EQUINITI

InFocus Document

Quick Scenario Modelling (QSM)

Contents

1 Introduction **3**

2 Groups for Financial Assumptions **5**

3 Post-Retirement Mortality Adjustments **7**

4 Valuation Runs & Consolidation **8**

5 Summarise Financial Assumptions **10**

6 Quick Scenario Modeller **13**

6.1 Consolidation Database 13
6.2 Liability Filters 13
6.3 Benefit Variations 14
6.4 Financial Assumption Adjustments 14
6.5 Post-Retirement Mortality Assumption 14
6.6 Amortisation of Surplus/Deficit 15
6.7 Amortisation Solver 15
6.8 Future Service Funding Rate 16
6.9 Type of Graph 16
6.10 Output 21
6.11 Saving Scenarios 22

7 Limitations **23**

1 Introduction

The Quick Scenario Modeller (QSM) module allows the User to quickly vary valuation assumptions (without running a SuperVal valuation):

- financial assumptions (allowing for any prospective caps and collars)
- post-retirement mortality (by a change in mortality rates or improvement)
- limiting future benefit accrual
- deficit / surplus amortisation

by manipulating valuation cash flows to gain approximate results to be able to investigate the effect on:

- liabilities (total or broken down by assumption change)
- cash flows
- financial position (total or broken down by membership class)
- Employer future funding rate
- total Employer contributions

QSM could be used when:

- deciding upon changes to the previous valuation basis
- looking at the effect of future what-if scenarios against the valuation result
- modifying valuation results to produce valuations used for other purposes such as Accounting valuations

For the QSM a new concept of Grouping has been introduced for Financial Assumptions. Financial assumptions that have the same underlying economic assumption (e.g. all assumptions related to RPI) can be grouped together and a single adjustment can be applied to these grouped assumptions (the adjustment is typically relative to the original assumption and will allow for prospective caps/collars).

Grouping provides a powerful way to make adjustments to related assumptions at one time.

Financial assumptions can be adjusted in a variety of methods:

- a relative (additive) change (scalar or vector)
- a percentage (multiplier) change (scalar or vector)
- a new assumption (useful when specifying a new yield curve for a proposed valuation basis, original caps and collars will apply)

If Spouse cashflows are stored separate to member cashflows (a new option in SuperVal), post-retirement mortality or mortality improvement can be adjusted, currently by a simple percentage reduction or improvement per year.

The QSM allows Future service accrual to be ceased after a specified period and for pensions to be capitalised at exit with an Expense/Profit loading.

Deficits can be amortised in two tranches over specified term(s) expressed as:

- a percentage of salaries
- level amounts
- a fixed amount plus interest on the outstanding balance

The results of the adjustments can be viewed graphically in a number of ways:

- change in total liabilities or the contribution of each assumption change to the liability change
- change in the financial position or the contribution of each membership class to the financial position change
- change in projected cash flows
- change in Employer contributions or change in the future service Funding Rate
- selecting a subset of the Membership Classes

Any scenario result can be saved to a file to be reviewed later (or to display in later discussions with clients).

The QSM is based on the current valuation structure with a few extra steps:

- Set up Groups in the Financial Assumptions
- Set Valuation Flags (ALM/LDI results required in Batching and, if post-retirement Mortality adjustments are required, Separate Spouse cash flows flag in Scheme Details)
- Consolidation of your Valuation Runs (consolidating ensures the Categories included represent a "Scheme" and allows an Asset value, Amortisations and Expenses to be specified)
- Summarise Financial Assumptions (in the Consolidation database)
- Run the Quick Scenario Modeller.

This document gives a summary of how the QSM module works in SuperVal and illustrates how the results are displayed and stored.

2 Groups for Financial Assumptions

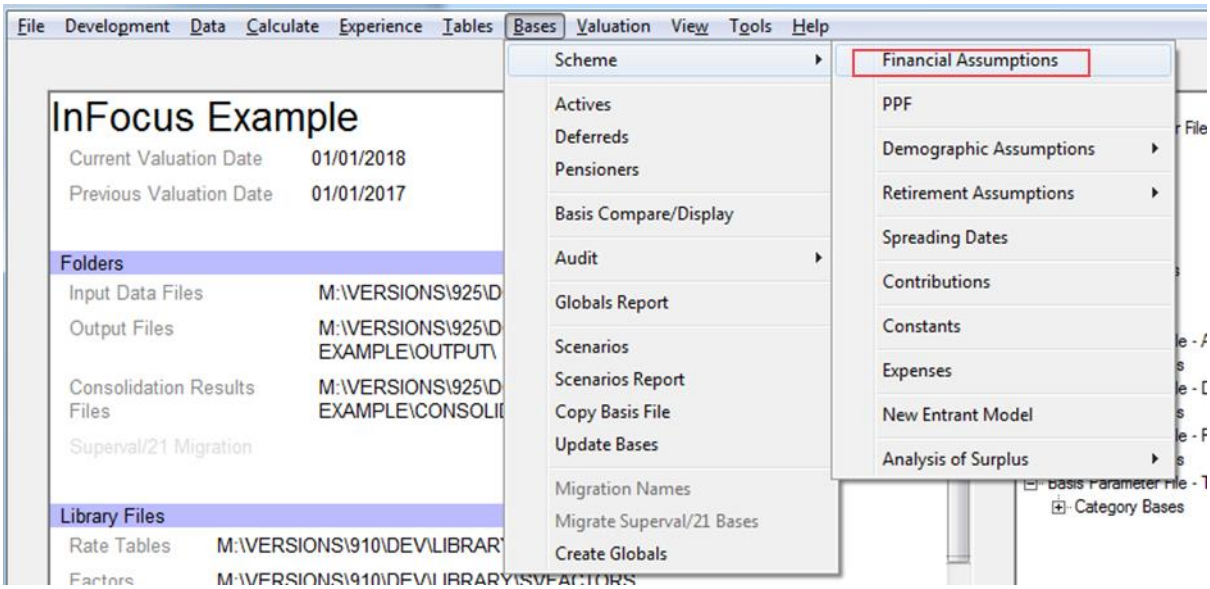
For the QSM a new concept of Grouping has been introduced for Financial Assumptions.

Financial assumptions that have the same underlying economic assumption (eg all assumptions related to RPI) can be grouped together and a single adjustment can be applied to these grouped assumptions in the QSM.

Grouping has the advantage of Users unfamiliar with the detail of the SuperVal bases can use the QSM by way of Grouping names and means that related financial assumptions applying across a number of different Membership Classes and Categories can be varied with a single change.

To set up Groupings:

- Select Bases > Scheme > Financial Assumptions



- Select “Add / Edit” Financials for the financial set to be used in the run.

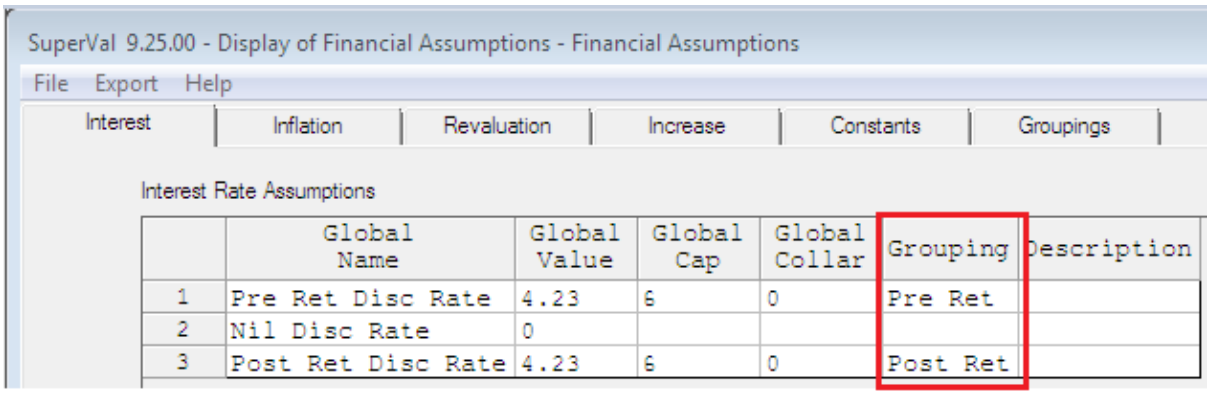
The tabs Interest, Inflation, Revaluation and Increase now have an extra column: “Grouping”.

