

## Exercise 7: Financial Forecasting

### Scenario:

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

### Solution:

#### Understanding Recursive Algorithms:

Recursion is a method which utilizes a function that calls itself to solve smaller instance of the problem until it reaches the base case, thus breaking down complex problems into subproblems. Solving recursive problems provide a beautiful simplicity and closely reflects the mathematical formulation which makes them useful for problems such as financial forecasting because these are recursive computations that are repeated many times.

### Analysis:

#### Time Complexity:

The time complexity is  $O(n)$ , where  $n$  is the number of years, since the function is recursively called  $n$  times.

#### Optimization:

Recursion can result in stack overflow or re-computation for large input. In order to optimize:

=>Utilizes Memoization to store intermediate results.

=>Or depending on the problem and cost of recursion, an iterative approach could be advantageous as it would remove the stack overhead.

### Conclusion:

Recursive algorithms provide a clear, inherent path for solving problems, such as financial forecasting, via breaking the problems into recursive sub problems. While the recursive solution for calculating future value is straightforward and reasonably understandable, the recursive approach can become inefficient for large inputs, when recursive function calls are made too many times. If you seeking a more efficient performance, optimization techniques such a memoization or the conversion to an iterative approach can be considered. Therefore, It is clear that recursion is a powerful algorithm design technique when applied correctly and with consideration of time efficiency and space complexity.