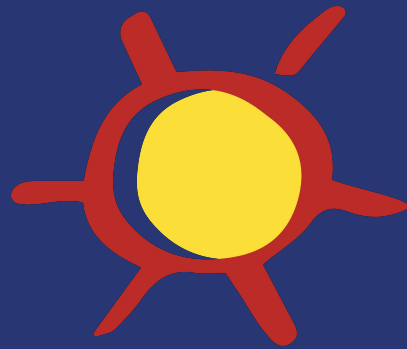# HAPNAV TECH-SPEC

The Happiness Navigator Technical Specification – UK Engine Calibration

HapNav

The Happiness Navigator

HAPNAV
UK Engine Calibration
Nov 2024

Version	Last Edited By	Last Edit Date (yyyy-mm-dd)
0.1	Vasilis Dialinos (created)	2020-07-27
0.2	Emma Abbate	2021-04-07

🔑 All the values and sources in this document can be configured to any values you choose to use.

Version	Last Edited By	Last Edit Date(yyyy-mm-dd)
001-SNAPSHOT	Emma Abbate	2024-11-19

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Display Elements

Choice of bands to analyse and display

Clearly insurance impacts worst cases, which are low probabilities of severe adverse events happening to individuals or a household. So the definition of the "Bad times" case is perhaps the most important calibration element. If we set the "Bad times" case to cover percentiles 0-25%, the results will be very different than if we set it to be 0-5% (for example). Currently, we have **"Good times"** showing the **OK band (percentiles 10% - 25%)** and for **"Bad times"** showing the **Worst band (percentiles 0% - 10%).**

System's default band configuration is the following

Band	Percentiles
Worst	0% to 10%
OK	10% to 25%
Good	25% to 70%
Best	70% to 100%

Both mapping of Good / Bad time to bands and band definitions can be configured.

Short vs Long-term

Typically, users' goals tend to concentrate on the early years of the simulation. To declutter "Our Future Goals" and "LifeMap" screens and facilitate easier goal creation for the first years, a "Short-Term" vs "Long-term" view switch has been implemented. "Short-term" view will only show the first **5** years' goals.

Diagnostics

Diagnostics

An array of diagnostics simulations are executed every time a user clicks on a low performing goal on the output screen and shown on the goal details area below the goals chart. We currently have **46** distinct diagnostics, each one to identify a different factor that may be causing the goal to perform poorly.

If any of those diagnostic simulations is found to improve the goal achievability by at least **5%**, a concrete action is suggested that the user can directly implement by choosing that action.

1. **Client's lifestyle expenses are affecting their goals.** This test will reduce lifestyle expenses of the household to **90%** (modelling.default.data.diagnostics.expense.reduce.living.expenses.to.percentage).

2. **The Client could consider renting instead of owning his/her property.** This test will model the effect of renting a property with a rent value equal to the monthly mortgage liability, releasing the equity of the property to the household balance sheet.

3. **The Client could consider buying instead of owning a property.** This test will model the effect of buying a property with a mortgage liability value equal to the rent value that the house is currently paying. The mortgage will have an **80%** LTV ratio (modelling.default.data.diagnostics.common.mortgage.ltv), **25** term years (modelling.default.data.diagnostics.common.mortgage.term) or up to the statutory retirement age of **67** (modelling.default.data.statutory.retirement.age) of the Client & **4.25%** interest rate. Please note that the mortgage will be adjusted in order to pass the mortgage affordability test by projecting household earned income and the goal value by their respective growth characteristics to the year of the goal. The projected, approximated maximum allowed mortgage will be reduced by **5%** (modelling.default.data.diagnostics.goal.buy.a.house.mortgage.affordability.buffer) to compensate for the projection approximation.

4. **A slightly higher Client income could make the future outcomes more achievable**. Consider increasing the client's income by **10%** (modelling.default.data.diagnostics.income.earned.income.increase.percentage) or add an earned income of **£ 50,000** (modelling.default.data.diagnostics.income.earned.income.add) if the client is not earning.

5. **A slightly higher Partner's income could make the future outcomes more achievable**. Consider increasing the partner's income by **10%** (modelling.default.data.diagnostics.income.earned.income.increase.percentage) or add an earned income of **£ 50,000** (modelling.default.data.diagnostics.income.earned.income.add) if the partner is not earning.

6. **Client's retirement objectives need a bit more income to be supported.** Re-simulate by adding an earned income that starts at retirement age and continues up to the **80th** (modelling.default.data.diagnostics.income.work.part.time.after.retirement.max.age) year of age at **25%** (modelling.default.data.diagnostics.income.work.part.time.after.retirement.percentage) of the Client's pre-retirement earned income.

7. **Partner's retirement objectives need a bit more income to be supported.** Re-simulate by adding an earned income that starts at retirement age and continues up to the **80th** (modelling.default.data.diagnostics.income.work.part.time.after.retirement.max.age) year of age at **25%** (modelling.default.data.diagnostics.income.work.part.time.after.retirement.percentage) of the Partner's pre-retirement earned income.

8. **Client's prior goals are consuming his money.** Re-simulate having removed all goals **5** years (modelling.default.data.diagnostics.goal.switch.off.earlier.goals.years) before the goal being diagnosed.

9. **Goal may be too expensive for Client's means.** Try re-simulating with **90%** (modelling.default.data.diagnostics.goal.spend.less.money.on.goal.to.percentage) of the original goal value or **80%** (modelling.default.data.diagnostics.goal.spend.less.money.on.goal.house.to.percentage) if the goal is property related.

10. **The timing of the goal may be causing the low achievability.** Try re-simulating by moving the goal **1** year (modelling.default.data.diagnostics.goal.move.it.to.the.future.years) in the future or **3** years (modelling.default.data.diagnostics.goal.move.it.to.the.future.retirement.years) if we are dealing with a retirement goal.

11. **Client's liquid assets are not sufficient to pay for the down-payment (Property related goals only).** Re-model by paying the minimum downpayment after calculating the maximum mortgage which the household is eligible to get. In this scenario, the mortgage rate will be increased by **1%** (modelling.default.data.diagnostics.goal.buy.a.house.downpayment.increase.mortgage.rate).

12. **Mortgage being too large for the Client's financial situation (Property related goals only).** Re-model by using the maximum mortgage that the household will be eligible to get. Please note that the mortgage will be adjusted in order to pass the mortgage affordability test by projecting household earned income and the goal value by their respective growth characteristics to the year of the goal. The projected, approximated maximum allowed mortgage will be reduced by **5%** (modelling.default.data.diagnostics.goal.buy.a.house.mortgage.affordability.buffer) to compensate for the projection approximation.

13. **Client's liquid assets are not sufficient to pay for a goal.** Try borrowing using the following assumptions

    a. **Property related goal** Add a mortgage with **80%** LTV (modelling.default.data.diagnostics.common.mortgage.ltv), **25** term years (modelling.default.data.diagnostics.common.mortgage.term) or up to the statutory retirement age of **67** (modelling.default.data.statutory.retirement.age) of the Client & **4.25%** interest rate

    b. **Other goals** Add a loan with **50%** LTV (modelling.default.data.diagnostics.common.loan.ltv), **4** term years (modelling.default.data.diagnostics.common.loan.term) & interest rate taken from the following matrix (modelling.default.data.diagnostics.common.loan.rate.matrix)

Amount	Interest rate
£0 to £2,999	15%
£3,000 to £4,999	8%
£5,000 to £7,499	3%
£7,500 and up	3%

14. **Finances are being used up by other expenses and goals** .Try saving for **3** years (modelling.default.data.diagnostics.goal.save.in.years) before the goal's date to meet that goal.

15. **Client's wealth is tied up in his home.** Simulate moving to a smaller property, **75%** (modelling.default.data.diagnostics.property.move.to.smaller.property.percentage) of the value of the currently owning property or just sell if the resulting property value is less than **£ 115,000** (user.default.data.asset.property.tradedown.vs.sell.amount).

16. **Client's wealth is tied up in investment properties.** The client should consider selling his/her's investment properties to release some equity.

