

InFocus Document

Using Yield Curves

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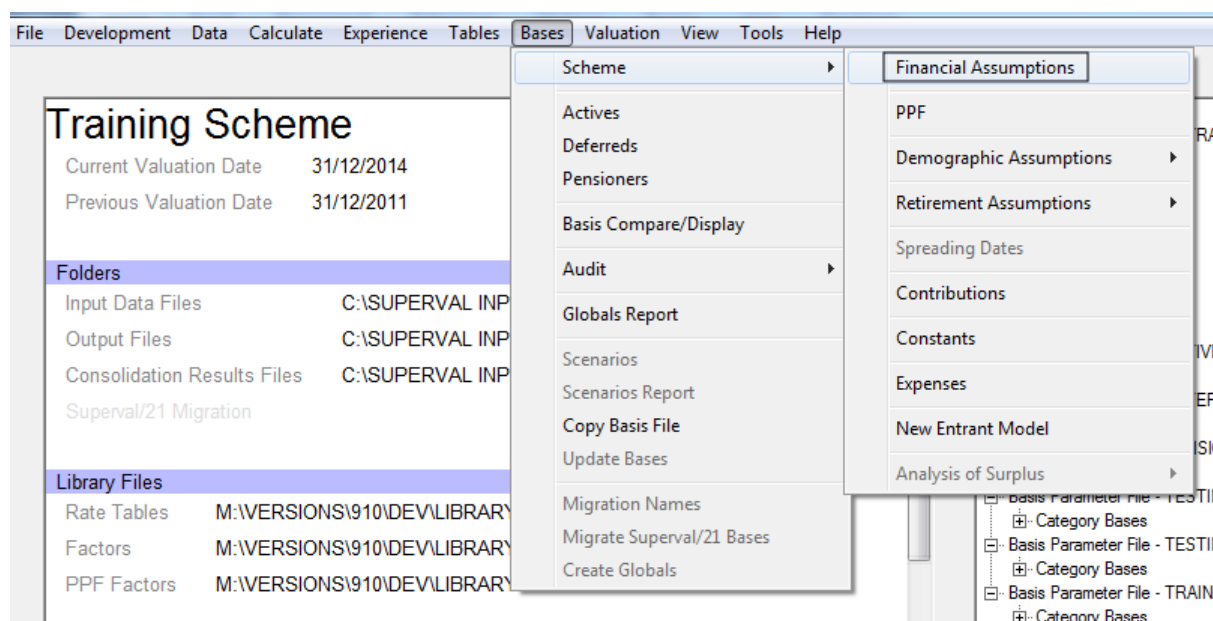
1 Introduction

This document is based on V9.25 of SuperVal. Any screenshots from previous versions are not materially different. It is relevant for the actives, deferreds and pensioners module.

SuperVal can be set up either to use financial assumptions that are fixed or to allow the assumptions to vary by each future year. This document discusses the different approaches that can be used when the user wishes to vary the assumptions over time.

Yield-curve valuations are becoming more common in practice and SuperVal can be set up in two different ways to allow for this. The main financial assumptions are selected on the Financial tab but in addition, various term-dependent financial assumptions can be used on the individual tabs.

The first method involves specifying a vector of data and the second approach involves using a yield curve entered in a .csv file. For both of these methods the assumptions will be specified within the Bases > Scheme > Financial Assumptions and then selected on the appropriate tab in the Basis File.



SuperVal assumes the data entered for yield curves equate to the one-year forward rates appropriate at each point in time. For example, the spot rate applicable over duration t is defined as y_t . SuperVal requires the user to enter the one year forward rate at time t (agreed at time 0) ie $f_t = f(t, 1)$.

SuperVal will determine the rate of interest over the period

$$\text{ie } (1+y_t)^t = (1+f_0) (1+f_1) (1+f_2) \dots (1+f_{t-1})$$

2 Setting up Scheme Parameter

2.1 Two different approaches

Consider the following assumptions used for the post-retirement interest rate, with year 1 starting from the valuation date:

Year	Post Retirement Interest Rate
1	7.5%
2	7.6%
3	7.7%
4	7.5%
5	7.3%
6 + years	7.0%

Note

SuperVal assumes these are the one year forward rates ie the rate applicable over year 2 is 7.6% and the rate applicable over year 5 is 7.3% etc.

