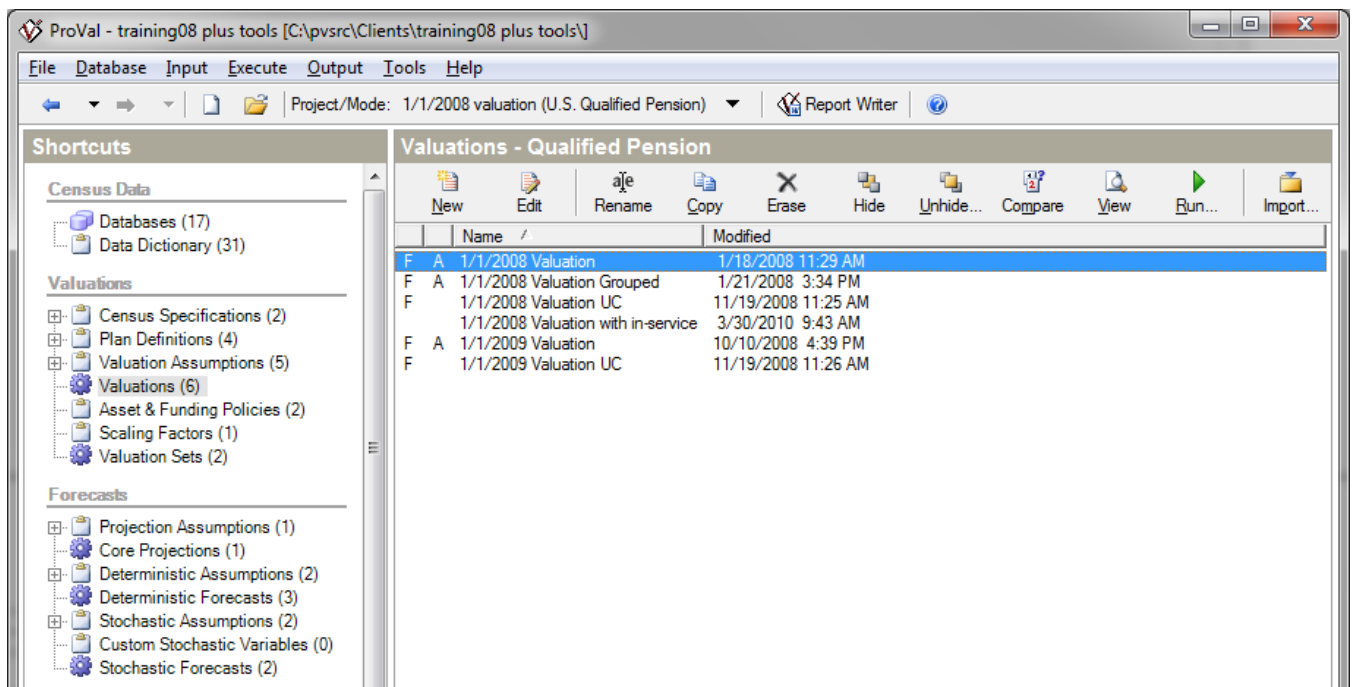


ProVal version 3.01 introduces dramatic **interface enhancements**, explicit **optional payment forms** in pension plans, and **non-parallel yield curve shifts** in deterministic forecasts. Also, for US Qualified Pension plans, ProVal has been updated to handle the provisions of the **Pension Relief Act of 2010** and perform **gain/loss analysis on PPA target liabilities**. You'll find details about these and other enhancements below.

### Interface

- ◆ ProVal's main window now sports a contemporary interface, making ProVal easier to learn and more efficient to use. You'll feel like you have more control, with a better grasp of the contents of a client and where you are within your project.



Some of the highlights:

- A shortcuts pane (on the left) contains the databases, data dictionary, and all of the libraries from the Input, Execute, and Tools menus. Libraries are organized by task, revealing how the pieces fit together. The number of unhidden entries is displayed in parentheses, letting you grasp what's in a project at a glance.



Back and Forward buttons let you quickly return to the last command you visited in the shortcuts pane, just like in a browser. This might be handy, for example, if you start in Gain/Loss Analysis and then go to Valuations to make some revisions. To return to Gain/Loss Analysis, simply click the Back button.

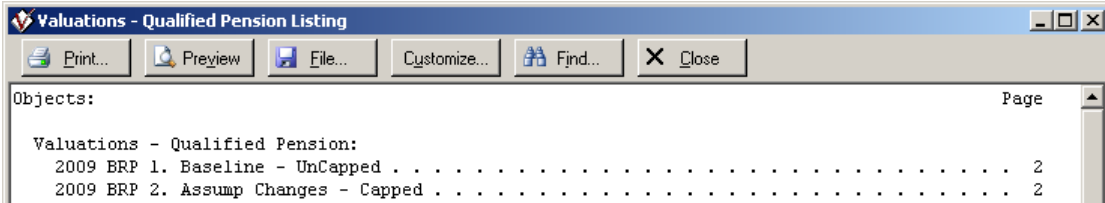
- An entries pane (on the right) displays the contents of the selected library. Buttons above the entries let you perform the familiar operations of New, Edit, Rename, Copy, Erase, etc.