17. **The mortgage on Client's residence may be too expensive.** Try remortgaging residential property by increasing mortgage by **5%** (modelling.default.data.diagnostics.debt.property.mortgage.increase.percentage) and by adding a new mortgage of **80%** LTV (modelling.default.data.diagnostics.common.mortgage.ltv), **25** term years (modelling.default.data.diagnostics.common.mortgage.term) or up to the statutory retirement age of **67** (modelling.default.data.statutory.retirement.age) of the Client, **4.25%** interest rate & **fixed rate** mortgage type (modelling.default.data.diagnostics.common.mortgage.rate). Please note that the mortgage will be adjusted in order to pass the mortgage affordability test by projecting household earned income and the goal value by their respective growth characteristics to the year of the goal. The projected, approximated maximum allowed mortgage will be reduced by **5%** (modelling.default.data.diagnostics.goal.buy.a.house.mortgage.affordability.buffer) to compensate for the projection approximation.

18. **The mortgage on Client's investment property may be too expensive.** Try remortgaging investment property by increasing mortgage by **5%** (modelling.default.data.diagnostics.debt.property.mortgage.increase.percentage) and by adding a new mortgage of **80%** LTV (modelling.default.data.diagnostics.common.mortgage.ltv), **25** term years (modelling.default.data.diagnostics.common.mortgage.term) or up to the statutory retirement age of **67** (modelling.default.data.statutory.retirement.age) of the Client, **4.25%** interest rate & **fixed rate** mortgage type (modelling.default.data.diagnostics.common.mortgage.rate). Please note that the mortgage will be adjusted in order to pass the mortgage affordability test by projecting household earned income and the goal value by their respective growth characteristics to the year of the goal. The projected, approximated maximum allowed mortgage will be reduced by **5%** (modelling.default.data.diagnostics.goal.buy.a.house.mortgage.affordability.buffer) to compensate for the projection approximation.

19. **The Client may be carrying too much expensive debt.** Try repaying loan by taking another loan of **4** term years (modelling.default.data.diagnostics.common.loan.term) & interest rate taken from the following matrix (modelling.default.data.diagnostics.common.loan.rate.matrix)

Amount	Interest rate
£0 to £2,999	15%
£3,000 to £4,999	8%
£5,000 to £7,499	3%
£7,500 and up	3%

20. **The Client may be taking too little investment risk in his/her's tax advantaged savings.** This test will model increasing the client's tax advantaged savings by **1** risk level (modelling.default.data.diagnostics.wrapper.tax.advantaged.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

21. **The Partner may be taking too little investment risk in his/her's tax advantaged savings.** This test will model increasing the partner's tax advantaged savings by **1** risk level (modelling.default.data.diagnostics.wrapper.tax.advantaged.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

22. **The Client may achieve his/hers future plans by taking less investment risk in his/hers tax advantaged savings.** This test will model decreasing the client's tax advantaged savings by **1** risk level (modelling.default.data.diagnostics.wrapper.tax.advantaged.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

23. **The Partner may achieve his/hers future plans by taking less investment risk in his/hers tax advantaged savings.** This test will model decreasing the partner's tax advantaged savings by **1** risk level (modelling.default.data.diagnostics.wrapper.tax.advantaged.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

24. **The Client may be taking too little investment risk in his/her's taxable savings.** This test will model increasing the client's taxable savings risk by **1** level (modelling.default.data.diagnostics.wrapper.gia.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

25. **The Partner may be taking too little investment risk in his/her's taxable savings.** This test will model increasing the partner's taxable savings risk by **1** level (modelling.default.data.diagnostics.wrapper.gia.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

26. **The Client may achieve his/hers future plans by taking less investment risk in his/hers taxable savings.** This test will model decreasing the client's taxable savings risk by **1** level (modelling.default.data.diagnostics.wrapper.gia.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

27. **The Partner may achieve his/hers future plans by taking less investment risk in his/hers taxable savings.** This test will model decreasing the partner's taxable savings risk by **1** level (modelling.default.data.diagnostics.wrapper.gia.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

28. **The Client may be taking too little investment risk in his/her's pension savings.** This test will model increasing the client's pension savings risk by **1** level (modelling.default.data.diagnostics.wrapper.pension.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

29. **The Partner may be taking too little investment risk in his/her's pension savings.** This test will model increasing the partner's pension savings risk by **1** level (modelling.default.data.diagnostics.wrapper.pension.risk.increase.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

30. **The Client may achieve his/hers future plans by taking less investment risk in his/hers pension savings.** This test will model decreasing the client's pension savings risk by **1** level (modelling.default.data.diagnostics.wrapper.pension.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

31. **The Partner may achieve his/hers future plans by taking less investment risk in his/hers pension savings.** This test will model decreasing the partner's pension savings risk by **1** level (modelling.default.data.diagnostics.wrapper.pension.risk.decrease.presets). It will also add **1%** of handling fee on the resulting portfolio (other.reference.data.assets.financial.default.fee).

32. **Client's pension contributions may be insufficient to fund his future plans.** Try increasing pension contributions by **1%** (modelling.default.data.diagnostics.wrapper.pension.contribution.increase.percentage) if private and also employer contributions by **1%** (modelling.default.data.diagnostics.wrapper.pension.contribution.increase.percentage) if a workplace pension. If no pension contribution exists, we add a contribution to a private pension of **8%**.

33. **Partner's pension contributions may be insufficient to fund his future plans.** Try increasing pension contributions by **1%** (modelling.default.data.diagnostics.wrapper.pension.contribution.increase.percentag

e) private (and employer contributions by **1%** if workplace pension). If no pension contribution exists, we add a contribution to a private pension of **8%**.

34. **The Client may not be using his tax efficient savings capacity to its fullest.** Try using Client's ISA to the maximum extent.

35. **The Partner may not be using his tax efficient savings capacity to its fullest.** Try using Partner's ISA to the maximum extent.

36. **The Client may not be investing sufficiently**. The client should consider investing his/her excess savings.

37. **The Partner may not be investing sufficiently**. The partner should consider investing his/her excess savings.

38. **The Household is not sufficiently covered if the Client passes away before his time.** Try adding a life insurance with sum assured equal to **5** years of living and rent expenses (modelling.default.data.diagnostics.insurance.term.life.total.expense.years) plus all current Client's liabilities. Term life insurance can run up to a specified age (modelling.default.data.diagnostics.insurance.term.life.max.age) or up to statutory retirement age **67** (modelling.default.data.statutory.retirement.age)**.**

39. **The Household is not sufficiently covered if the Partner passes away before his time.** Try adding a life insurance with sum assured equal to **5** years of living and rent expenses (modelling.default.data.diagnostics.insurance.term.life.total.expense.years) plus all current Partner's liabilities. Term life insurance can run up to a specified age (modelling.default.data.diagnostics.insurance.term.life.max.age) or up to statutory retirement age **67** (modelling.default.data.statutory.retirement.age).

40. **The Client is not sufficiently covered if he/she becomes disabled.** Simulate with disability insurance with annual payout equal to **60%** (modelling.default.data.diagnostics.insurance.disability.insurance.earned.income.per centage) of the Client's annual earned income. Disability insurance runs up to the statutory retirement age **67** (modelling.default.data.statutory.retirement.age)**.**

41. **The Partner is not sufficiently covered if he/she becomes disabled.** Simulate with disability insurance with annual payout equal to **60%** (modelling.default.data.diagnostics.insurance.disability.insurance.earned.income.per centage) of the Partner's annual earned income. Disability insurance runs up to the statutory retirement age **67** (modelling.default.data.statutory.retirement.age)**.**

42. **The Client is not sufficiently covered if he becomes critically ill.** Simulate with a critical illness insurance with sum assured equal to **5** years of living and rent expenses (modelling.default.data.diagnostics.insurance.critical.illness.total.expense.years) plus all current Client's liabilities. Critical illness insurance can run up to a specified age

(modelling.default.data.diagnostics.insurance.critical.illness.max.age) or up to statutory retirement age **67** (modelling.default.data.statutory.retirement.age)**.**

43. **Partner is not sufficiently covered if he becomes critically ill.** Simulate with a critical illness insurance with sum assured equal to **5** years of living and rent expenses (modelling.default.data.diagnostics.insurance.critical.illness.total.expense.years) plus all current Partner's liabilities. Critical illness insurance can run up to a specified age (modelling.default.data.diagnostics.insurance.critical.illness.max.age) or up to statutory retirement age **67** (modelling.default.data.statutory.retirement.age)**.**

44. **Client's mortgage could be a problem if either of the partners pass away before their time.** Try adding a mortgage life insurance.