In the “Grouping” column either:

- Right click to display the current Groupings list (which has been listed in the “Groupings” tab - see below); or
- type a new descriptive name (one not already on the Groupings list) – which will then be added to the list on the “Groupings” tab.

Note that these can be called anything, but grouped assumptions will move in unison. The QSM currently supports 10 different groupings (there is no theoretical limit to the number of Groups but this is considered to be a likely practical limitation if assumptions are appropriately grouped).

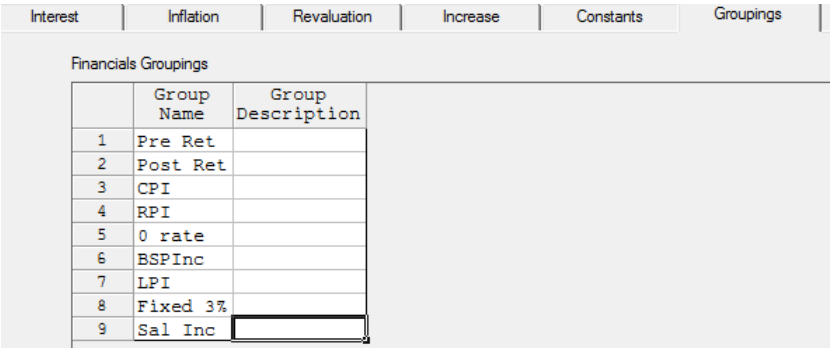
E.g.



	Global Name	Global Value	Global Cap	Global Collar	Grouping	Description
1	Pre Ret Disc Rate	4.23	6	0	Pre Ret	
2	Nil Disc Rate	0				
3	Post Ret Disc Rate	4.23	6	0	Post Ret	

If a financial assumption is fixed, the Grouping should be left blank and this assumption will not be available to specify any variation.

There is now an extra tab under "Financial Assumptions" called Groupings.



	Group Name	Group Description
1	Pre Ret	
2	Post Ret	
3	CPI	
4	RPI	
5	0 rate	
6	BSPInc	
7	LPI	
8	Fixed 3%	
9	Sal Inc	

A Grouping Name can be added either:

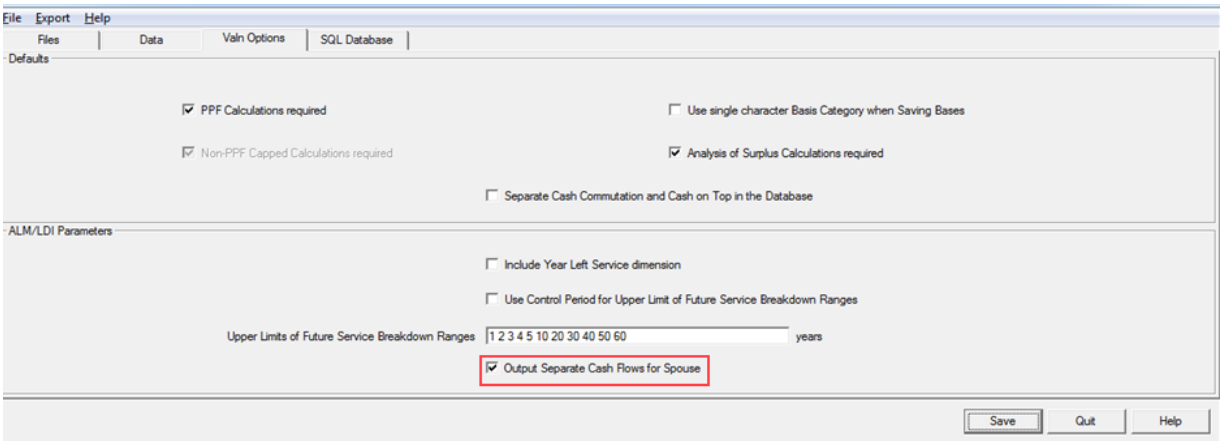
- to the Interest, Inflation, Revaluation or Increase tabs which will be automatically added to the Groupings tab, or
- under the Groupings tab and this list can then be used in the Interest, Inflation, Revaluation and Increase tabs

Note also that in Version 9.25, Users can now define prospective caps and collars for interest, inflation, revaluation and increase in the Financial Assumption grid. These values can be entered as a scalar value. The Caps and Collars will be applied within the Quick Scenario Modelling calculations (with any adjustment restricted to the specified range).

3 Post-Retirement Mortality Adjustments

The post-retirement Mortality adjustments in QSM rely on having separate member and spouse pension cash flows stored in the database.

To create separate output for Cashflows for Spouses in SuperVal, tick the box “Output Separate Cashflows for Spouse” under File > Properties > Valn Options.



In the QSM, post-retirement mortality or mortality improvement can be adjusted, currently by a simple percentage reduction or percentage improvement per year.

More complex mortality improvement models could be coded, if required.

The "average" mortality underlying pension cashflows is derived from the cashflows by removing the inflationary elements (inflation, revaluation and increases) leaving a set of cashflows decreasing over time only as a result of the "average" mortality.

Thus, if mortality adjustments are to be performed in the QSM, it is important that the inflationary elements are specified as accurately as possible. This is particularly relevant where multiple tranches of benefit (which may have different underlying rates of inflation and revaluation) are grouped because they relate to the same Pension Increase. As the rates of inflation and revaluation extracted by SuperVal when Summarising Financial Assumptions (see below) will relate to just one tranche of benefit, some judgement may be required to adjust these rates to represent the "average" rate over all tranches grouped by Pension Increase.

4 Valuation Runs & Consolidation

The QSM will only work with valuation runs with:

- the ALM/LDI Interface Required field ticked in the Batch parameters; and
- spread pension benefits (pension benefits can be capitalised at the point of commencement in the QSM, if required).

Currently, the QSM will not work with Accurate Scenario valuation runs.

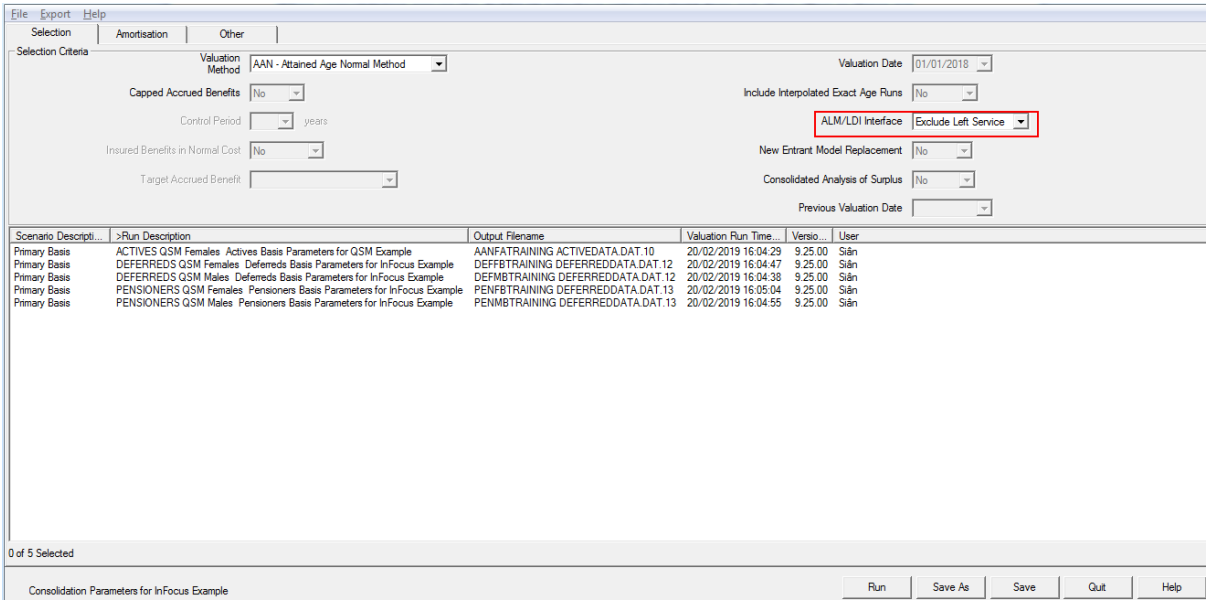
The QSM requires a Consolidation database.

The rationale for this is Consolidation forces the user to select a group of homogeneous runs (in terms of Valuation Method, Control Period, etc.) which represent a "Scheme" (whether that be all membership classes or a single class) for whom a segregated amount of assets can be ascertained.