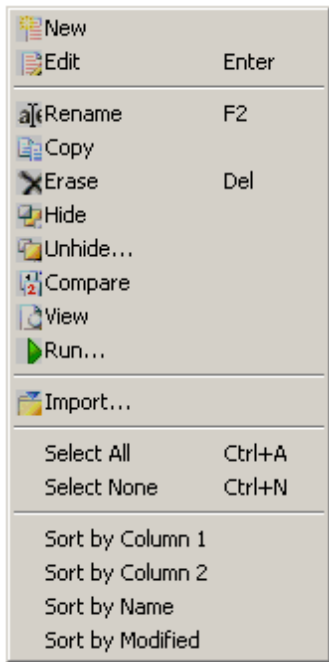
A new Run button (where applicable) lets you select multiple runs and add them to the Batch Execution queue.



A new View button lets you display the selected entry's definition (as if you Edited it and clicked View). If you select more than one entry to View, a list of objects will also be included. This can be used as a way to produce a list of all entries in a library: simply select all the entries, click View, and the list will appear at the top.



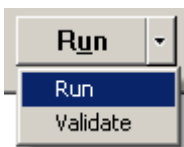
All of the operations mentioned above can also be performed by right-clicking.



- o A status bar (at the bottom) reports statistics about the listed entries, among other things.



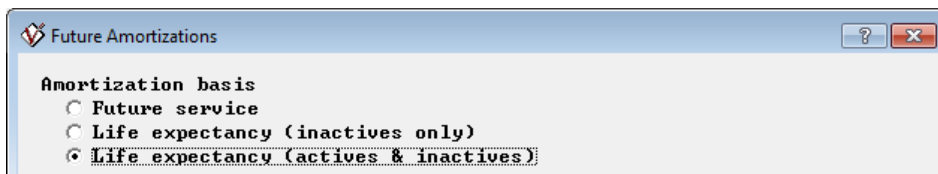
- o No retraining required. ProVal's existing menus have not changed, so you won't *have* to change the way you use ProVal (although you'll probably *want* to!).
- ◆ Split buttons (i.e., buttons with a drop down menu) have been introduced to reduce clutter. For example, you'll notice that the Run and Validate buttons have been combined in a few places like this:



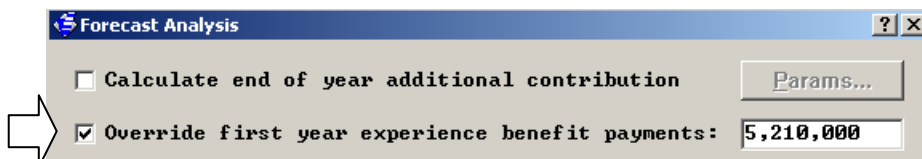
- ◆ Inverted libraries (such as output style libraries) now allow entries to be sorted by date and allow multiple entries to be deleted at once.
- ◆ To reflect the increased international usage of ProVal:
  - A "U.S." prefix has been added to the Nondiscrimination testing, PIA calculation and Government Forms Extract tools.
  - "SERP (Non-qualified) Pension" mode has been renamed "Universal Pension".
  - The payment form "REA Post-decrement death benefit" has been renamed "Post-decrement death benefit".
  - In File > New Client, the default mode will now be set by looking at the user's location as set in Regional Settings.

## All Plans

- ◆ The average expected future service/lifetime denominator is now the number of participants expected to receive a benefit instead of the number of participants alive at the end of the year. For more on this change, why it was made, and transition considerations, see [Average Expected Future Service & Lifetime](#) on page 24.
- ◆ An option in the Asset & Funding Policy > Future Amortization lets you amortize over the life expectancy of all participants (actives & inactives).



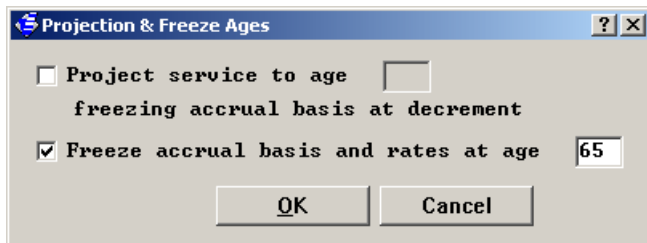
- ◆ Present value of future salary/service is now calculated for all funding runs. Previously, they were only calculated if the corresponding entry age normal liability method was turned on.
- ◆ In the Asset & Funding Policy, the first year experience benefit payments can now be overridden. You can fudge this amount to get to a known asset value 1 year into a forecast. (The former technique of fudging the first year investment return didn't work for US Qualified Pension plans subject to PPA because the investment return is now used to roll forward the credit balance.)