45. **Client's health status has an impact on his/her desired future.** This test will model increasing the health of the client by **1** health level (modelling.default.data.diagnostics.lifestyle.too.unhealthy.increase.status).

46. **Partner's health status has an impact on his/her desired future.** This test will model increasing the health of the partner by **1** health level (modelling.default.data.diagnostics.lifestyle.too.unhealthy.increase.status).

Income and Income Growth

Age based growth of Earned Income

While income growth is a function of several factors, we are using our simplified Age-based growth earned income calculator that is calculating additional increases on top of CPI based on the following age based table. See [1], (key: user.default.data.income.earned.age.adjusted.growth.rate.matrix).

(Example: Income grows at CPI + 2.4% between ages 30-39 based on the table below.)

Age	CPI adjustment	How we got the percentage
Up to 29th year of age	4.1%	RATE(10,0,-16830,25057,0,2%)
30 to 39	2.4%	RATE(10,0,-25057,31812,0,2%)
40 to 49	0.9%	RATE(10,0,-31812,34633,0,2%)
50 to 59	-0.8%	RATE(10,0,-34633,32038,0,2%)
60 and above	-1.4%	RATE(10,0,-32038,27833,0,2%)

The third column of the above table shows how we derived the year on year income increase from the data in [1]. To get the data please go at the bottom of the page in [1] and obtain the spreadsheet "Data-tool-for-publication", then go to tab "Age group". At the top of this sheet select to show annual earnings and adjust data for inflation.

We consider the 2019 values. Observe that, in the data, the age intervals are 18-21, 22-29, 30-39 and so on. We make a slight simplification by adjusting the first intervals to normalize their length, as seen in the table below. We use this data in the RATE function as seen in the above table.

19-	20-29	30-39	40-49	50-59	60+
£16,830	£25,057	£31,812	£34,633	£32,038	£27,833

Breakdown of Dividends vs Capital Gains

- user.default.data.income.investment.equity.divident.percent[0]
  This key is used for the calculation of investment income, i.e, the investment return that will be taxed as income (interest plus dividends). 100% of annual return on cash and bonds is deemed to be income. First **4%** of return on **Equities** is deemed to be income (i.e. dividends). The latter percentage is this key's value [2]

- user.default.data.income.investment.equity.divident.percent[1]
  This key stores the percentage of asset return on **Real** that is considered dividend similarly to the equities above. First **2%** of return on Real is deemed to be income [3]

- user.default.data.income.investment.equity.divident.percent[2]
  This key stores the percentage of asset return on **Other** that is considered dividend similarly to the equities above. First **2%** of return on Other is deemed to be income.

Expense Growth

Lifestyle and Fixed Expenses

Lifestyle and Fixed expenses are modelled as different line items in the Client's income statement. Lifestyle expenses are discretionary, while the Fixed expenses are mandatory. We assume growth to **CPI** for Fixed (basic) expenses, and growth to **Household Income Growth** for Lifestyle expenses items and a survivor adjustment of **75%** (adjustment of expenses in case any of the partners passes away).

Post retirement expenses

(First 10 Years in Retirement & After First 10 Years)

Client has the ability to adjust post-retirement expenses directly on the retirement goal. More specifically, expenses adjustment before the first 10 years post retirement (currently defaulting to **75%**) and further expenses adjustment after the first 10 years post retirement (currently defaulting to **75%**). See [4, 5].

Funding Sources and Sequence

There are 2 cases when we use funding sources in the engine:

1. Fund **shortfall**, that is the remediatory action that we take **after** we pay all our **non-discretionary expenditure** and the income statement is in the red. Then we will create an internal non-discretionary goal to fund this shortfall and will use the funding ladder to fund that. This special goal funding source is only the Liquid Asset Funding Source with sequence PERIOD_NET_INCOME, GENERAL_INVESTMENT_ACCOUNT, TAX_ADVANTAGED, PENSION (when liquid).

2. Fund **goals**, that starts **after** we pay all **non discretionary expenditure and fund shortfall**. All goals have an associated funding source configuration, if this is empty, the default is used. That is the Liquid Asset Funding Source with sequence PERIOD_NET_INCOME, GENERAL_INVESTMENT_ACCOUNT, TAX_ADVANTAGED, PENSION (when liquid). Additional funding sources can be configured on goals like Liquid Assets, Save towards a goal, Loan, UK Student Loan, Mortgage, Bank of Mum and Dad, Residential Property, Investment property, Future Residential Property (acquired by a goal), Future Investment property (acquired by a goal).

Mortgage affordability test for Property related goals

> **NOTE**: Other Mortgage affordability tests are also available on request.

Property related goals may fail due to 2 reasons,

1. unaffordable down-payment

2. fail the mortgage eligibility test.

While the first check for the downpayment is a normal goal achievability check where we make sure that the available funds are sufficient to fund the down-payment, the second check has more elaborate logic. Basically the check for the mortgage eligibility will check if the household earned income is sufficient to support it. So the goal will pass the eligibility test if

a. In a single person household, the mortgage is less than **4** times the annual earned income of the Client (user.default.data.goal.house.times.user.only).

b. In a 2 partner's household, the mortgage is less than **3** times the joint earned income of the Client and Partner (user.default.data.goal.house.times.user.and.partner).

Emergency Funding

Automatic trade-down of property

As an emergency measure, the simulation engine is configured to automatically trade down the residential property to X% of current value when the household is in the "red" (i.e. does not have enough cash and liquid assets to pay its expenses). Default Configuration parameters are

1. **£25,000** The threshold of household being in debt before triggering automatic trade-down.

2. **60%** The percentage (of its projected future value) to which we trade down residential property in order to release equity.

3. Below **£115,000** of house value, the house is sold instead of being traded down.

Savings Sequence

How excess savings are saved

At the end of each simulated year and right before the asset rebalancing (that is effectively the last operation to take place on each simulated year), the engine will run the subroutine that moves excess money to the balance sheet following a sequence of steps. These steps can be parameterised, enabled, disabled or reordered to achieve desired savings behavior of the household (simulation.parameter.savings.sequence). Help to Buy ISAs are currently not included in our engine.

Saving step	Enabled by default
Emergency savings Save in cash GIA accounts **6** months of earned income worth of cash. If both partners exist, the amount will be equally distributed in their respective GIA cash portfolios. If no cash GIA portfolio has been created for a partner, the engine will auto-generate one with default fees of **1%** (other.reference.data.assets.financial.default.fee) & default risk profile based on the risk profile per wrapper matrix configured (see Capital Market Assumptions section).	**Enabled**
Top up ISA savings Use the ISA account to the maximum extent. If both partners exist, the amount will be equally distributed in their respective ISA portfolios. If no ISA portfolio has been created for a partner, the engine will auto-generate one with default fees of **1%** (other.reference.data.assets.financial.default.fee) & default risk profile based on the risk profile per wrapper matrix configured (see Capital Market Assumptions section).	**Disabled**
Distribute in investment portfolios Distribute savings in GIA investment accounts. If both partners exist, the amount will be equally distributed in their respective GIA investment portfolios. If no GIA investment portfolio has been created for a partner, this step will be effectively disabled.	**Disabled**
Distribute in cash portfolios Distribute savings in GIA cash accounts. If both partners exist, the amount will be equally distributed in their respective GIA cash portfolios. If no cash GIA portfolio has been created for a partner, the engine will auto-generate one with default fees of **1%** (other.reference.data.assets.financial.default.fee) & default risk profile based on the risk profile per wrapper matrix configured (see Capital Market Assumptions section).	**Enabled**
Fallback As a fallback, if there is still surplus money to be saved after executing the previous saving steps, the remaining amount is saved in a GIA cash account. If both partners exist, the amount will be equally distributed in their respective GIA cash portfolios. If no cash GIA portfolio has been created for a partner, the engine will auto-generate one with default fees of **1%** (other.reference.data.assets.financial.default.fee) & default risk profile based on the risk profile per wrapper matrix configured (see	**Always on and always at the end. Cannot be disabled or moved**

Capital Market Assumptions section).	

