Financial Forecasting

- Concept of Recursion:

Definition: Recursion is a process in which a function calls itself directly or indirectly to solve a problem.

Base Case and Recursive Case: A recursive function has a base case that terminates the recursion and one or more recursive cases that reduce the problem towards the base case.

Simplification: Recursion can simplify the solution to problems that have repetitive, nested, or self-similar structures, such as tree traversals, factorial calculation, and the Fibonacci sequence.

- Time Complexity:

Time Complexity of Recursive Algorithm: The time complexity is $O(n)$, where n is the number of years. This is because each recursive call reduces the number of years by one until the base case is reached, resulting in n recursive calls.

- Optimizing the Recursive Solution:

Memoization: By storing the results of intermediate calculations in a map, the algorithm avoids recalculating the future value for the same number of years. This reduces the number of recursive calls and improves the time complexity to $O(n)$ with a reduced constant factor.

Space Complexity: The space complexity increases to $O(n)$ due to the storage required for the memoization map, but this is a reasonable trade-off for the improved performance.