For all three modules, the post-retirement interest rate assumption will be defined in the Interest Rate section of the Financial Assumption Parameters.

Method 1: Using vectors

In the Financial Assumptions section, the required interest rate is defined by adding the values of the vector with a space between each year's rates. The final figure entered will be used for all years into the future. Within the Basis File, these values can then be selected by choosing the correct Global Variable Name. Once selected, the values for the vector will be shown to the right of the pointer. The main financial assumptions are selected on the Financial tab but in addition, various term-dependent financial assumptions can be used on the individual tabs i.e. Legislation tab, Salary tab and Contributions tab for Actives.

Note that you are unable to enter negative rates for vectors and that a maximum of 115 characters can be entered in a vector.

Method 2: Using yield curves

In the Financial Assumptions section, the required interest rate is defined by adding a .csv table (see below). Within the Basis File, this yield curve can then be selected by choosing the correct Global Variable Name.

File Export Help				
Interest	Inflation	Revaluation	Increase	Constants
Interest Rate Assumptions				
	Global Name	Global Value	Description	
1	Pre Interest	yc 1-5%.csv		

The table of interest rates to be used must first be set-up in excel and then saved as a .csv file in the user's SuperVal input folder. The table should have one row and up to 200 columns. The entry in column 1 represents the rate that will apply during the first year after the valuation date. The entry in column n represents the rate to apply during the nth year after the valuation date. There is no limit on the number of decimal places you can specify. The final figure entered will be used for all years into the future.

The data entered into the .csv file may also contain negative rates for yield curves.

Home Insert Page Layout Formulas Data Review View Dev							
Clipboard Font Alignment Number							
A1 fx 7.5							
A	B	C	D	E	F	G	H
1	7.5	7.6	7.7	7.5	7.3	7	
2							

Within the Global Financial Parameters, the .csv files available in the input folder are found by a right click in the Global Value column.

Which method is more appropriate to use?

In the above example, the interest rate only varied between years 1 to 6 and then remained fixed at 7%. This would be a relatively simple scenario to set up using the vector method.

However, for a yield curve that applies over many more years, method 2 is usually the quickest and easiest approach to use. The table only needs to be specified once and can then be used in SuperVal as required. In addition, negative values for assumptions can only be entered when using the yield curve approach.

SuperVal will only allow you to choose one assumption for a particular financial assumption i.e. Interest Rate 1 or Interest Rate 2 etc. You can, however, use different approaches for different financial assumptions ie define pension escalation using a vector but salary escalation using a yield curve (.csv file).

3 Setting up Scheme Basis Files

Yield curves can be used for the financial assumptions throughout all of the Bases File. The method for selecting these is identical across all three modules.

3.1 Actives

Yield-curve inputs on the Financial tab

For each of the parameters where a financial assumption is required, select from the drop down list the Global Variable Name containing the appropriate data. For vectors the values that will be used and for yield curves the name of the yield curve will then be shown next to Global Variable Name.

Note, the image below shows the use of a vector for Pre Retirement Interest and a yield curve for Post Retirement Interest.

SuperVal - Actives Valuation/Benefits Basis

File Export Goto Help

Main Financial Legislation PPF/CAP Mortality Demographic Salaries Slices All Slices Membership Ret Pension

Interest Rate Assumptions

Pre Retirement Interest Rate: Actives IntRate 5.5 6.5 7.5

Post Retirement Interest Rate: Actives IntRate 3 yc 1-5%.csv

Switch Use Post-Ret Int for Accrued/Wdis

Salary Overall Parameters

Salary Increase Rate: Actives IntRate (2) yc 1-5%.csv

CARE Parameters

Revaluation Rate: RevRate 3

Timing of Revaluations: Continuous Review Date: 06/04 DD/MM

Deferred Revaluation

Rate: Actives RevRate 5

Rate 2: Pensioners RevRate 0

Rate 3: Pensioners RevRate 0

Male Barber Adjustment to Main: 1

Male Barber Adjustment to Special: 1

Male Barber Adjustment to Peninc3: 1

Male Barber Adjustment to Peninc4: 1.25

Female Barber Adjustment to Main: 1

Female Barber Adjustment to Special: 1

Female Barber Adjustment to Peninc3: 1

Female Barber Adjustment to Peninc4: 1

Cutrate Revaluation Period

Pension Escalation

Pre 1988 GMP: Fixed 0% (3) 0 (Fixed)

Main: RPI 2.25 (RPI)

Peninc3: LPI Increase 2.25 (LPI Increases min(2.25%,inflation))

Timing of Pension Increases: Continuous

Post 1988 GMP: Fixed 3% (3) 3 (Fixed)

Special: No Increases 0 (Fixed)

Peninc4: Actives IncRate 3 (Pinc)

Increase Date: 06/04 DD/MM

Edit Scheme Financials

Yield-curve inputs on the Legislation tab

On the Legislation tab, yield curves can be used for the various increase rates that are applied.

