Analysis of Recursive and Iterative Algorithms for Financial Forecasting

# 1. Introduction

This document analyzes recursive and iterative approaches for implementing a financial forecasting tool. The tool predicts the future value of an investment based on a fixed growth rate over a number of years.

# 2. Algorithm Description

## 2.1 Recursive Method

The recursive method calculates the future value by calling itself with a reduced year count until it reaches the base case. It follows the formula:  
  
FV(n) = FV(n-1) × (1 + rate)  
Base Case: FV(0) = Present Value

## 2.2 Iterative Method

The iterative method uses a loop to multiply the present value by the growth factor for the number of years specified. This approach avoids the overhead of recursive function calls.

# 3. Time and Space Complexity

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| --- | --- | --- | --- |
| Method | Time Complexity | Space Complexity | Remarks |
| Recursive | O(n) | O(n) | Simple, but uses stack memory |
| Iterative | O(n) | O(1) | Efficient for large datasets |

# 4. Recommendation

Both approaches yield the same results and have linear time complexity. However, the iterative method is recommended for production systems due to its constant space usage, making it safer and more efficient for larger inputs without the risk of stack overflow.