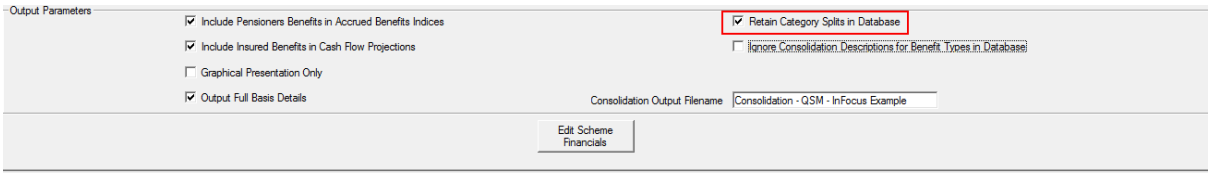
It also allows other assets and liabilities to be included such as:

- two tranches of Amortisation Contributions
- an Asset Value
- other Liabilities (such as Additional Accumulations, post-valuation significant Asset gains/losses, etc.)
- Scheme expenses (note that they currently only relate to Actives members - additional expense elements for Other Membership Classes can be added, if required).

When consolidating ensure the ALM/LDI Interface selection field does not show "No" as these are the cashflows used by the QSM - it should be either "Exclude Left Service" or "Include Left Service" (depending on whether the Left Service dimension (File > Properties > Valn Options) was flagged in the valuation runs).



The Retain Category Splits in the Database field should be ticked (QSM works at Sex/Category level in its calculations as there may be differences in financial assumptions between Categories).

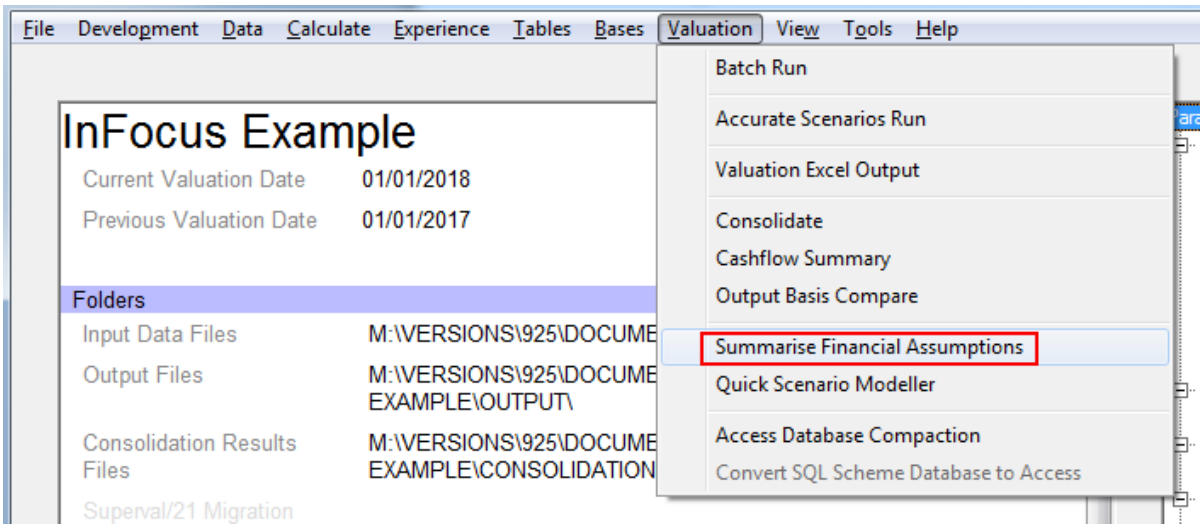


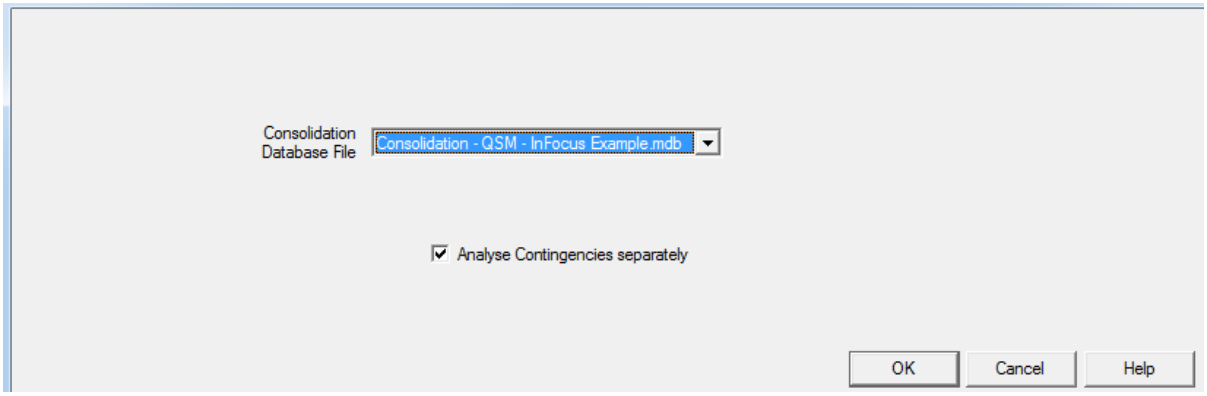
5 Summarise Financial Assumptions

The QSM uses the Financial Assumptions used in valuation runs as well as some elements of the Scheme benefit design and the actuarial basis to remove inflationary elements (and mortality, if desired) from the valuation cash flows (these deflated cash flows can have adjusted assumptions applied to them to produce adjusted valuation results).

The extraction of this data is carried out in the Summarise Financial Assumptions module.

Select Valuation -> Summarise Financial Assumptions





Select the Consolidation Database to be summarised.

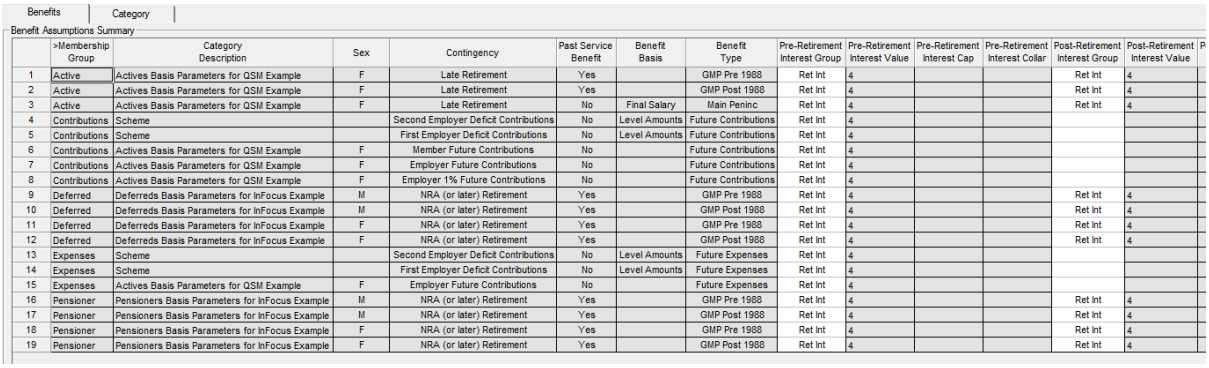
If "Analyse Contingencies separately" tick box is checked, the Financial Assumptions summary (and the consequent QSM calculations) will be separated by Contingency. If it is left unchecked, QSM will run slightly quicker but all benefits in each Category will be assumed to have the same Financial Assumptions and benefit basis as the Retirement benefit.

If Summarise Financial Assumptions has previously been run on the selected Consolidation Database, the results of that summarising will simply be extracted from the database (unless "Analyse Contingencies separately" tick box is checked and it wasn't checked last time, in which case the Summary of Financial Assumptions will be performed again broken down by Contingency).

Ultimately, it will display the information extracted from the Valuation Bases as:

- a table (on the Benefits tab) showing Benefit level information broken down by Membership Class, Category, Sex, Benefit Type, Past or Future Service benefit and, if requested, Contingency
- a table (on the Category tab) showing Category level information broken down by Membership Class, Category and Sex.