Yield-curve inputs on the PPF/CAP tab

On the PPF/CAP tab, a yield curve can be used for the Pre and Post 1997 Discontinuance Increases.

Yield-curve inputs on the Salary tab

Within each salary definition, the salary increase rate assumption can be overridden and the deductor/cap increase rates can also be specified as a yield curve.

This is done by choosing the assumption containing the relevant .csv file where appropriate.

Yield-curve inputs on the Contributions tab

Various term-dependent financial assumptions can also be used on the Contributions tab.

File Data Goto Help

● Death Pen ● Death Cash ● IH Pension ● IH Cash ● IH COT ● PHI ● Leaving ● Ind Slices ● Contributions ● NE Data D

Member Contributions

Member Contributions Definition: Contributions Parameters for Training Scheme

Member Conts Salary: FPS - Post97

ROC In Service Interest (% p.a.): Actives Int Rate1 4 5 3

Additional Cont. Rate (%):

Interest (% p.a.): Actives Int Rate2 yc 1-5%.csv

Company Contributions

Company Contributions Definition: None

Ratio of Member Conts:

Company Conts Salary: FPS - Post97

Use Exact Age in Contributions calculations

Current Cost Company Contribution Rate - Death: 0 %

- Ill-Health: 0 %

Underpin Contributions

☒ Benefits Underpinned

Underpin Contributions Definition: None

Underpin Contributions Salary: FPS - Post97

Initial Underpin Amount:

Underpin Commencement Date:

Underpin Interest (% p.a.): Actives Int Rate2 yc 1-5%.csv

Edit Scheme Financials Edit Contributions Definition

3.2 Deferreds

The set-up is similar to the Actives, in that the main term-dependent assumptions should be set up by specifying appropriate .csv files as tables within the user's scheme input folder. These can then be used to define an interest rate in the Financial Assumptions area.

These are then accessed from the various tabs but in particular the Financial tab.

The screenshot shows the 'SuperVal - Deferreds Valuation/Benefits Basis' window with the 'Financial' tab selected. The window contains several sections for configuring financial assumptions:

- Interest Rate Assumptions:** Includes 'Pre Retirement Interest Rate' (set to 5.5 5.25 5.00) and 'Post Retirement Interest Rate' (set to 'yc 1-5%.csv').
- Excess Revaluation - Overall Parameters:** Includes 'Excess Revaluation' (set to 'RevRate' with file 'yc revaluations.csv'), 'Count Complete Years' (checked), 'NRA Exits Rounding' (set to 'Exact Days'), 'Pre Valuation Date Revaluation' (set to 'No'), 'Pre Valuation Date Rate' (set to 'Pensions RevRate' with value 0), and 'Pre Valuation Date Rate Rounding' (set to 'Nearest Years').
- Pension Escalation:** Includes 'Pre 1988 GMP' (set to 'No Increases' with value 0), 'Main' (set to 'RPI' with value 2.25), 'PenInc3' (set to 'Max(5%, Inflation)' with value 2.5), 'Post 1988 GMP' (set to 'Fixed 3%' with value 3), 'Special' (set to 'No Increases' with value 0), 'PenInc4' (set to 'LPI Increase' with value 2.25), and 'Increase Date' (set to '06/04').

Buttons at the bottom include 'Save As', 'Save', 'Quit', and 'Help'. A status bar at the bottom left indicates '0 cat 0 from REGRESSION-DEFERREDS_CAT0-3 <DEFERREDS>'.

Other tabs where term-dependent assumptions can be specified include the PUPs tab, NSPUPs tab and the Legislation tab. For client code 3 users, the Ind PUPs tab can also allow for term-dependent assumptions.

The screenshot below is taken from the PUPs tab, as an example of where a term-dependent assumption can be set up in the Deferreds module.