Excess money each year is by default added to the Client's GIA account and reallocated based on the selected risk profile on the assets page. By default we have topping up **ISA as disabled** (this is a configurable on/off flag) **unless the household already uses ISAs**, in which case we assume they will always maximise their ISAs each year.

The annual allowance or annual cap on ISA savings is **£20,000**, see [6].

Retirement Choices and Solutions

State Pension

Key	Description	Default Value
user.default.data.income.pension.state.primary.started.work.at.age	This key stores the age the user/primary started working. It is assumed to be at 22. It is used for the calculation of the entitlement of the state pension. For the calculation of the entitlement the number of years that a person has worked needs to be accounted for. Therefore we mark when the user started working to facilitate this. During the simulation only years that the user earns income are accounted for.	**22**
user.default.data.income.pension.state.partner.started.work.at.age	This key stores the age the partner started working. It is assumed to be at 22. It is used similarly to the primary key, see above.	**22**
user.default.data.income.pension.state.uk.inflation.fixed.rate	In the nominal case the state pension amount inflates at max(CPI, MWG, 2.5%) yearly. MWG = Median Wage Growth, which is a correlated stochastic variable.	**max(CPI, MWG, 2.5%)**
modelling.default.data.statutory.retirement.age	Default value for statutory retirement age used in the diagnostics calculations for determining, for example, the mortgage term, which should not go beyond the retirement age, or similarly for determining an insurance's term.	**67**

- user.default.data.income.pension.state.primary.started.work.at.age
  This key stores the age the user/primary started working. It is assumed to be at **22**. It is used for the calculation of the entitlement of the state pension. For the calculation of the entitlement the number of years that a person has worked needs to be accounted for. Therefore we mark when the user started working to facilitate this. During the simulation only years that the user earns income are accounted for.

- user.default.data.income.pension.state.partner.started.work.at.age
  This key stores the age the partner started working. It is assumed to be at **22**. It is used similarly to the primary key, see above.

- user.default.data.income.pension.state.uk.inflation.fixed.rate
  In the nominal case the state pension amount inflates at **max(CPI, MWG, 2.5%)** yearly.

- modelling.default.data.statutory.retirement.age
  Default value for statutory retirement age used in the diagnostics calculations for determining, for example, the mortgage term, which should not go beyond the retirement age, or similarly for determining an insurance's term. It is assumed to be at **67**.

Pension Drawdown and Liquidity Rules

The "default" behaviour of the Pension is drawdown with 25% of each draw tax free (assuming pension is less than the Lifetime Allowance aka LTA)

Annuity vs Drawdown vs Tax Free Cash from pensions

Goal Related Data and Assumptions

Buy a House Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £400,000 valued house with a mortgage of £320,000, 3% rate and 25 year term.

Achievability
The goal is achieved if in the year of the goal the household can afford the down-payment (GIA, ISA & Pension if retired) and also the household can pass the mortgage affordability test as described in the Mortgage affordability test section.

Buy a Car Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £25,000 priced car with a loan of £18,750, 5% rate and 5 year term.

Achievability
The goal is achieved if in the year of the goal the household can afford the downpayment (amount - loan) using the available liquid assets (GIA, ISA & Pension if retired).

Travel Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £10,000 expense.

Achievability
The goal is achieved if in the year of the goal the household can afford the goal amount using the available liquid assets (GIA, ISA & Pension if retired).

Get Married Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £12,000 expense.

Achievability
The goal is achieved if in the year of the goal the household can afford the goal amount using the available liquid assets (GIA, ISA & Pension if retired).

Further Education Goal (for the Client)

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £10,000 per year cost with a £5,000 student loan.

Achievability
The goal is achieved if in the year of the goal the household can afford the self-funded part of the goal (amount - loan amount) with the liquid assets (GIA, ISA & Pension if retired). Please note that income stops for the duration of the studies and resumes with a configurable increase.

Have a Child Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £7,500 cost per year.

Achievability
This goal is always achieved. We don't want to measure the ability of the household to have a child, just the impact on the rest of the household goals.

Take a Sabbatical Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a 1 year duration for the goal with the expenses not changing (i.e. 100% of what they were pre-goal). We will default 0% of the pre-goal income during the duration of the goal.

Achievability
This goal is always 100% achievable... The only case that this goal may not have 100% achievability is if you associate it to a person in a 2 person household and that person passes away.

Your Personal Goal

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default a £10,000 expense

Achievability
The goal is achieved if in the year of the goal the household can afford the goal amount using the available liquid assets (GIA, ISA & Pension if retired).

Send my Child to University and other Recurring Goals

Implementation
Please refer to the Localisation Document

Defaults
If nothing is specified, we will default an initial and recurring amount of £5,000 for recurring goals for a duration of 10 years. For a 'sending a child to university goal', we will default a £15,000 initial and recurring amount for a duration of 3 years.

Achievability
These goals are achieved if the household can afford the goal amount (one-time) payment and all recurring payments for the duration of the goal. If any of those payments fail, the goal will also fail. Please note that if a goal fails because the household could not afford a payment, the previous payments are not un-done.

Retirement Goal

Implementation
Please refer to the Localisation Document

Achievability
The goal is considered achieved when the available net-worth of the household is positive in the year that both partners of the household have passed away (effectively the simulation end).

Another way of achieving this goal, is that if the household's Cash + Liquid assets needs to be > the household's expenses, for each and every timestep in that simulated life from when the first adult retires, until when both adults have passed away (or the simulation ends).

This includes emergency funding rules that allow a household to access cash/liquid assets if their Cash + Liquid assets without the emergency funding does not cover their expenses.

That may include trading down the primary residence, selling Buy-to-Let properties, accessing illiquid investments, etc.

Demographic Data

Product Pricing Assumptions

NOTE: Please refer to the *Envizage_Templates for Capital Markets Assumptions and Actuarial Assumptions_Last edit 2019-09-18* excel file.

Capital Markets Assumptions and Model Portfolios

NOTE: these are the assumptions we have implemented in our current version of the app. They can be changed to any values you choose to use, provided we have a reliable source.

Market data provider

The market data provider is an abstraction layer introduced to enable easy parameterisation of market data parameters like short term interest rates, CPI, property growth and so on. Each parameter can be a value internally calculated by the engine (**Process Data**), a fixed reference data (**Reference Data**), alias to an asset class (**Asset Class**) or the summary of an asset class and a reference data (**Asset class plus reference data**). The full list of the market data parameters of the system and their values is shown in the table below (simulation.parameter.market.data.provider.config).