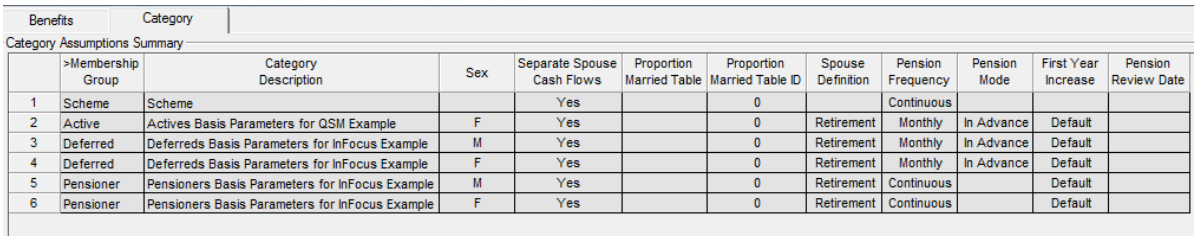
Below is an example of the tables (only part is shown):



Benefits | Category

Benefit Assumptions Summary

	>Membership Group	Category Description	Sex	Contingency	Past Service Benefit	Benefit Basis	Benefit Type	Pre-Retirement Interest Group	Pre-Retirement Interest Value	Pre-Retirement Interest Cap	Pre-Retirement Interest Collar	Post-Retirement Interest Group	Post-Retirement Interest Value
1	Active	Actives Basis Parameters for QSM Example	F	Late Retirement	Yes		GMP Pre 1988	Ret Int	4			Ret Int	4
2	Active	Actives Basis Parameters for QSM Example	F	Late Retirement	Yes		GMP Post 1988	Ret Int	4			Ret Int	4
3	Active	Actives Basis Parameters for QSM Example	F	Late Retirement	No	Final Salary	Main Peninc	Ret Int	4			Ret Int	4
4	Contributions	Scheme		Second Employer Deficit Contributions	No	Level Amounts	Future Contributions	Ret Int	4				
5	Contributions	Scheme		First Employer Deficit Contributions	No	Level Amounts	Future Contributions	Ret Int	4				
6	Contributions	Actives Basis Parameters for QSM Example	F	Member Future Contributions	No		Future Contributions	Ret Int	4				
7	Contributions	Actives Basis Parameters for QSM Example	F	Employer Future Contributions	No		Future Contributions	Ret Int	4				
8	Contributions	Actives Basis Parameters for QSM Example	F	Employer 1% Future Contributions	No		Future Contributions	Ret Int	4				
9	Deferred	Deferreds Basis Parameters for InFocus Example	M	NRA (or later) Retirement	Yes		GMP Pre 1988	Ret Int	4			Ret Int	4
10	Deferred	Deferreds Basis Parameters for InFocus Example	M	NRA (or later) Retirement	Yes		GMP Post 1988	Ret Int	4			Ret Int	4
11	Deferred	Deferreds Basis Parameters for InFocus Example	F	NRA (or later) Retirement	Yes		GMP Pre 1988	Ret Int	4			Ret Int	4
12	Deferred	Deferreds Basis Parameters for InFocus Example	F	NRA (or later) Retirement	Yes		GMP Post 1988	Ret Int	4			Ret Int	4
13	Expenses	Scheme		Second Employer Deficit Contributions	No	Level Amounts	Future Expenses	Ret Int	4				
14	Expenses	Scheme		First Employer Deficit Contributions	No	Level Amounts	Future Expenses	Ret Int	4				
15	Expenses	Actives Basis Parameters for QSM Example	F	Employer Future Contributions	No		Future Expenses	Ret Int	4				
16	Pensioner	Pensioners Basis Parameters for InFocus Example	M	NRA (or later) Retirement	Yes		GMP Pre 1988	Ret Int	4			Ret Int	4
17	Pensioner	Pensioners Basis Parameters for InFocus Example	M	NRA (or later) Retirement	Yes		GMP Post 1988	Ret Int	4			Ret Int	4
18	Pensioner	Pensioners Basis Parameters for InFocus Example	F	NRA (or later) Retirement	Yes		GMP Pre 1988	Ret Int	4			Ret Int	4
19	Pensioner	Pensioners Basis Parameters for InFocus Example	F	NRA (or later) Retirement	Yes		GMP Post 1988	Ret Int	4			Ret Int	4



Benefits | Category

Category Assumptions Summary

	>Membership Group	Category Description	Sex	Separate Spouse Cash Flows	Proportion Married Table	Proportion Married Table ID	Spouse Definition	Pension Frequency	Pension Mode	First Year Increase	Pension Review Date
1	Scheme	Scheme		Yes		0		Continuous			
2	Active	Actives Basis Parameters for QSM Example	F	Yes		0	Retirement	Monthly	In Advance	Default	
3	Deferred	Deferreds Basis Parameters for InFocus Example	M	Yes		0	Retirement	Monthly	In Advance	Default	
4	Deferred	Deferreds Basis Parameters for InFocus Example	F	Yes		0	Retirement	Monthly	In Advance	Default	
5	Pensioner	Pensioners Basis Parameters for InFocus Example	M	Yes		0	Retirement	Continuous		Default	
6	Pensioner	Pensioners Basis Parameters for InFocus Example	F	Yes		0	Retirement	Continuous		Default	

The rows in the tables can be sorted by Right Clicking in the column header (Right Clicking on the first column header restores the original order).

Most of the entries in these tables are protected and cannot be changed (as their value is known with certainty) but some on the Benefits table are able to be changed (as they are either user-defined or the value may be one (or an average) of many values) as follows:

- Groups - the user can change Financial Groups (perhaps noting an issue after running the QSM) to:
  - separate Financial Assumptions (currently grouped)
  - group separate groups of Financial Assumptions together
  - remove groups that are not needed.

- Inflation and Revaluation assumptions - where multiple tranches of benefit (which may have different underlying rates of inflation and revaluation) are combined because they relate to the same Pension Increase, the rates of inflation and revaluation extracted by SuperVal when Summarising Financial Assumptions will relate to just one tranche of benefit. Some judgement may be required to adjust these rates (and their corresponding caps and collars) to represent the "average" rate over all tranches grouped by Pension Increase. Note that only a numeric value (scalar or vector) can be specified.

  Any mortality adjustments performed in the QSM rely on the accuracy of the inflationary elements specified as the "average" mortality underlying pension cashflows is derived from the cashflows by removing the inflationary elements (inflation, revaluation and increases) leaving a set of cashflows decreasing over time only as a result of the "average" mortality only.

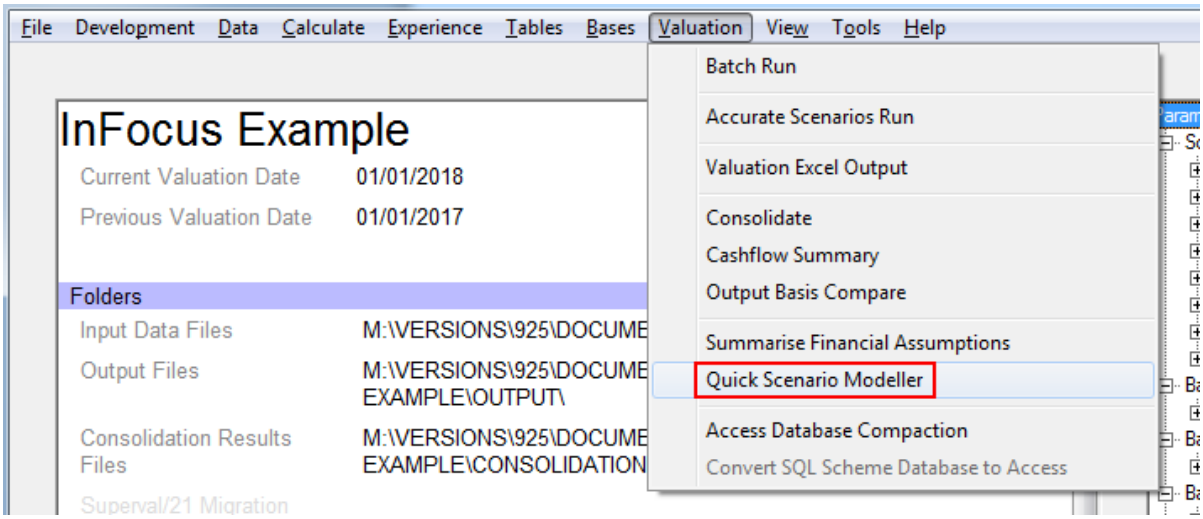
These summarised Financial (and other benefit basis and actuarial basis) Assumptions, including any changes made, are stored in the database.