The screenshot shows the 'SuperVal - Deferreds Valuation/Benefits Basis' window with the 'PUPs' tab selected. The window contains several sections for configuring PUP (Pension Unemployment Payment) parameters:

- PUP Payment Parameters:** Includes 'PUP Amount' (set to 'yPUP'), 'Revaluation Rate Override' (set to 'RevRate (5)' with file 'yc random.csv'), 'Spouses DAR Override' (set to '%'), 'Complete Years Only Override' (set to '%'), 'PUP Adjustment Factor' (set to 1), 'Override % for DBR Pension' (set to 'ySPC/DEFERED' with value 5), 'NRA Exits Rounding Override' (set to '%'), and 'PUP Exits' (set to '%').
- PUP Indicators:** Includes 'Ignore for Cash' (unchecked), 'Ignore for DBR' (unchecked), 'SRF Indicator' (set to 'ETP1'), 'Pension Increases' (set to 'Special Pension'), and 'Include in Unleash' (set to 'Exclude').
- PUP PPF Parameters:** Includes 'Male PPF NRA (Surv. Valuations)' (set to '55'), 'Female PPF NRA (Surv. Valuations)' (set to '55'), and 'PPF Service Period' (set to 'Pre 57').

Buttons at the bottom include 'OK', 'Cancel', and 'Help'. A status bar at the bottom left indicates '0 cat 0 from REGRESSION-DEFERREDS_CAT0-3 <DEFERREDS>'.

3.3 Pensioners

In the Pensioners module, term-dependent assumption can be selected from the list of available assumptions in the Financial Assumptions.

SuperVal - Pensioner Valuation/Benefits Basis

File Export Goto Help

Main Financial Legislation Mortality Demographic Pensions

Interest Rate Assumptions

Post Retirement Interest Rate: Post Ret Interest Inactives yc 1-5%.csv

Pension Escalation

Pre 1988 GMP: No Increases 0 (Fixed) Post 1988 GMP: Fixed 3% 3 (Fixed)

Timing of Pension Increases: Continuous Increase Date: 06/04 DD/MM

Edit Scheme Financials

1 cat 1 from REGRESSION-PENSIONERS CATS 1 - 4 <PENSIONERS>

Save As Save Quit Help

Other tabs where term-dependent assumptions can be specified include the Legislation tab and the Pensions tab.

SuperVal - Pensioner Valuation/Benefits Basis - Edit Pension Definition

File Help

Pension Description: Pen 2

Pension Amounts

Cash Sum or Pension: Pension Pension Amount: qPENSION1

Spouse's Reversion: 100% Spouse's Pension Amount:

Adjustment Factor: 1

Pension Payment Parameters

Benefit Commencing at Age: 65 years Pension Ceasing at Age: 120 years

Payable On Death In Deferment Revaluation In Deferment: RevRate yc revaluations.csv

Pension Increases in Payment: LPI Increase 2.25 (LPI increases min(2.25%,inflation))

Pension Indicators

Pension Increases Only Spouse's Reversion Only

GMP Adjustments

Include in Adjustment at SPA/Death

Pre 1988 Included at Retirement: qPRE88GMP_RET Post 1988 Included at Retirement:

Pre 1988 Included at Valuation Date: Post 1988 Included at Valuation Date:

PPF Parameters

Male PPF NRA: 67 years Female PPF NRA: 67 years

PPF Service Period: Pre 97 PPF Revaluation in Deferment: RevRate yc revaluations.csv

Benefit Included in Cap

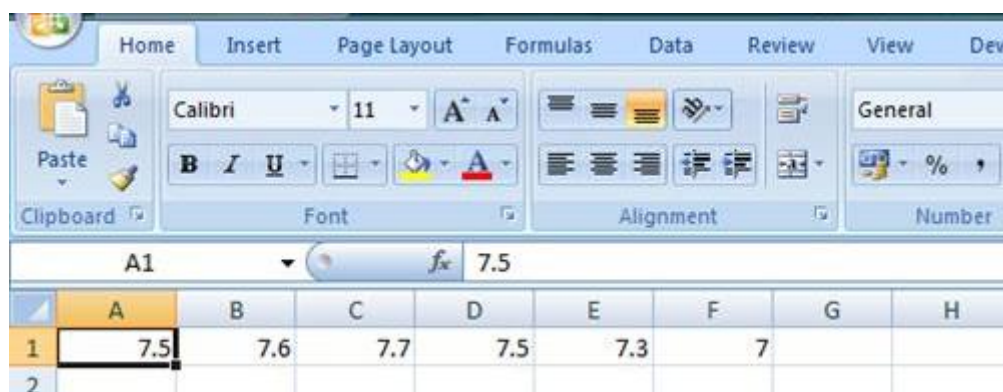
Edit Scheme Financials

OK Cancel Help

4 Timing of application

All of the rates specified using the yield-curve functionality will apply from the valuation date.

