FFFL Model Suite: A Comprehensive User Guide

Welcome to the **Flex First, Fix Later (FFFL) Model Suite**. This collection of tools is designed to help you explore a modern retirement income strategy that balances flexibility in your early, active years with security in your later years.

This guide will walk you through each of the four models, explaining their purpose, how they work, and how to interpret their results.

Table of Contents

1. Core Concepts: The FFFL Strategy

The **"Flex First, Fix Later"** strategy is built around a simple idea: your retirement needs and risk tolerance change over time.

- **Flex Phase (Early Retirement):** You draw a flexible income from your invested pension pot. This allows you to enjoy your active years, but it also means your income is subject to market performance.

- **Fix Phase (Later Retirement):** At a pre-determined age, you use a significant portion of your remaining pot to purchase a **lifelong, inflation-linked annuity**. This provides a secure, guaranteed income for the rest of your life, removing market risk when you are older and potentially more vulnerable.

To manage this, the models split your pension pot into three conceptual parts:

- **Drawdown Pot:** The primary engine for your income during the 'Flex' phase.

- **Annuity Pot:** Ring-fenced and invested with the specific goal of growing enough to buy your target annuity at the 'Fix' age.

- **Excess Pot:** Any funds left over after the Drawdown and Annuity pots are funded. This acts as a buffer and can be used for emergencies or extra spending.

2. The Calculation Engine: How the Models Work

All four models are built on the same core calculation engine. Understanding how it works is key to interpreting the results.

The Core Calculation: Present Value

At its heart, the model works by calculating the **Present Value** of your future income needs. In simple terms, it answers the question: "How much money do I need **today** to fund all my income payments until my 'Fix' age, and also have enough left over to buy my annuity?"

This is done in two parts:

1. **Required Annuity Pot:** The model calculates the future cost of your annuity (your target income at the 'Fix' age divided by the annuity rate). It then "discounts" this amount back to today's value using the expected investment return of the Annuity Pot. This gives the amount you need to set aside today in the Annuity Pot.

2. **Required Drawdown Pot:** The model calculates the value of every single income payment you'll take during the 'Flex' phase. Each payment is discounted back to today's value based on how far in the future it is and the expected returns of the Drawdown Pot. The sum of all these discounted payments is the amount you need in your Drawdown Pot today.

The total required pot is the sum of these two values.

Finding Your Income

- **Max Income Mode:** To find the maximum sustainable income, the model uses a **binary search algorithm**. It's like a "high-low" guessing game. It starts with a guess for your income, calculates the required pot, and sees if it's more or less than your actual pot. If it's too high, it tries a lower income; if it's too low, it tries a higher one. It repeats this process 100 times, rapidly narrowing down the possibilities to find the precise maximum income your pot can support.

- **Target Income Mode:** This is simpler. The model calculates the required pot for your **target** income. If your starting pot is larger, the difference becomes your **Excess Pot**. If it's smaller, the model will show an error.

The Stochastic Models (Random Journey & Monte Carlo)

The simulation models introduce market volatility. To do this, they make a key assumption:

Key Assumption: Investment returns follow a **Normal (or "Gaussian") Distribution**.

This is a standard assumption in financial modelling. It means that returns will be clustered around the average (your input), with extreme positive or negative returns being much less likely, creating the classic "bell curve" shape.

- **Generating Random Returns:** For each year of a simulation, instead of using your fixed average return, the model generates a random return from this normal distribution. It uses your **"Avg. Return"** as the mean of the distribution and your **"Volatility (Std. Dev.)"** to determine the width of the bell curve (i.e., how much the returns can vary). The calculation uses the **Box-Muller transform**, a standard method for generating normally distributed random numbers. It's important to note that the random returns for the **Growth Fund** and the **Low-Risk Fund** are generated independently of each other; the model does not assume any correlation between them.

- **Annual Recalibration:** This is the most important concept. At the end of each simulated year, after the random return has been applied, the model re-evaluates your entire plan. It looks at the new pot value and recalculates the sustainable income from that point forward. This is what causes the income path to fluctuate in the simulation models.