The Benefit Basis column includes a description of the liability, which guides the calculations in the QSM, such as:

- Final Salary (use the Final Average Salary period when inflating)
- CARE (use Revaluations for Past service and use both Revaluation and Salary Inflation for Future service)
- Valn Basis Pro Rata (for Valuation Basis Cash Commutation allows the Cash Commutation to be recalculated on the adjusted Valuation basis)
- Cash (for Pensioners to indicate a Cash benefit - revalued only)
- the Amortisation method being used for the amortisation tranche.

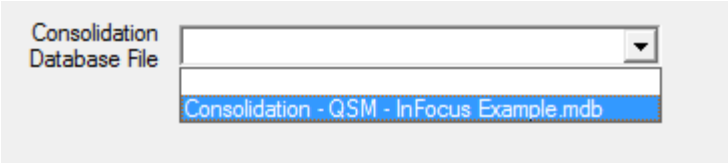
6 Quick Scenario Modeller

Next select Valuation -> Quick Scenario Modeller



6.1 Consolidation Database

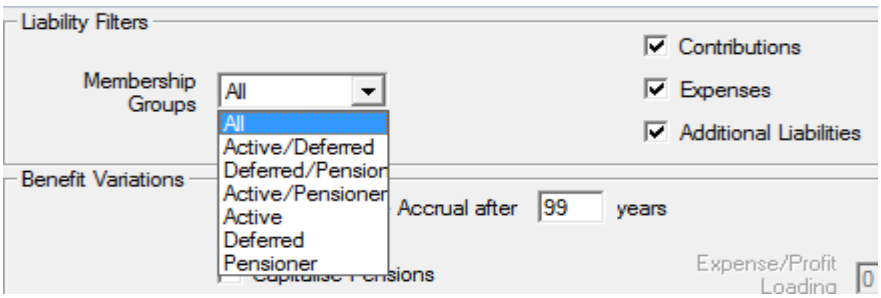
Select the Consolidation Database File that is to be used.



6.2 Liability Filters

The user can restrict the membership classes (All, any combination of two, or Actives, Deferreds or Pensioners) to be included in the calculations.

The user can also select whether or not to include contributions (Actives Member and Employer and Amortisations) and / or expenses and / or additional liabilities (if there are any). Note that, for the purposes of cashflows, any Consolidation additional liabilities are "paid out" immediately as the nature of the liability is unknown.

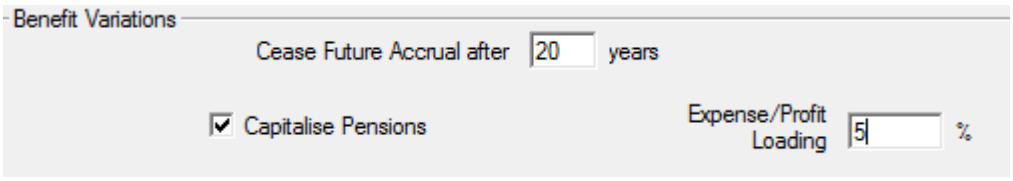


6.3 Benefit Variations

The user can restrict Future benefit accrual to a (integral or non-integral) period of years.

Note that this calculation assumes uniform accrual of future service benefits over the period up to the point of exit. Thus any benefit design that includes a maximum service accrual period, non-uniform future benefit accrual (other than CARE which has been allowed for) or where the benefits already have a limit on future accrual, the calculations will be inaccurate.

The user can also capitalise pensions at the point of exit (to simulate a buy-out) using the adjusted post-retirement assumptions. A profit / expenses loading can also be applied to these capitalised amounts.



6.4 Financial Assumption Adjustments

The Financial Assumptions can be adjusted in the following ways:

- a Relative Change (positive or negative additive change)
- a % Change (positive or negative multiplier change)
- a % of Current Value: 100 + % Change
- New Values: Ignores the current value

There are three different adjustments which can be used:

- A single number (negative or positive)
- A vector of numbers (negative or positive) separated by a space (limit of 50 digits)
- A yield curve file (.csv file)

Each value in a vector or a yield curve relates to one projection year and the last value applies for the remainder of the term.

The New Values option may be most useful when deciding upon changes to the previous valuation basis - particularly when yield curves are used for Financial Assumptions.

6.5 Post-Retirement Mortality Assumption

The user can specify a scalar or a vector percentage adjustment here.

If the “per Annum” box is unchecked, it is an adjustment to the mortality rates by the percentage specified.

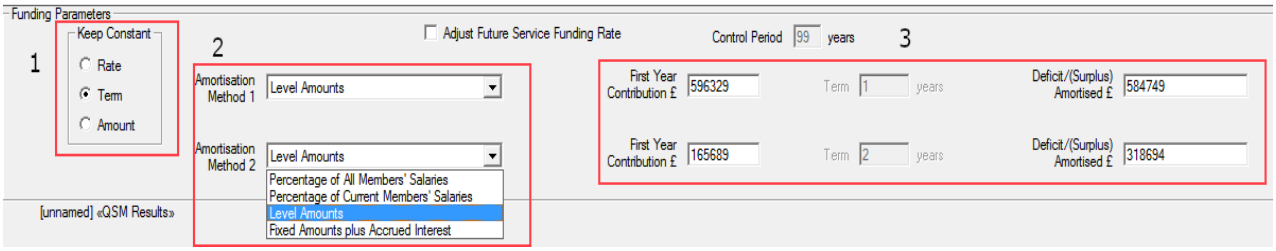
If the “per Annum” box is checked, it is an adjustment to the mortality improvement ie

π_t (1-mortality adjustment$_t$) at time t.

6.6 Amortisation of Surplus/Deficit

When consolidating, the surplus / deficit can be amortised using 2 tranches.

These amortisation tranches can then be altered within the QSM:



1 Select one of the rate, term or amount to be kept constant.

2 Choose one of four amortisation methods:

- Percentage of All Members' Salaries (including New Entrants)
- Percentage of Current Members' Salaries
- Level Amounts
- Fixed Amounts plus Accrued Interest

3 The field chosen in 1 to remain constant is greyed out in 3. Changing any of the remaining available fields alters the other available field for that tranche.

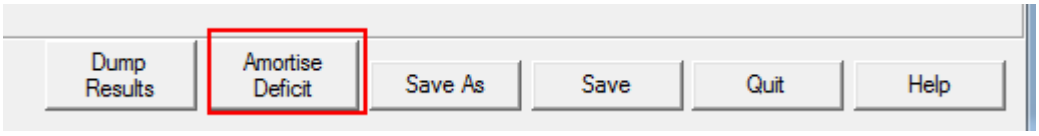
Thus you can alter the amount of deficit / surplus that is amortised (if the Amount is not selected to remain constant) by changing the either the Amount or the Rate or Term (depending on which is available).

If the Amount is kept constant, changing the Rate or Term will simply change the other to amortise the given amount of amortisation.

In the above example, "Term" is chosen to remain constant, so if "First Year Contribution" is increased/decreased, "Deficit/(Surplus) Amortised" will increase/decrease or vice versa if the Deficit(Surplus) is changed.

6.7 Amortisation Solver

Alternatively, the "Amortise Deficit" button can be used to amortise any resultant deficit/(surplus) (after any assumption adjustments) so that the Liabilities are fully funded.



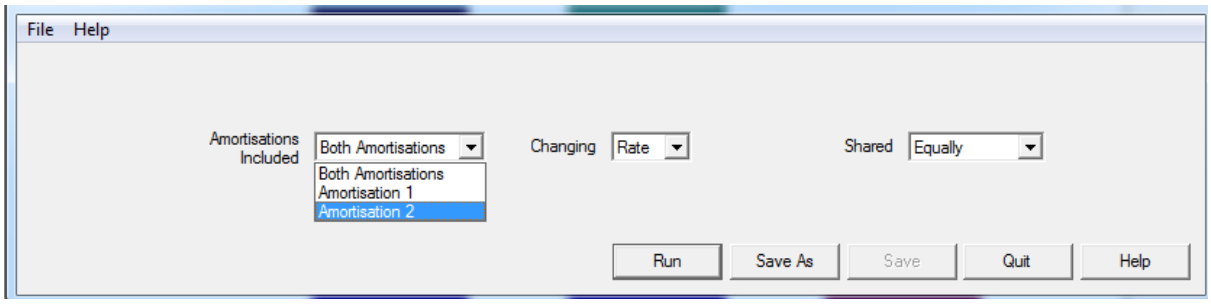
The Amortisation Solver can spread the amortisation over either or both of the two amortisation tranches by changing either:

- the Rate of Contribution or the Term of the Contributions

and, if both selected, either:

- Equally or Proportionally.