For example, below is an interest-rate assumption that has been set up using the yield-curve functionality.



	A	B	C	D	E	F	G	H
1	7.5	7.6	7.7	7.5	7.3	7		
2								

SuperVal will use the rate of 7.5% for the period VDATE to VDATE+1, 7.6% from VDATE+1 to VDATE+2 and so on.

This applies to all assumptions. In particular, care should be taken when entering the post retirement interest rate as this will apply from the valuation date and NOT from the year the member retires.

For example, consider a member whose age is 2 years below NRA, with the yield curve above being used for both pre and post retirement interest rates. For this member, the Interest Rate used in the first year post retirement will be 7.7%.

5 Parameters in the Basis Files where yield curves can be used

Module	Tab	Frame	Parameter
Actives/Deferreds	Financial	Interest Rate Assumptions	Pre Retirement Interest Rate
Actives/Deferreds/Pensioners	Financial	Interest Rate Assumptions	Post Retirement Interest Rate
Actives	Financial	Salary Overall Parameters	Salary Increase Rate
Actives	Financial	CARE Parameters	Revaluation Rate
Actives	Financial	Deferred Revaluation	Rate
Actives	Financial	Deferred Revaluation	Rate 2
Actives	Financial	Deferred Revaluation	Rate 3
Actives/Deferreds	Financial	Pension Escalation	Main
Actives/Deferreds	Financial	Pension Escalation	Special
Actives/Deferreds	Financial	Pension Escalation	PenInc 3
Actives/Deferreds	Financial	Pension Escalation	PenInc 4
Actives/Deferreds/Pensioners	Financial	Pension Escalation	Pre 1988 GMP
Actives/Deferreds/Pensioners	Financial	Pension Escalation	Post 1988 GMP
Actives	Legislation	GMPs	Section 148 Orders
Actives/Deferreds	Legislation	GMPs	Revaluation Rate to NRA < SPA
Actives	Legislation	IR Maximum Parameters	Cap Increase Rate
Actives/Deferreds	PPF/CAP	Discontinuance Pension Increase	Pre 1997 Discontinuance Pension Increases
Actives/Deferreds	PPF/CAP	Discontinuance Pension Increase	Post 1997 Discontinuance Pension increases
Actives	Salary		Override Salary Increase Rate

Module	Tab	Frame	Parameter
Actives (GAD only)	Salary		Post NRA Salary Revaluation Rate
Actives	Salary	Salary Deduction	Increase Rate Override
Actives	Salary	Salary Maximum	Increase Rate Override
Actives	Contributions	Member Contributions	ROC in Service Interest
Actives	Contributions	Member Contributions	ROC in Deferral Interest
Actives	Contributions	Underpin Contributions	Underpin Interest
Deferreds	Financial	Excess Revaluation – Overall Parameter	Excess Revaluation
Deferreds	Financial	Excess Revaluation – Overall Parameter	Pre Valuation Date Rate
Deferreds	PUPs, Ind PUPs, NSPUPs	PUP Payment Parameters	Revaluation Rate Override
Deferreds/Pensioners	Legislation	GMPs	Revaluation Rate to SPA
Deferreds	Ret Cash	Cash Cap	Revaluation Rate Override
Deferreds	Death	Death in Deferment Cash	Conts Interest Rate
Deferreds	Death	Death in Deferment Cash	Plus Conts Interest Rate
Deferreds	Underpin	Underpin Parameters	Underpin Interest
Pensioners	Legislation	GMPs	Revaluation Rate when BAGE < SPA
Pensioners	Pensions	Pension Payment Parameters	Revaluation in Deferment
Pensioners	Pensions	Pension Payment Parameters	Pension Increases in Payment
Pensioners	Pensions	PPF Parameters	PPF Revaluation in Deferment