Parameter	Source	Value
CPI Annual CPI	**Asset Class**	**CPI**
cash UK Cash	**Asset Class**	**Cash**
Wage growth UK wage growth	**Asset Class**	**WGRO**
Property growth UK property growth	**Asset Class**	**RPGRO**
Short term interest rate	**Asset Class**	**Bank Rate**
Medium term interest rate	**Asset Class**	**5-year Interest Rate**
Long term interest rate	**Asset Class**	**15-year Interest Rate**

Capital Market Assumptions

The configured asset classes, returns and volatility

ID	Type	Returns	Volatility	Description
CASH	**CASH**	0.0083	0.0253	Cash & Short-term Gov. Bonds
COMM	**REAL**	0.0114	0.1643	Commodities and Real Estate
DWEQ	**EQUITY**	0.0317	0.1450	Developed Markets Equity
WGOV	**BONDS**	0.0063	0.0368	Developed Markets Gov. Bonds
EMEQ	**EQUITY**	0.0409	0.1834	Emerging Markets Equity
EHYB	**BONDS**	0.0240	0.0818	High-Yield & Emerging Markets Bonds
UKIL	**BONDS**	0.0098	0.0451	Inflation Linked Bonds
UKIG	**BONDS**	0.0117	0.0613	Investment Grade Corporate Bonds
WGRO	**OTHER**	0.0150	0.0662	Wage Growth
RPGRO	**REAL**	0.0318	0.0414	UK Residential Property Growth
LTIR	**OTHER**	0.0200	0.0073	GTGBP15Y Govt
INFL	**REAL**	0.0360	0.0130	UK Inflation

The asset correlation matrix

	CASH	COMM	DWEQ	WGOV	EMEQ	EHYB	UKIL	UKIG	LTIR	WGRO	RPGRO	INFL
CASH	1.00	0.62	-0.31	0.76	-0.17	0.66	0.32	0.63	-0.70	-0.19	-0.32	-0.25
COMM	0.62	1.00	-0.26	0.65	0.03	0.62	0.49	0.52	-0.57	-0.34	-0.24	-0.16
DWEQ	-0.31	-0.26	1.00	-0.36	0.82	0.12	0.14	0.16	0.33	0.16	0.28	0.07
WGOV	0.76	0.65	-0.36	1.00	-0.20	0.63	0.57	0.64	-0.84	-0.05	-0.12	-0.19
EMEQ	-0.17	0.03	0.82	-0.20	1.00	0.23	0.33	0.16	0.21	0.05	0.28	-0.04
EHYB	0.66	0.62	0.12	0.63	0.23	1.00	0.49	0.87	-0.59	-0.27	-0.25	-0.15
UKIL	0.32	0.49	0.14	0.57	0.33	0.49	1.00	0.44	-0.56	-0.18	0.09	-0.03
UKIG	0.63	0.52	0.16	0.64	0.16	0.87	0.44	1.00	-0.61	-0.16	-0.15	-0.12
LTIR	-0.70	-0.57	0.33	-0.84	0.21	-0.59	-0.56	-0.61	1.00	0.03	0.07	0.21
WGRO	-0.19	-0.34	0.16	-0.05	0.05	-0.27	-0.18	-0.16	0.03	1.00	0.34	0.15
RPGRO	-0.32	-0.24	0.28	-0.12	0.28	-0.25	0.09	-0.15	0.07	0.34	1.00	0.39
INFL	-0.25	-0.16	0.07	-0.19	-0.04	-0.15	-0.03	-0.12	0.21	0.15	0.39	1.00

Source:

Michele Morra, **Moneyfarm**, on 30 April 2021 (with permission from Giovanni Daprà)

The following are the default asset allocations if the user does not specify otherwise. In order to override those defaults you will need to create a portfolio for a wrapper and set a risk profile.

	CASH	WGOV	UKIG	EHYB	DWEQ	EMEQ	COMM	REAL	ALTS
GIA	100%	0%	0%	0%	0%	0%	0%	0%	0%
ISA	100%	0%	0%	0%	0%	0%	0%	0%	0%
ESDCS	100%	0%	0%	0%	0%	0%	0%	0%	0%
SIPP	100%	0%	0%	0%	0%	0%	0%	0%	0%

GIA :   General Investment Account
ISA :   Individual Savings Account
ESDCS :   Employer-sponsor DC Scheme
SIPP :   Self-invested Personal Pension

The risk profiles configured

	CASH	COMM	DWEQ	WGOV	EMEQ	EHYB	UKIL	UKIG
P0	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
P1	41.0%	0.0%	0.0%	21.4%	0.0%	3.0%	7.0%	27.6%
P2	29.0%	0.0%	18.5%	17.0%	1.0%	10.5%	9.0%	15.0%
P3	15.0%	0.0%	31.9%	12.3%	2.0%	10.5%	9.0%	19.3%
P4	9.3%	3.0%	42.5%	9.0%	6.5%	9.5%	5.0%	15.2%
P5	11.0%	3.0%	55.1%	8.9%	7.2%	7.4%	0.0%	7.4%
P6	4.0%	3.0%	65.9%	10.5%	7.7%	6.0%	0.0%	3.0%
P7	2.0%	3.0%	75.8%	5.5%	9.7%	4.0%	0.0%	0.0%

Source:
Michele Morra, **Moneyfarm**, on 30 April 2021 (with permission from Giovanni Daprà)

Actuarial Assumptions

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NOTE: Please refer to the *Envizage_Templates for Capital Markets Assumptions and Actuarial Assumptions_Last edit 2019-09-18* excel file.

Taxation

Taxes on Income, Dividends, and Capital Gains

Key: other.reference.data.income.tax.matrix

Tax band limits	Tax rates on Income	Tax rates on Dividends	Capital Gains Tax on chargeable assets	Capital Gains Tax on residential property
0.0	0.0	0.0	0.0	0.0
12 570	0.20	0.075	0.1	0.18
50 270	0.4	0.325	0.2	0.28
150 000	0.45	0.3810	0.2	0.28

Source: GOV.UK tax rates [7, 8, 9]

Property (Council) Taxes

Key: other.reference.data.income.tax.uk.local.property.bands.matrix

Value of dwelling (estimated at April 1991)	Proportion of the tax due for a Band D dwelling
0 - 40 000	0.6667 (6/9)
40 001 - 52 000	0.7778 (7/9)
52 001 - 68 000	0.8889 (8/9)
68 001 - 88 000	1 (9/9)
88 001 - 120 000	1.2222 (11/9)
120 001 - 160 000	1.4444 (13/9)
160 001 - 320 000	1.6667 (15/9)
320 001 +	2 (18/9)

Source: "Council tax levels set by local authorities: England 2020-21 - Revised (page 15)".
[10]

Each property is assigned a local tax band. Local tax bands are based on the value of the property as of 1 April 1991. Any property built after this date is given a notional 1991 value for local tax purposes.

Dependent on their assigned local tax band properties pay a proportion of the Band D local tax. The bands and the proportion of band D local tax they will pay are given in the above table.

The bands are defined by the limits in the first column. They are labeled with the letters **A**, **B**, **C**, **D**, **E**, **F**, **G**, **H**. Band **A** is between 0 and 40 000, band **B** is between 40 001 and 52 001, and so on. The second column shows the proportion of the tax for a band **D** (68 001-88 000) property that a property belonging to each of the other bands will pay.

- other.reference.data.income.tax.uk.local.property.price.reference.to.today
  Stores the ratio of the 1991 UK House Price Index to today's UK House Price Index. It is used to estimate the 1991 value of a property, a value that is used to calculate the local tax.

- other.reference.data.income.tax.uk.local.property.tax.average.today
  The band D local tax rate. Its use is described in the description of the bands matrix above.

User Interface Defaults

UI defaults

Default values and pre-populated fields. With gray high-lighting are default values that no UI control exists for the user to modify.