Recalibration Strategies

When recalibrating, you have two choices:

- **Recalculate Income:** The model solves for a new maximum sustainable income from that point forward. This new, adjusted income is still designed to rise each year with your assumed rate of inflation (CPI). This strategy ensures your long-term inflation protection is maintained, but it can lead to larger swings (both up and down) in your income from one year to the next.

- **Smooth Increases:** The model tries to maintain the previous year's income level and instead solves for a new, sustainable rate of future income increases for the **remainder of the flex period**. If returns were good, your future increases might be higher than CPI; if they were poor, they might be lower. Once the annuity is purchased at the 'Fix' age, the income increases are determined by the terms of that annuity (assumed to be CPI-linked in this model). This strategy generally leads to a less volatile income path, but potentially at the cost of lower income in good years compared to the "Recalculate" strategy.

3. Model 1: Calibration and Projection

This is the foundational model. Its primary purpose is to determine a sustainable level of income based on your assumptions and project how your funds might evolve in a predictable, non-volatile world.

Key Features

- **Calculates Sustainable Income:** It determines the maximum possible starting income you can take that will rise with inflation and still be sufficient to purchase your target annuity at your chosen 'Fix' age.

- **Projects Pot Values:** It shows a year-by-year projection of how your three pots (Drawdown, Annuity, Excess) will change over time, assuming constant investment returns.

- **Stress Testing:** Allows you to simulate a one-off market shock in a specific year to see how it impacts your plan and what adjustments might be needed.

How to Use It

1. **Set Core Assumptions:** Enter your starting pot, age, target annuity age, and inflation (CPI).

2. **Choose a Mode:**

   o **Max Income:** The tool will calculate the highest possible starting income for you.

   o **Target Income:** You enter a desired starting income, and the tool will tell you if it's sustainable and calculate your initial "Excess Pot".

3. **Define Investment Strategy:** Use the sliders to set the investment allocation (% in growth funds) for each of the three pots. You can also set a "de-risking" period, over which the allocation will gradually shift from the start to the end allocation.

4. **Run a Stress Test (Optional):** Enable the stress test, choose the year of the shock, and define the poor market returns for that year. You can then select a strategy for how your income should be adjusted post-shock.

5. **Interpret the Results:**

   o **Key Income Display:** The main purple card shows your calculated sustainable starting income.

   o **Three-Pot Projection Chart:** This bar chart shows how the value of your three pots is projected to change each year.

   o **Annual Income Projection Chart:** This line chart shows your income rising steadily with inflation.

   o **Year-by-Year Breakdown:** The table provides the detailed numbers for each year of the projection.

4. Model 2: Random Journey Simulator

This model takes the principles of the first tool and adds a crucial element: **market volatility**. It simulates a single, random retirement journey from start to finish.

Key Features

- **Simulates One Random Path:** Instead of constant returns, it generates a random investment return for each year based on your volatility assumptions.

- **Annual Recalibration:** Each year, it recalculates your sustainable income based on the **actual** investment returns you experienced. This shows how your income might realistically fluctuate.

- **Compares Strategies:** After running a simulation, you can instantly toggle between the "Recalculate Income" and "Smooth Increases" strategies to see how each would have performed on the **exact same set of market returns**.

How to Use It

1. **Set All Inputs:** The inputs are the same as the Calibration model, but you now need to add **Volatility (Std. Dev.)** for your growth and low-risk funds. A higher number means a wider range of possible returns.

2. **Run a New Simulation:** Click the button to generate a new, random sequence of market returns.

3. **Analyze the Journey:**

   o **Charts:** The charts now show two lines: the "Expected Path" (what would happen with average returns) and the "Simulated Path" (what actually happened with the random returns).

o **Year-by-Year Table:** The table shows the details of the random journey, including the actual growth return for each year and the resulting income.

4.   **Switch Strategies:** Use the "Annual Recalibration Strategy" buttons to instantly re-run the calculations on the **same** set of random returns and compare the outcomes.

5. Model 3: Vulnerability Analysis

This model is a powerful diagnostic tool. It systematically stress-tests your plan to identify the years in which you are most vulnerable to a market shock.