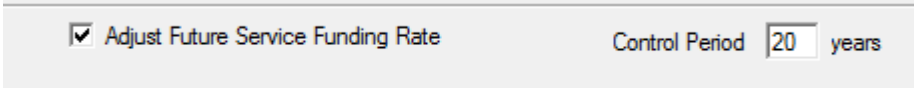
Press Run and the Amortisation fields will be updated with the required values.



6.8 Future Service Funding Rate

The rate (i.e. the percentage of salaries) of future service "normal" Employer Contributions (i.e. non-amortisation contributions) can be varied in line with the adjustments in the valuation basis by checking the Adjust Future Service Funding Rate box.

For the PUC method, the user can also change the Control Period.



If the Adjust Future Service Funding Rate box is unchecked, the future service "normal" Employer Contribution rate will remain unchanged.

In both cases, the amount of these contributions will be affected by changes in the inflationary component underlying the contributions and their value will also be affected by changes in the discount rate applying.

Note that future service "normal" Employer Contributions are calculated at member level in the valuation but the QSM calculation is based on groups of members by Sex/Category. As a consequence, there will be some minor differences when compared to a valuation run - particularly for a small group of members.

6.9 Type of Graph

There are seven options to graphically display the results (by selecting “Type of Graph”):

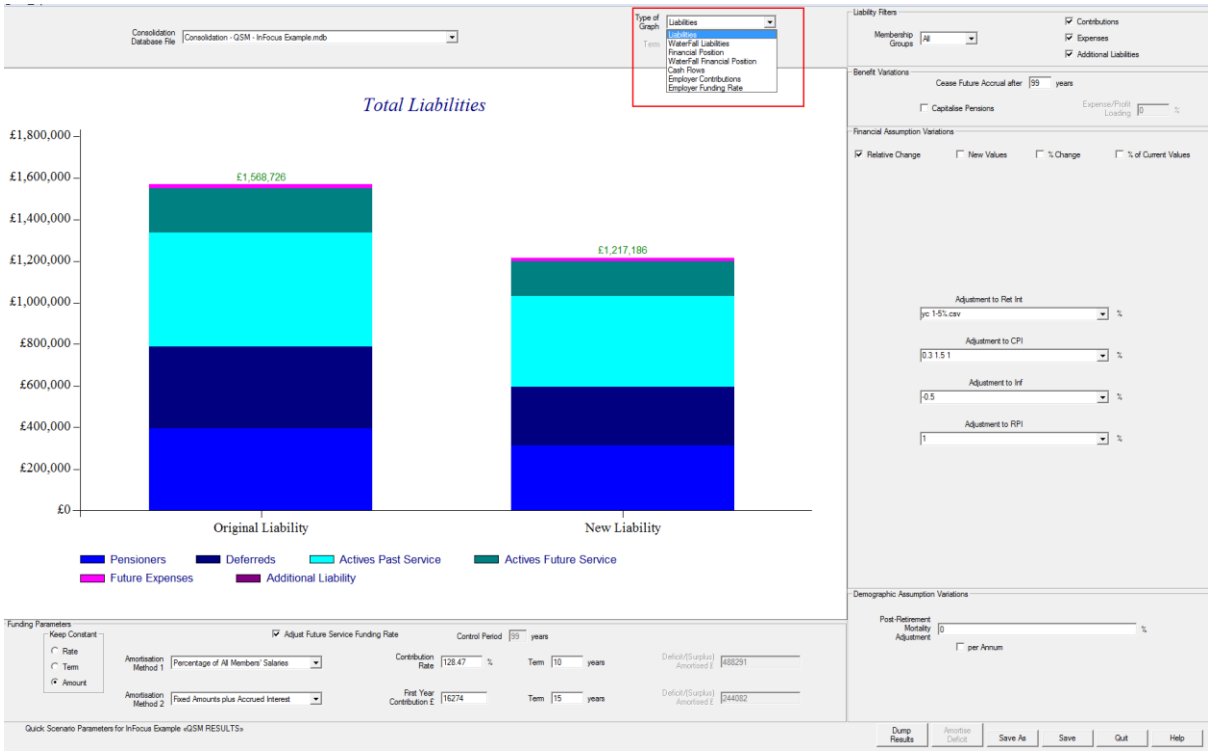
- Liabilities

- Waterfall Liabilities
- Financial Position
- Waterfall Financial Position
- Cash flows
- Employer Contributions
- Employer Funding Rate

All the graphs respond immediately to adjustments made to any of the liability filters, benefit variations, valuation assumptions or amortisations.

6.9.1 Liabilities

The Liabilities graph displays the liabilities broken down by Membership Class and Past/Future Service (including expense and additional liabilities specified in consolidation) on the valuation basis and after adjustments:

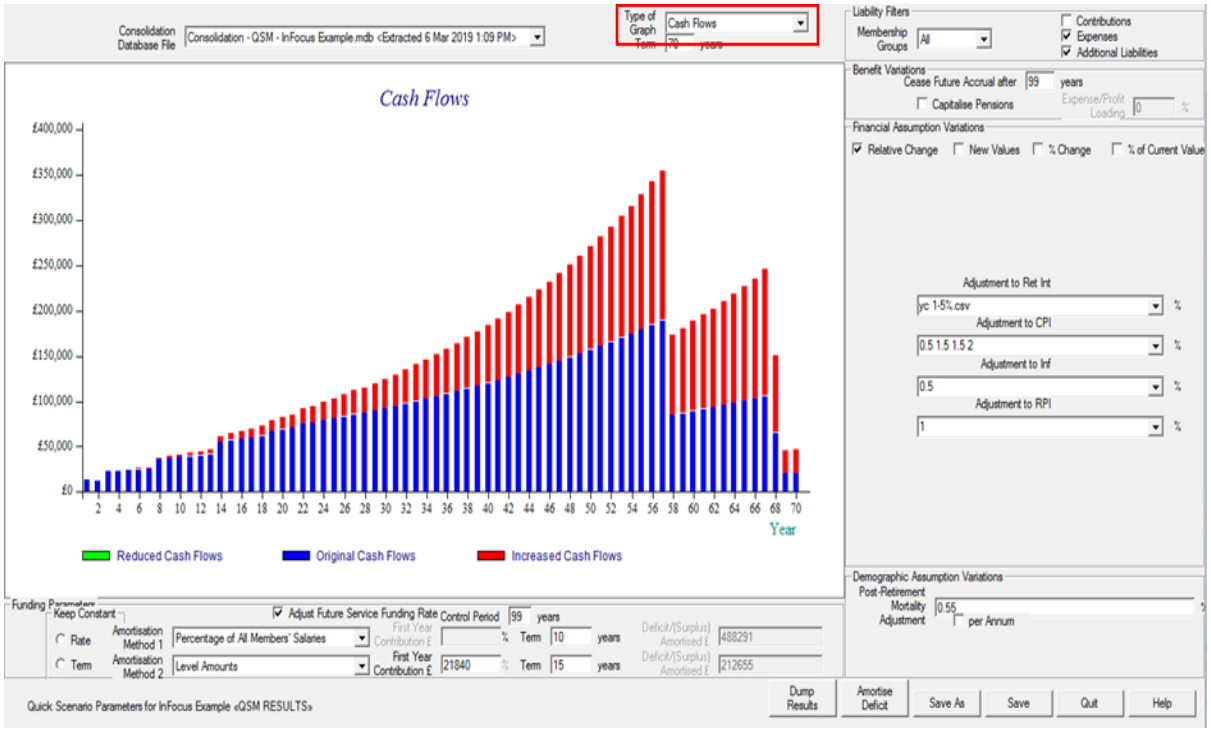


6.9.2 Waterfall Liabilities

The Waterfall Liabilities graph displays the change in liabilities broken down by the Assumption Change:

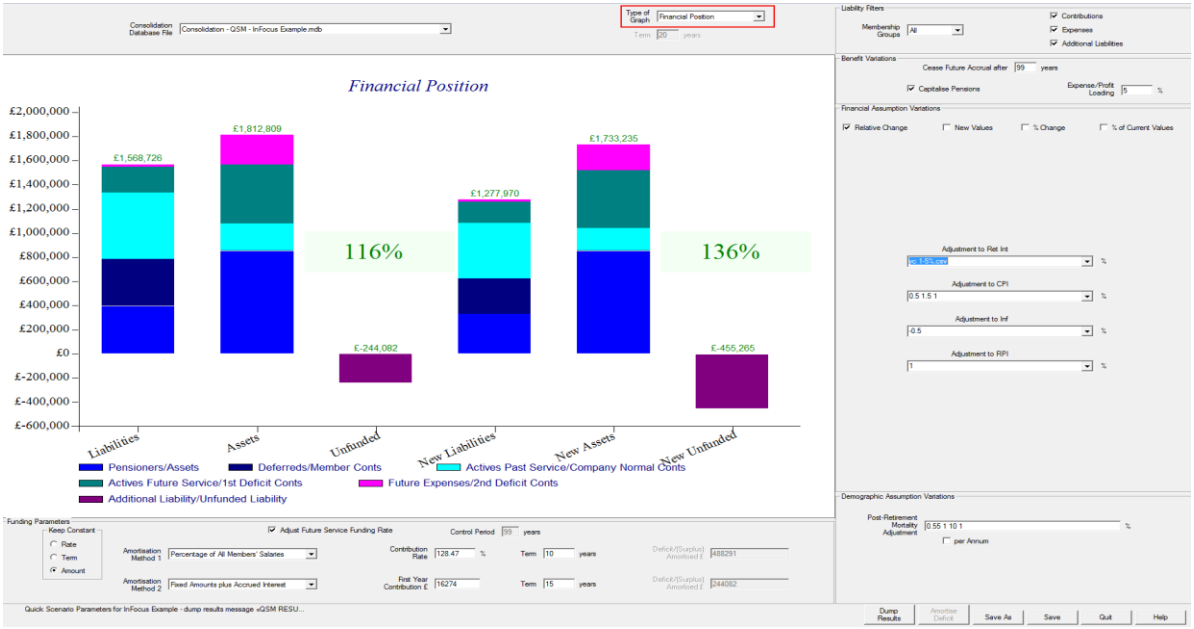
6.9.3 Cash Flows

The Cash Flows graph displays the change in cashflows (net of Contributions if they are included):



6.9.4 Financial Position

The Financial Position graph displays the Scheme's financial position broken down by Membership Class and Past/Future Service including the amortisations and the Asset Value, expenses and additional liabilities specified in consolidation on the valuation basis and after adjustments:

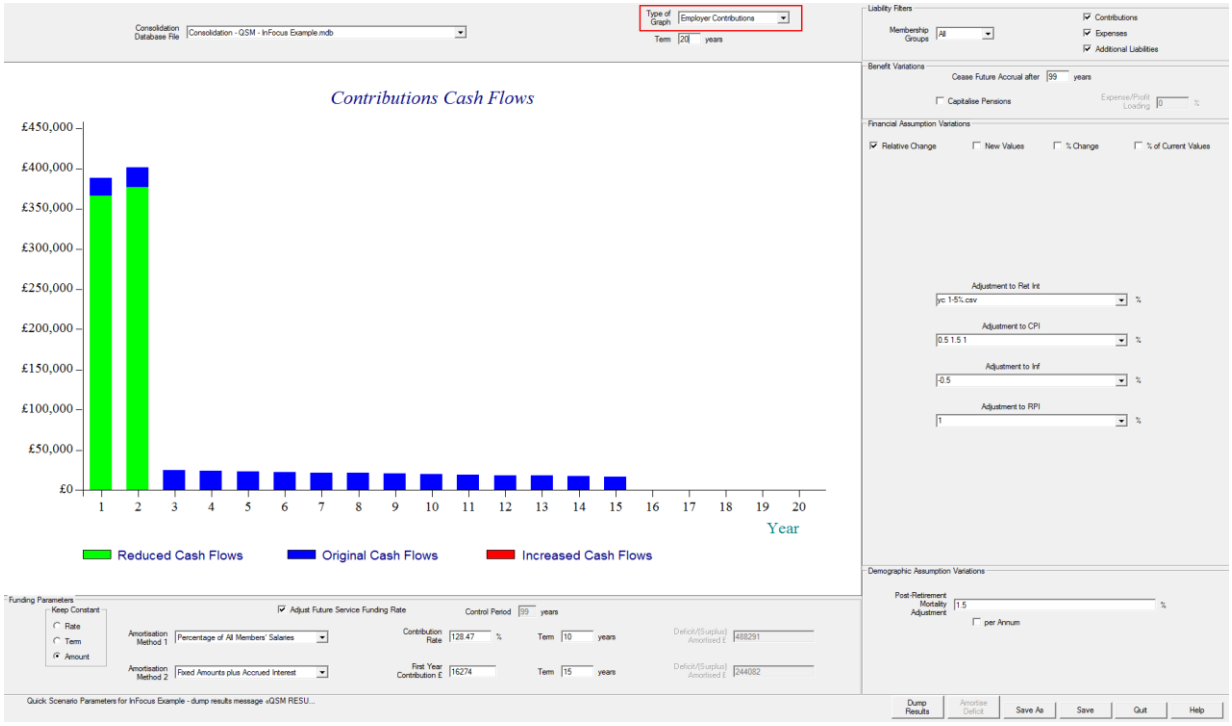


6.9.5 Waterfall Financial Position

The Waterfall Financial Position graph displays change in the Scheme's financial position broken down by Membership Class and Past/Future Service and the amortisations on the valuation basis and after adjustments:

6.9.6 Employer Contributions

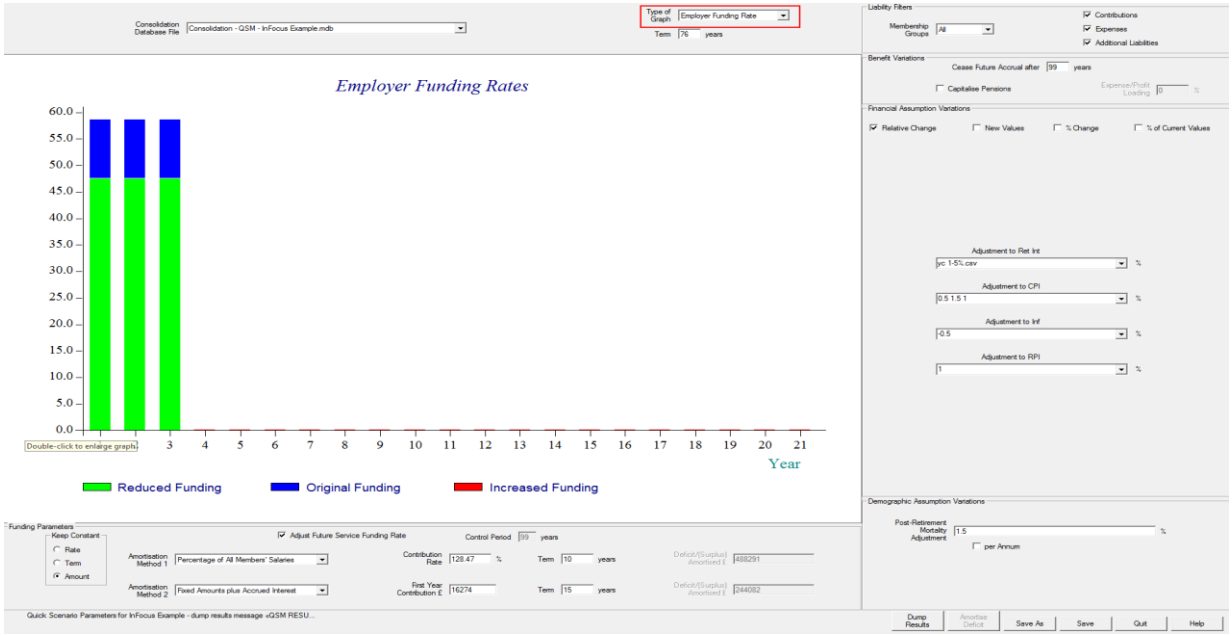
The Employer Contributions graph displays the amount of the Employer's total contributions on the valuation basis and after adjustments:



6.9.7 Employer Funding Rate

The Employer Funding Rate graph displays the Employer Future Service Funding Rate on the valuation basis and after adjustments:

This is only relevant for Actives, and the “Adjust Future Service Funding Rate” needs to be ticked.



6.10 Output

At the bottom of the screen there is a “Dump Results” button which will produce a text file with results on the adjusted valuation basis (Equiniti will output this file in a HTML format in the next release).

This contains:

- a summary of any Liability Filters
- a summary of the changes in valuation assumptions (benefits, financial, mortality and contributions)
- the original / change in / revised liabilities, split by Membership Class, Sex/Category, Past/Future Service, Benefit Type and (if selected) Contingency
- revised cashflows, split into the components shown in the Consolidation output.