Page	Description	default
Me and My family	Client's gender	**female**
Me and My family	Client's & partner's age	**39**
Me and My family	Client's & partner's retirement age (user.default.data.asset.retirement.age.primary, user.default.data.asset.retirement.age.partner)	**67**
Me and My family	Client's & partner's health state & job type	**Good, Sedentary**
Me and My family	Children age	**2**
Income and expenses	Earned & Other incomes	**£ 50,000 p.a.**
Income and expenses	Rent income	**2% p.a.**
Income and expenses	Living & lifestyle expense	**£ 2,000 p.m.**
Income and expenses	Living & lifestyle expense survivor adjustment (user.default.data.expense.living.survivor.adjustment.percent)	**75%**
Income and expenses	Rent expense	**£ 1,000 p.m.**
Income and expenses	Other expense amount & non-discretionary vs disc	**£ 1,000 p.m**
Income and expenses	Other expense non-discretionary vs discretionary	**50%**
Assets and debts	ISAs, Pensions & GIA assets amount	**£ 50,000**
Assets and debts	Investment ISA, Pensions & Other investments risk	**Medium-high**
Assets and debts	Employer's minimum contribution. See [11].	**3%**
Assets and debts	Residential & Investment properties value	**£ 220,000 p.a.**
Assets and debts	Mortgage	**80% LTV, 3% fixed, 25Y**
Assets and debts	Credit card loan	**£ 1,500, 19.9%, 2Y**
Assets and debts	Car loan	**£ 10,000, 6.5%, 5Y**
Assets and debts	Other loan	**£ 10,000, 8%, 5Y**
Assets and debts	All loans type	**Principal amortization**

Protection	Life insurance amount of cover	**£ 250,000**
Protection	Critical illness amount of cover	**£ 187,500 (75% of Life)**
Protection	Income protection amount of cover	**£ 30,000**
Protection	All insurances extra parameters	**Not joint, up to retirement**
Protection	Other insurance amount of cover	**£ 10,000**
Protection	Other insurance type	**Life insurance**

General Simulation Defaults

Real vs Nominal

The "real" calculation is a completely different one from the "nominal" calculation, and so the achievability of goals looks very different under one vs the other. It is not consistent as to which one is better. Specifically, the "real" calculation takes the nominal returns and "deflates" them by CPI for each time step and each simulated life.

Simulated lives and random seeds

The default value of **500** simulated lives has proven to be a good trade-off between simulation speed (~ 1 second, depending on the hardware) and results stability (convergence).

When we talk about results stability we mean the variance of the results (i.e. the achievability % of each goal/outcome) when re-simulating the same scenario. With 500 simulated lives, the results are quite stable but goal achievabilities may vary up to 1% or 2%. While we consider this to be acceptable, it may pose a serious UX challenge to explain to the end-user why this is happening.

For this reason, we have chosen to **fix** the seeds of the random number generators so that we get consistently the same random numbers for a life / timestep pair across simulations.

Core Calculation Assumptions

Core calculations assumptions

Default values for the core calculations behind Envizage model

Description	default
General	
Use ISA account by default. See [6]. (simulation.parameter.savings.sequence)	**active:false annual cap: £20,000**
Default goal funding sources sequence (simulation.parameter.funding.sources)	**PNI (PERIOD_NET_INCOME), GIA, ISA, Pension**
Shortfall funding sources sequence (simulation.parameter.shortfall.funding.sources)	**PNI, GIA, ISA, Pension**
Minimum number of lives for which calculation of percentiles is performed (simulation.parameter.minimum.accepted.lives)	**30**
Default risk profile on GIA accumulation if no GIA portfolio is specified (modelling.default.data.asset.allocation.matrix)	**Cash**
Default fee of holding a financial asset if not otherwise specified (other.reference.data.assets.financial.default.fee)	**1%**
Surviving partner estate entitlement if children exist. See [12, 13]. (other.reference.data.inheritance.survivor.estate.entitlement[0])	**100%**
Surviving partner estate entitlement if parents exist. See [12, 13]. (other.reference.data.inheritance.survivor.estate.entitlement[1])	**100%**
Incomes / expenses	
Percentage of asset return on Equities is considered dividend (user.default.data.income.investment.equity.divident.percent[0]). See Breakdown of Dividends vs Capital Gains section.	**4%**
Percentage of asset return on Real is considered dividend (user.default.data.income.investment.equity.divident.percent[1]). See Breakdown of Dividends vs Capital Gains section.	**2%**
Percentage of asset return on Other is considered dividend (user.default.data.income.investment.equity.divident.percent[2]). See Breakdown of Dividends vs Capital Gains section.	**2%**
State Pension	
Age we consider that the primary started work. Used for state pension entitlement (user.default.data.income.pension.state.primary.started.work.at.age). See State Pension section.	**22**

Age we consider that the partner started work. Used for state pension entitlement (user.default.data.income.pension.state.partner.started.work.at.age). See State Pension section.	**22**
Full state pension yearly amount. See [14]. (user.default.data.income.pension.state.uk.amount)	**£ 9,339.20 (£179.60 per week)**
Years of work to be entitled to 100% of the state pension amount. See [14]. (user.default.data.income.pension.state.uk.eligibility.years.max)	**35**
Minimum years of work to be entitled to a state pension. See [14]. (user.default.data.income.pension.state.uk.eligibility.years.max)	**10**
Fixed state pension inflation rate (nominal only) (user.default.data.income.pension.state.uk.inflation.fixed.rate) See [14] and State Pension section.	**2.5%**

Statutory retirement age based on year of birth. See [15]. (user.default.data.income.pension.state.uk.payout.age.matrix)	(see table below)

Year	M	F
< 1954	**65**	**65**
1954	**66**	**66**
1960	**67**	**67**
1969	**68**	**68**

Statutory retirement age. See State Pension section. (modelling.default.data.statutory.retirement.age)	**67**

Private pension	
Default employee pension contribution, as a percentage of earned income. See [16]. (user.default.data.income.pension.employee.contribution.percent)	**5.0%**
Minimum employer pension contribution, as a percentage of the employee's earned income. See [16]. (user.default.data.income.pension.employer.contribution.min.percent)	**3.0%**
Pension annuity central premium (i.e. annuity payout rate). See [17]. (modelling.default.data.pension.annuity.central.annual.payout.rate)	**3.1%**

Depends on annuitization age (modelling.default.data.pension.annuity.payout.scaling.age)	(see table below)

Age	Factor
55	**100%**
60	**117%**
65	**138%**
70	**164%**
75	**198%**
80	**259%**

Depends on health state (modelling.default.data.pension.annuity.payout.scaling.health)	<table><tr><td>**Health**</td><td>**Factor**</td></tr><tr><td>**Healthy**</td><td>100%</td></tr><tr><td>**Smoker**</td><td>118%</td></tr><tr><td>**Drinker**</td><td>104%</td></tr><tr><td>**Critically ill**</td><td>114%</td></tr></table>	
Depends on marital status (modelling.default.data.pension.annuity.payout.scaling.married)	<table><tr><td>**Status**</td><td>**Factor**</td></tr><tr><td>**Single**</td><td>100%</td></tr><tr><td>**Married**</td><td>94%</td></tr></table>	

Goals related	
Student loan term in years that will be created after a Go to School goal is achieved (modelling.default.data.student.loans.term.years). See [18].	**30**
Student loan interest depends on income. Maximum interest rate is X% + CPI (modelling.default.data.student.loans.uk.add.to.cpi.interest.rate) See [18].	**3%**
Determines the low and high income thresholds on which interest rate depends on (modelling.default.data.student.loans.uk.undergraduate.interest.matrix). See [18].	**£ 25,726 - £ 46,305**
Student loan repayment rate (modelling.default.data.student.loans.uk.undergraduate.repayment.rate). See [18].	**9%**
Age adjusted growth rate matrix. Adjustment that will be applied on the have a kid goal amount as a yearly expense for the first 18th years of the child. (modelling.default.data.expense.raising.child.uk.age.adjusted.growth.rate.matrix) . See [19].	<table><tr><td>**Age**</td><td>**Adjust.**</td></tr><tr><td>0</td><td>100%</td></tr><tr><td>1</td><td>137.39%</td></tr><tr><td>5</td><td>70.43%</td></tr><tr><td>11</td><td>68.69%</td></tr></table>
Total years of applying the additional raising a child goal expense (modelling.default.data.expense.raising.child.years)	**18**
Years of Go To School goal duration (user.default.data.goal.school.years)	**1**
Default deposit as a percentage of the property value (user.input.goal.house.save.deposit.percent). See [20].	**20%**