Key Features

- **Runs Multiple Scenarios:** It runs a separate simulation for every year of your 'Flex' phase. In each simulation, it applies a market shock in that specific year and assumes normal returns for all other years.

- **Identifies Vulnerable Years:** It calculates the impact of a shock at each age and plots it on a chart, allowing you to see at a glance which years are the most sensitive.

- **Compares Strategy Impacts:** It shows the impact of a shock under both the "Recalculate" and "Smooth" adjustment strategies.

How to Use It

1. **Set Up Your Base Plan:** Configure your core assumptions and investment strategy as you would in the Calibration model.

2. **Define the Shock:** In the "Shock Parameters" section, define what a "bad year" looks like (e.g., -20% return for growth funds).

3. **Run the Analysis:** The model will automatically run a simulation for every possible shock year.

4. **Interpret the Results:**

o **Summary Card:** This tells you the single most vulnerable age for each of the two adjustment strategies.

o **Impact Charts:** These charts are key. They plot the "damage" caused by a shock at each age. A higher point on the chart means a shock at that age would have a more severe impact on your retirement income.

o **Breakdown Table:** This provides the detailed numbers for the impact of a shock at every age.

6. Model 4: Monte Carlo Stochastic Analysis

This is the most comprehensive model. Instead of just one random journey, it runs 1,000 simulations to give you a statistical understanding of the range of possible outcomes.

Key Features

- **Runs 1,000 Simulations:** It simulates your retirement journey 1,000 times, each with a unique, random sequence of market returns.

- **Calculates Percentiles:** It aggregates the results of all simulations to show you the statistical range of potential outcomes. For example, it will show you the 5th percentile (a very unlucky outcome), the 50th percentile (the median or middle outcome), and the 95th percentile (a very lucky outcome).

- **Measures Income Volatility:** It calculates the standard deviation of the year-to-year changes in your income, providing a powerful metric to compare the "smoothness" of different strategies.

How to Use It

1. **Set All Inputs:** Configure your plan just as you would for the Random Journey Simulator, including volatility.

2. **Run Simulations:** The model will run 1,000 simulations. This may take a few moments.

3. **Interpret the Results:**

- o **Key Results Card:** This gives you two crucial summary numbers: the 90% confidence range for your income at your 'Fix' age, and the average volatility of your income throughout the flex phase.

- o **Simulated Income Percentiles Chart:** This is the main chart. The shaded bands show the range of likely income paths. The wider the bands, the more uncertainty there is.

- o **Volatility Chart:** This chart shows the standard deviation of income changes at each age. A higher line indicates more year-to-year unpredictability.

7. Sharing Scenarios: Import/Export Feature

All models in the suite include a feature to save and load your inputs, making it easy to share scenarios with others or save your work.

- **Export:** Clicking the **Export** button will open a dialog asking you to name your file. This will save all your current inputs into a .json file on your computer.

- **Import:** Clicking the **Import** button will open your computer's file browser. You can select a .json file that you previously exported from any of the FFFL models.

- **Automatic Run:** Once a valid file is imported, the model will automatically update all the inputs and run the corresponding projection, simulation, or analysis.

Because all models share the same core inputs, you can **export a scenario from one model and import it into another** to see the same situation from a different analytical perspective.

8. Common Inputs and Assumptions

- **Starting Pot:** The total value of your pension funds at the start of retirement.

- **Starting Age / Annuity Age:** Defines the length of your 'Flex' phase.

- **CPI (Inflation):** The assumed rate of inflation. Income is projected to rise by this amount each year.

- **Annuity Rate:** The rate you expect to get for a lifelong, inflation-linked annuity. For example, a rate of 8% means you get £8 of income per year for every £100 used to buy the annuity.

- **Fund Returns & Volatility:** Your best estimate for the average annual return (net of fees) and the standard deviation (a measure of how much the return might vary) for your chosen funds.

9. Important Disclaimers

This suite of tools is for **illustrative and educational purposes only**. It does **not** constitute financial, investment, or retirement advice. The projections are based entirely on the assumptions you provide and are not a guarantee of future results. Always consult with a qualified and regulated financial advisor before making any decisions about your retirement.