Fatboy Software Financial Planner

Modeling Framework, Assumptions & Validation Benchmarks

Version 1.1

Reston, Virginia

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This document describes the modeling architecture, assumptions, and validation benchmarks used in the Fatboy Software Financial Planner. The objective is transparency, reproducibility, and technical clarity.

1. Purpose and Scope

The Fatboy Software Financial Planner provides a forward-simulation framework for analyzing retirement sustainability under explicit economic assumptions. This document describes the structure of the modeling engine, return generation methods, tax treatment, success criteria, and benchmark validation results.

2. System Architecture

The projection framework separates economic inputs, return generation, cashflow aggregation, withdrawal logic, taxation, and success evaluation into modular components. Each simulation operates on an isolated scenario input to ensure reproducibility and prevent cross-scenario state mutation.

2.1 Scenario Isolation

Each scenario begins with a clone of a baseline ProjectionInput object. Scenario-specific parameters are applied to the clone and passed into a newly instantiated projection engine instance.

2.2 Deterministic vs Monte Carlo Execution

The framework supports both deterministic projections and Monte Carlo simulation. In Monte Carlo mode, multiple stochastic return paths are generated and evaluated independently to produce distributional outcomes.

2.3 Modular Engines

Annual simulation steps include return generation, income aggregation, withdrawal sequencing, tax calculation, and RMD enforcement. Each module operates independently and updates state variables sequentially.

2.4 Success Evaluation

Success classification occurs after all simulation years are evaluated. Terminal asset levels and interim liquidity failures are recorded to determine scenario outcomes.

2.5 State Management

Each scenario execution creates a fresh engine instance. No global mutable state persists across runs. Benchmark Mode optionally caches return paths within a session for deterministic comparisons.

3. Return Modeling Framework

Seven return-generation methodologies are implemented. Inflation is deterministic across all models and is applied uniformly to spending adjustments.

3.1 Geometric Brownian Motion (GBM) – Parametric return generation using user-specified mean and volatility.

3.2 Regime Model – Four-state Markov process representing bull, normal, bear, and stagnation regimes.

3.3 Regime Conservative – Stress-weighted variant emphasizing adverse market regimes.

3.4 Regime Enhanced – Adds optional valuation adjustments and correlation dynamics.

3.5 Crash Scenario – Includes explicit crash and recovery states with volatility amplification.

3.6 Historical Recent – Empirical block bootstrap using modern market data.

3.7 Historical Full – Long-run bootstrap series incorporating historical crisis events.

4. Withdrawal Mechanics & Success Definitions

Withdrawals occur when income sources fail to cover annual expenses. Account drawdown sequencing follows defined liquidity rules and tax treatment depending on account type.

5. Tax & IRMAA Modeling

Federal income tax calculations use progressive tax brackets and the standard deduction. Medicare IRMAA thresholds are evaluated using modeled income and applicable lookback rules.

6. Reproducible Monte Carlo Benchmarking

Benchmark Mode enables deterministic simulation comparisons by fixing a random seed and reusing identical return paths across scenarios.

7. Validation Benchmarks

Withdrawal Rate	Success Rate	P95 Terminal Value	Median Terminal Value	P5 Terminal Value
3%	92.2%	$13,263,834	$2,477,242	$0
4%	89.4%	$11,773,836	$2,049,495	$0
5%	86.4%	$10,796,468	$1,793,405	$0
6%	84.7%	$9,930,374	$1,565,491	$0

Account Type	Success Rate	Median Terminal Value
Roth (No Tax)	89.4%	$2,049,495
Traditional (Tax Enabled)	63.8%	$880,322

8. Model Limitations

Inflation is deterministic, longevity is modeled using fixed horizons, and no optimization algorithms are embedded. Results should be interpreted as analytical scenarios rather than predictions.

9. Version Governance

The source code is maintained under Git version control. Tagged releases correspond to specific modeling configurations and benchmark results.

10. Conclusion

The Fatboy Software Financial Planner provides a transparent analytical framework for retirement planning. By isolating assumptions and enabling reproducible Monte Carlo benchmarking, the system supports disciplined evaluation of retirement sustainability under uncertainty.