problem. It is particularly useful for problems that can be broken down into simpler, repetitive sub-problems.
* **Base Case and Recursive Case:** A recursive function has a base case, which stops the recursion, and a recursive case, which continues the recursion.
* **Simplification:** Recursion can simplify the code for problems that have a natural hierarchical or repetitive structure, such as factorial calculation, Fibonacci sequence, and tree traversal.

**Creating a Method to Calculate Future Value Using a Recursive Approach:**

* Let's assume we have a yearly growth rate and want to predict the future value based on this growth rate. The formula for future value can be simplified recursively as: Future Value(n)=Present Value × (1+Growth Rate)n
* We can break this into: Future Value(n) = (1+Growth Rate) ×Future Value(n−1) where n is the number of years into the future.

**Time Complexity:**

* **Time Complexity:** O(n)
  + **Explanation:** The recursive function calls itself once for each year, resulting in n recursive calls. Therefore, the time complexity is linear with respect to the number of years.

**Optimizing the Recursive Solution:**

* **Memoization:** Store the results of sub-problems to avoid redundant calculations. This technique involves caching the results of previous calculations and reusing them when needed.
* **Iterative Approach:** Convert the recursive solution to an iterative one, which typically reduces the overhead associated with recursive calls and stack usage.