Default percentage of the savings to be saved for buying a property (user.input.goal.house.save.savings.percent).	up to **75%** of my savings can be put aside to fund my savings for a house during the period that I am saving for a house when I use the SAVE_IN_YEARS funding source
Taxation	
Capital gains tax allowance. See [21]. (other.reference.data.capital.gains.tax.allowance)	**£ 12,300**
Taxable income to income tax rate lookup table (other.reference.data.income.tax.matrix). See [7, 8, 9].	**See Taxes on Income, Dividends and Capital Gains section**
Council tax is a tax on domestic property, based on their 1991 valuations. This is the bands array used to calculate the local tax. (other.reference.data.income.tax.uk.local.property.bands.matrix). See [10].	**See Property (Council) Taxes section**
Property price reference value (1991) to today's value (other.reference.data.income.tax.uk.local.property.price.reference.to.today). See [22] and Property (Council) Taxes section.	**0.2507**
Average local property tax today. The D-band rate. See [10] and Property (Council) Taxes section. (other.reference.data.income.tax.uk.local.property.tax.average.today)	**£1,750**

Taxable income to social security tax rate lookup table. See [23].
(other.reference.data.income.tax.uk.social.security.matrix)

Income	Rate
0	0%
£ 8,424	12%
£ 46,356	2%

Percentage of buy to let income to be tax-free (other.reference.data.personal.tax.allowances.buy.to.let.rental.income.percentage)	**20%**
Annual pension contribution cap. See [24]. (other.reference.data.personal.tax.allowances.employee.pension.contributions)	**£ 40,000**
Investment income allowance. See [8]. (other.reference.data.personal.tax.allowances.interest.and.dividends.allowances)	**£ 2,000**
Income tax personal allowance. See [7]. (other.reference.data.personal.tax.allowances.personal.allowance)	**£ 12,500**
Income over £ 100,000 rules: Personal allowance goes down by 1 currency unit for every 2 currency units that the adjusted net income is above this threshold. See [25]. (other.reference.data.personal.tax.allowances.personal.allowance.adjusted.net.income.threshold)	**£ 100,000**
Defines the step in the income over £ 100,000 rules. See [25]. (other.reference.data.personal.tax.allowances.personal.allowance.adjusted.net.income.step)	**2**

Taxation on excess lifetime pension drawdown. See [26]. (other.reference.data.tax.advantaged.investments.pensions.drawdown.lifetime.excess.tax.lumpsum)	**55%**
Lifetime pension draw-down limit. See [26]. (other.reference.data.tax.advantaged.investments.pensions.drawdown.lifetime.limit)	**£ 1,073,100**
Percentage of pension draw-down to be tax-free. See [27]. (other.reference.data.tax.advantaged.investments.pensions.drawdown.tax.free.percentage)	**25%**

References

[1] "Average earnings by age".
https://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-8456#fullreport

[2] "Dividend Yields - FTSE 100"
https://www.dividenddata.co.uk/dividendyield.py?market=ftse100

[3] "iShares UK Property UCITS ETF GBP (Dist) | IUKP"
https://www.morningstar.co.uk/uk/etf/snapshot/snapshot.aspx?id=0P000095BF

[4] "Financial Implications of Death of a Partner".
https://www.york.ac.uk/inst/spru/research/pdf/Bereavement.pdf

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Appendix

Table of Contents

Assumptions

Version	Last Edited By	Last Edit Date(yyyy-mm-dd)
001-SNAPSHOT	Emma Abbate	2024-11-19

Taxation

Assumption	Value					Source
Taxable income to income tax rate lookup table	Tax Bands	Income Tax Rate	Dividend Tax Rate	CGT Non-Residential Tax Rate	CGT Residential Tax Rate	GOV UK - Autumn Budget 2024
	0	0.2	0.0875	0.18	0.18	
	37700	0.4	0.3375	0.24	0.24	
	125140	0.45	0.3935	0.24	0.24	
Taxable income to social security tax rate lookup table	Tax Bands	National Insurance Tax Rate				GOV UK - National Insurance
	0	0				
	12584	0.08				
	50284	0.02				
Capital gains tax allowance	3000					GOV UK - CGT Allowance
Percentage of buy to let income to be tax free	0					GOV UK - Renting a Property
Annual pension contribution cap	60000					GOC UK - Pension Cap
Income tax personal allowance	12570					GOV UK - Personal Allowance
Maximum allowed tax free lumpsum pension portfolio percentage	0.25					GOV.UK - Tax-Free Lump Sum
Percentage of pension draw down to be tax free	0.25					GOV.UK - Tax Free Pension Drawdown
Full state pension yearly	11523.2					GOV UK - Full State

amount		Pension
Lump Sum and Death Benefit Allowance	1073100	GOV UK - Pension Drawdown Limit

Capital Markets Assumptions

Assumption	Value				Source
Asset returns matrix	Asset Class	Mean Return	Mean Volatility		Amundi
	Cash	0.04	0.01		
	Defensive	0.045	0.067		
	Growth	0.075	0.168		
	CPI	0.0285	0.01		
Asset allocation presets	Risk Profile	Cash Asset Class Allocation	Defensive Asset Class Allocation	Growth Asset Class Allocation	Amundi
	Cash	1	0	0	
	Low	0	0.7	0.3	
	Medium-low	0	0.55	0.45	
	Medium	0	0.4	0.6	
	Medium-high	0	0.25	0.75	
	High	0	0.1	0.9	
Wage growth rate spread over CPI	0.0086				

Sequences

Item	Sequence
Funding sources of the emergency fund	GENERAL_INVESTMENT_ACCOUNT, then TAX_ADVANTAGED, then PENSION
Default funding sources	GENERAL_INVESTMENT_ACCOUNT, then TAX_ADVANTAGED, then PENSION
Funding sources of the shortfall	GENERAL_INVESTMENT_ACCOUNT, then TAX_ADVANTAGED, then PENSION, then EMERGENCY_FUND

The savings ladder sequence	Distribute savings in GIA investment accounts, then Distribute savings in GIA cash accounts

Insurance Premium Calculations

Source: Example insurance premium calculators from various UK websites

Assumption	Value
Critical Illness Insurance	
Central cases's premium of critical illness insurance premiums	938.4
Scaling age of critical illness insurance premiums	<table><tr><th>Age</th><th>Scaling factor</th></tr><tr><td>25</td><td>0.57</td></tr><tr><td>30</td><td>0.74</td></tr><tr><td>35</td><td>1</td></tr><tr><td>40</td><td>1.41</td></tr><tr><td>45</td><td>2.14</td></tr><tr><td>50</td><td>3.44</td></tr><tr><td>55</td><td>5.87</td></tr></table>
Scaling cover of critical illness insurance premiums	<table><tr><th>Cover amount (£)</th><th>Scaling factor</th></tr><tr><td>50000</td><td>0.2</td></tr><tr><td>100000</td><td>0.4</td></tr><tr><td>150000</td><td>0.62</td></tr><tr><td>250000</td><td>1</td></tr><tr><td>300000</td><td>1.16</td></tr><tr><td>400000</td><td>1.48</td></tr><tr><td>500000</td><td>1.62</td></tr><tr><td>1000000</td><td>3.04</td></tr><tr><td>1500000</td><td>4.46</td></tr><tr><td>2000000</td><td>6.08</td></tr></table>
Scaling gender of critical illness insurance premiums (given in the following order UNSPECIFIED, MALE, FEMALE, TRANS_MALE, TRANS_FEMALE, OTHER_MALE, OTHER_FEMALE, OTHER)	No scaling factor
Scaling health status of critical illness insurance premiums (given in the following order EXCELLENT, GOOD, AVERAGE, POOR)	No scaling factor
Scaling job type of critical illness insurance premiums (given in the following order SEDENTARY, ACTIVE, PHYSICAL)	No scaling factor
Scaling term of critical illness insurance premiums	<table><tr><th>Term (years)</th><th>Scaling factor</th></tr></table>

		10	0.9
		15	0.95
		20	1
		30	1.28

Disability Illness Insurance (Income Protection)	
Central case's premium of disability insurance premiums	206.78

Scaling age of disability insurance premiums		
	Age	Scaling factor
	25	0.4313
	30	0.6283
	35	1
	40	1.679
	45	3.0587
	50	5.6545
	55	9.9246