File Edit Format View Help

```
M:\VERSIONS\925\DOCUMENTS\QSM INFOCUS EXAMPLE\CONSOLIDATION\Consolidation - QSM - InFocus Example.mdb

Membership Classes
==================
Active and Additional Liability and Contributions and Deferred and Expenses and Pensioner
Contributions Included:  Yes
Expenses Included:  Yes
Additional Liabilities Included:  Yes

Benefit Variations
==================
Cease Future Accrual after 99 years
Capitalise Pensions at Exit:  No

Financial Assumption Variations
===============================
Type of Variation:  Relative Change
Adjustment to Ret Int:  yc 1-5%.csv
Adjustment to CPI:  0.5 1.5 1
Adjustment to Inf:  -0.5
Adjustment to RPI:  1

Demographic Assumption Variations
=================================
Post-Retirement Mortality Adjustment:  1.5%

Future Service Funding
======================
Adjust Future Service Funding Rate:  Yes

Amortisation
============
Amortisation 1
    Method:  Percentage of All Members' Salaries
    Rate:  128.47% of Salaries
    Term:  10
    Amount:  488291
Amortisation 2
    Method:  Fixed Amounts plus Accrued Interest
    Rate:  œ16274
    Term:  15
    Amount:  244082

Liabilities
===========
```

Class	Sex	Category		Benefit Type	Contingency	Original Liability	Change	New Liability
Active	F	Actives Basis Parameters for QSM Example	Past Service	GMP Pre 1988	Late Retirement	230,606	-46,859	183,747
Active	F	Actives Basis Parameters for QSM Example	Past Service	GMP Post 1988	Late Retirement	318,846	-65,890	252,956
Active	F	Actives Basis Parameters for QSM Example	Future Service	Main Peninc	Late Retirement	211,412	-45,670	165,742
Additional Liability	Scheme	Scheme	Past Service	Additional Liability	Additional	1,000	0	1,000
Contributions	F	Actives Basis Parameters for QSM Example	Future Service	Future Contributions	Member Future Contributions	-7,601	161	-7,440
Deferred	M	Deferreds Basis Parameters for InFocus Example	Past Service	GMP Pre 1988	NRA (or later) Retirement	89,254	-27,792	61,462
Deferred	M	Deferreds Basis Parameters for InFocus Example	Past Service	GMP Post 1988	NRA (or later) Retirement	117,077	-38,174	78,903
Deferred	F	Deferreds Basis Parameters for InFocus Example	Past Service	GMP Pre 1988	NRA (or later) Retirement	120,146	-28,709	91,437
Deferred	F	Deferreds Basis Parameters for InFocus Example	Past Service	GMP Post 1988	NRA (or later) Retirement	66,764	-16,633	50,131
Expenses	F	Actives Basis Parameters for QSM Example	Future Service	Future Expenses	Employer 1% Future Contributions	19,004	-403	18,600
Expenses	F	Actives Basis Parameters for QSM Example	Future Service	Future Expenses	Per Member (inflated)	20	0	19
Pensioner	M	Pensioners Basis Parameters for InFocus Example	Past Service	GMP Pre 1988	NRA (or later) Retirement	80,051	-16,928	63,123
Pensioner	M	Pensioners Basis Parameters for InFocus Example	Past Service	GMP Post 1988	NRA (or later) Retirement	104,473	-21,122	83,351
Pensioner	F	Pensioners Basis Parameters for InFocus Example	Past Service	GMP Pre 1988	NRA (or later) Retirement	136,439	-27,543	108,896
Pensioner	F	Pensioners Basis Parameters for InFocus Example	Past Service	GMP Post 1988	NRA (or later) Retirement	73,636	-14,984	58,652
Contributions	F	Actives Basis Parameters for QSM Example	Future Service	Future Contributions	First Employer Deficit Contributions	-488,291	10,363	-477,928
Contributions	Scheme	Scheme	Future Service	Future Contributions	Second Employer Deficit Contributions	-244,082	31,427	-212,655
Contributions	F	Actives Basis Parameters for QSM Example	Future Service	Future Contributions	Employer Future Contributions	-222,834	45,912	-176,921

```
Cash Flows
==========
```

Year	NR Cash	ER Cash	Ret Pen	Death Cash	Death Pen	Death Ins	IH Cash	IH Pen	IH Ins	Leaving Cash	Leaving Pen	DiD	Def/Pen	Memb Conts	Employer Conts	Amort Conts	Expenses
1	0	0	0	0	0	0	0	0	0	0	0	0	2,608	-3,867	-91,947	-273,912	9,677
2	0	0	0	0	0	0	0	0	0	0	0	0	2,695	-4,002	-95,165	-281,967	10,015
3	0	0	20,102	0	0	0	0	0	0	0	0	0	2,790	0	0	-24,254	0
4	0	0	20,888	0	0	0	0	0	0	0	0	0	2,884	0	0	-23,615	0
5	0	0	21,705	0	0	0	0	0	0	0	0	0	2,982	0	0	-22,977	0
6	0	0	22,555	0	0	0	0	0	0	0	0	0	3,083	0	0	-22,339	0
7	0	0	23,439	0	0	0	0	0	0	0	0	0	3,188	0	0	-21,700	0
8	0	0	24,358	0	0	0	0	0	0	0	0	0	13,925	0	0	-21,062	0
9	0	0	25,313	0	0	0	0	0	0	0	0	0	14,391	0	0	-20,424	0
10	0	0	26,307	0	0	0	0	0	0	0	0	0	14,874	0	0	-19,785	0
11	0	0	27,341	0	0	0	0	0	0	0	0	0	15,373	0	0	-19,147	0
12	0	0	28,416	0	0	0	0	0	0	0	0	0	15,889	0	0	-18,509	0
13	0	0	29,534	0	0	0	0	0	0	0	0	0	16,424	0	0	-17,870	0
14	0	0	30,697	0	0	0	0	0	0	0	0	0	30,749	0	0	-17,232	0
15	0	0	31,906	0	0	0	0	0	0	0	0	0	31,777	0	0	-16,594	0
16	0	0	33,164	0	0	0	0	0	0	0	0	0	32,839	0	0	0	0

This output was primarily prepared as way to check results against Consolidation output.

If requested, the QSM results could be exported to:

- a Consolidation database; and/or
- Excel output

6.11 Saving Scenarios

A scenario can be saved to a file and re-opened at a later time (with the assumption settings restored to the point they were when saved).

Note that the cash flows (original and adjusted) are stored in the file so the QSM is independent of the original database from which the cash flows were extracted.

As a consequence, if the consolidation database is re-created, any changes in the cash flows in this new consolidation database will not be reflected in cash flows stored in QSM files. To aid with the job of identifying QSM cash flows needing updating, when opened, the timestamp when the QSM scenario was originally saved is displayed as part of the database name.

7 Limitations

The valuation process works at the individual member level whereas the QSM works at Sex/Category level. As a consequence, member level information is lost which, in some circumstances, will result in an inaccuracy of the results produced by QSM.

The more important known issues include:

- Any benefit comparisons such as Alternate Slices, Tier Deductions, Underpins etc. cannot be modelled.
- Non – homogeneous assumptions e.g. benefit tranches with the same pension increase but different revaluations cannot be separately identified. To get around this the User has the ability to amend the Assumptions Summary which will mitigate this limitation.
- Mortality Assumptions uses a “benefit weighted” average Mortality at each exit point (/contingency if separated). The same adjustment is applied to all ages.
- Under Pensioners – Pensions Increases Only and Spouse’s Only options do not work in QSM.
- Only post retirement mortality assumptions can be adjusted.
- GMP calculations involving franking use an approximate modelling method in this version, due to the greater complexity.
- Benefits cannot be capitalised.

We have tested the QSM over a wide range of benefit parameters but, with the range of basis parameters in SuperVal, it is unlikely that we have been able to test every possible combination of basis parameters. This issue is exacerbated by users using work-arounds (using basis parameters in ways not originally envisaged or combining two different valuation runs to achieve the required result).

The QSM is provided on an "as-is" basis and it is highly recommended that some testing of QSM results for each Scheme be performed to confirm the accuracy (or to evaluate the inaccuracy, if the benefit design includes a limitation above) of the QSM results.

To expedite this testing (if requested by users), we could write an export of the valuation assumption adjustments to an Accurate Scenario Model parameter set.