Scaling cover of disability insurance premiums		
	Cover amount (£)	Scaling factor
	100000	0.6795
	150000	1
	200000	1.3205
	300000	1.9614
	500000	3.2433
	1000000	6.448

Scaling gender of disability insurance premiums (given in the following order UNSPECIFIED, MALE, FEMALE, TRANS_MALE, TRANS_FEMALE, OTHER_MALE, OTHER_FEMALE, OTHER)	No scaling factor
Scaling health status of disability insurance premiums (given in the following order EXCELLENT, GOOD, AVERAGE, POOR)	No scaling factor
Scaling job type of disability insurance premiums (given in the following order SEDENTARY, ACTIVE, PHYSICAL)	No scaling factor

Scaling term of disability insurance premiums		
	Term (years)	Scaling factor
	10	0.4071
	15	0.5364
	20	0.7255
	25	1
	30	1.4275

Life Insurance	
Central case's premium of life insurance premiums	187.68
Scaling age of life insurance premiums	

	Age	Scaling factor
	25	0.57
	30	0.74
	35	1
	40	1.41
	45	2.14
	50	3.44
	55	5.87

Scaling cover of life insurance premiums	Cover amount (£)	Scaling factor
	150000	0.62
	250000	1
	300000	1.16
	400000	1.48
	500000	1.62
	1000000	3.04
	1500000	4.46
	2000000	6.08

Scaling gender of life insurance premiums (given in the following order UNSPECIFIED, MALE, FEMALE, TRANS_MALE, TRANS_FEMALE, OTHER_MALE, OTHER_FEMALE, OTHER)	No scaling factor
Scaling health status of life insurance premiums (given in the following order EXCELLENT, GOOD, AVERAGE, POOR)	No scaling factor
Scaling job type of life insurance premiums (given in the following order SEDENTARY, ACTIVE, PHYSICAL)	No scaling factor

Scaling term of life insurance premiums	Term (years)	Scaling factor
	10	0.9
	15	0.95
	20	1
	30	1.28

Mortgage Life Insurance	
Central case's premium of life insurance premiums	187.68

Scaling age of life insurance premiums	Age	Scaling factor
	25	0.57
	30	0.74
	35	1
	40	1.41
	45	2.14

	50	3.44
	55	5.87

Scaling cover of life insurance premiums	Cover amount (£)	Scaling factor
	150000	0.62
	250000	1
	300000	1.16
	400000	1.48
	500000	1.62
	1000000	3.04
	1500000	4.46
	2000000	6.08

Scaling gender of life insurance premiums (given in the following order UNSPECIFIED, MALE, FEMALE, TRANS_MALE, TRANS_FEMALE, OTHER_MALE, OTHER_FEMALE, OTHER)	No scaling factor	
Scaling health status of life insurance premiums (given in the following order EXCELLENT, GOOD, AVERAGE, POOR)	No scaling factor	
Scaling job type of life insurance premiums (given in the following order SEDENTARY, ACTIVE, PHYSICAL)	No scaling factor	

Scaling term of life insurance premiums	Term (years)	Scaling factor
	10	0.9
	15	0.95
	20	1
	30	1.28

Diagnostics (Next Best Actions)

Assumption	Value
Employee pension contribution to high risk diagnostic – Decrease pension pot riskiness to specified allocation preset name	low
Employee pension contribution to low risk diagnostic – Increase pension pot riskiness to specified allocation preset name	high
Insufficient critical illness protection diagnostic – Increase or add critical illness insurance to cover for specified percentage of household expenses	0.66
Insufficient disability protection diagnostic – Increase or add disability insurance to cover for specified percentage of household expenses	0.6
Insufficient pension savings diagnostic – Increase pension contributions to that factor	2

Insjfficient tax advantaged savings diagnostic – Enable saving in a tax advantaged wrapper.	isa
Unsupportable lifestyle diagnostic – Reduce living expenses to that percentage	0.9
Spend on previous goals diagnostic – Years before diagnosed goal to remove goals	5
Too expensive goal diagnostic – Reduce goal amount to that percentage	0.9
Too expensive goal diagnostic – Reduce goal amount to that percentage (only for buy to let and buy a house goal)	0.8
Too illiquid balance sheet diagnostic – Reduce residential property value and mortgage to that percentage	0.9
Unsupportable debt diagnostic – Reduce loans to that percentage	0.9
Default loan LTV	0.5

	House value	Loan rate
Default loan rate matrix	0	0.15
	3000	0.08
	5000	0.04
	7500	0.03

Default loan term	4
Default mortgage LTV	0.8
Default mortgage rate	0.0425
Default mortgage term	25
The mortgage may be too expensive diagnostic – Mortgage increase when remortgaging	0.05
Short term volatility diagnostic – Number of years before goal to revert to the default asset allocation matrices	3
Client's lifestyle expenses diagnostic – Reduce living expenses to that percentage	0.9
Down-payment is unaffordable diagnostic – Increase mortgage rate by this rate	0.01
Downpayment is unaffordable diagnostic – Decrease downpayment to that percentage	0.9
Remortgage diagnostic – Buffer for the mortgage affordability test	0.05
Delay the goal diagnostic – Move retirement goal to the future in years	3
Delay the goal diagnostic – Move goal to the future in years	1
Save for the goal diagnostic – Save before reaching that goal date in years	3
Goal is too expensive diagnostic – Spend less on goal (property related)	0.8
Goal is too expensive diagnostic – Spend less on goal, retirement related. In this case it will reduce both post-retirement expense values.	0.75
Goal is too expensive diagnostic – Spend less on goal (not property	0.9

related)	
Prior goals consume too much money diagnostic – Years before diagnosed goal to remove goals	5
Not enough income diagnostic – Add income amount if not earning	50000
Not enough income diagnostic – Increase income by that percentage	0.1
Work part time after retirement diagnostic – Maximum age of post-retirement part-time work	80
Work part time after retirement diagnostic – Income percentage of post-retirement part-time work	0.5
Critical illness insurance policy doesn't cover enough diagnostic – Total Liabilities + 5x 1st year household expenses	5
Income protection policy doesn't cover enough diagnostic – Disability annual payout cover of annual earned income percentage	0.6
Life insurance policy doesn't cover enough diagnostic – Total Liabilities + 5x 1st year household expenses	5
User is too unhealthy diagnostic – Try increasing health status	1
Move to a smaller property diagnostic – Trade down house percentage	0.75
Increase pension contribution diagnostic – Increase earned income pecentage saved by this figure	0.01

Other Assumptions

Assumption	Value		
Number of simulated lives	1000		
Buy A House goal eligibility mortgage check. Mortgage should be smaller than the sum of primary and partner annual earned incomes amount multiplied by this multiplier	3		
Buy A House goal eligibility mortgage check. Mortgage should be smaller than annual earned income amount multiplied by this multiplier	4		
Net rental yield as a percentage of the house value	0.037		
Age-adjusted earned income growth rate matrix	Age	Scaling factor	
	20	0.025	
	30	0.016	
	40	0.004	
	50	-0.005	
Earned income adjustment based on the amount	Income (£)	Scaling factor	
	0	0.004	
	84000	0.008	
	185000	0.012	

Percentage of asset return on equities is considered dividend (0 = Equities, 1 = Real, 2 = Other)	Asset Type	Return Percentage
	Equities	0.04
	Real	0.02
	Other	0.02

Multiplier to be applied to earned income after achieving a go to school goal and resume work	1.18
Percentage of the original property that the automatic trade down for crisis funding will happen	0.6
Threshold of household being in debt before triggering automatic trade down of primary residential property for crisis funding	25000
Threshold of house price under which the property is sold instead of being traded down	115000

Actuarial Assumptions

Assumption	Source
Mortality rates	ONS
Critical illness rates	UK Institute and Faculty of Actuaries CMI board
Disability rates	Example disability table, used to show the chance of income ceasing due to illness
Disability recovery female rates	Example disability table, used to show the chance of income ceasing due to illness
Disability recovery male rates	Example disability table, used to show the chance of income ceasing due to illness