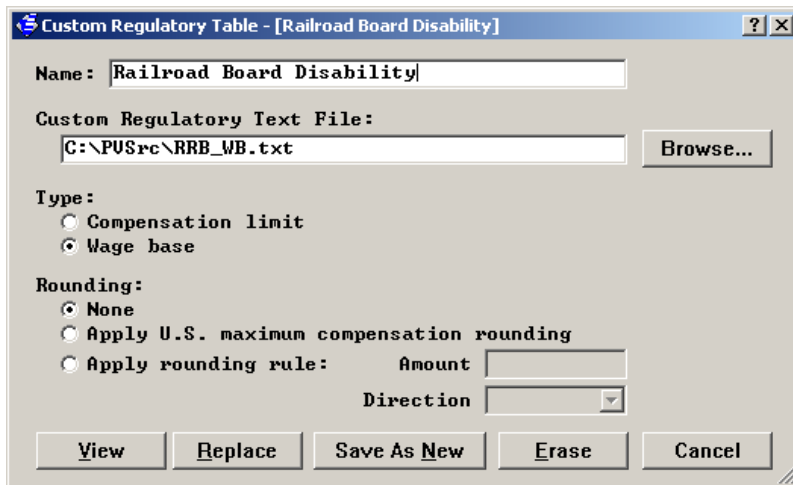
## Pension Plans

- ◆ An "Optional Payment Forms" topic has been added to Benefit Definitions. In Valuation Assumptions, the user can specify the conversion basis (table or interest and mortality) and post-decrement probabilities. This streamlines the work involved in valuing optional payment forms (i.e., removes the need to have separate benefits for each payment form). On a related note, this also makes it easier to value different payment forms for married and single participants. For more, see [Optional Payment Forms](#) on page 16.

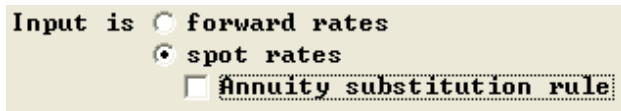
- ◆ A freeze age option has been added to accrual definitions to stop accruals at some age. This simplifies coding formulas that compare actuarially increased frozen benefits with ongoing benefits.



- ◆ Users can now specify custom regulatory limits. These custom limits can be referenced in ProVal's custom operators and used to limit Present Value of future salary and Valuation salary.



- ◆ Life expectancy is now calculated in pension modes for active and emerging inactive participants. On a related note, participants with a "Vested valued through active" status are now included in the inactive life expectancy.
- ◆ The percent married assumption can now vary by coded field.
- ◆ Fiscal year contributions are now available in stochastic forecasts, either through a Custom Stochastic Variable or in Trial Detail saved to a .csv file. (To see fiscal year contributions in a Deterministic Forecast, use Deterministic Forecast Exhibits.)
- ◆ There is new checkbox in Valuation Assumptions > Lump Sums & Optional Payment Forms that allows the "Annuity substitution rule" to be turned on or off (the latter is new) when using a lump sum spot interest assumption that is variable by duration from the valuation date. Unchecking this box is useful for US Qualified Pension plans when converting lump sums to annuities on a 417(e) interest and mortality basis.



Check this box to calculate a lump sum factor at decrement that is adjusted such that, when it is discounted to the valuation date, it is equivalent to valuing the annuity payments implicit in the lump sum. For US Qualified Pension plans using PPA law type, this is appropriate for converting annuities to lump sums on a 417(e) interest and mortality basis, as discussed in IRS Reg. 1.430(d)-1(f)(4)(iii)(B).

Uncheck this box to calculate an unadjusted lump sum factor at decrement. For example, when decrement occurs four years after the valuation date, the factor is determined based on the rates as of the valuation date with the first four rates dropped. For US Qualified Pension plans

using PPA law type, this is appropriate for converting lump sums to annuities on a 417(e) interest and mortality basis, as discussed in example 14 of IRS Reg 1.430(d)-1(f)(9) and question 2 of the 2010 IRS Gray Book.

- Salary Definitions now allow salary in the year of hire to be annualized, excluded, or left untouched. In addition, the “Current salary field (annual)” label has been renamed “Current salary field (annual amount for year starting on the valuation date)” for clarity.

- A “transform data (e.g., hours) to service” option has been added in Service Definitions for computing (future) service accruals. This avoids having to calculate the service accrual fraction using Define Field by Expression or Data Defaults when the translation follows a step function. For example, instead of the expression:

$(\text{Hours} \geq 320 * 0.5) + (\text{Hours} \geq 901 * 0.05) + (\text{Hours} \geq 1001 * 0.05) + (\text{Hours} \geq 1101 * 0.05) + (\text{Hours} \geq 1201 * 0.05) + (\text{Hours} \geq 1301 * 0.05) + (\text{Hours} \geq 1401 * 0.05) + (\text{Hours} \geq 1501 * 0.05) + (\text{Hours} \geq 1601 * 0.05) + (\text{Hours} \geq 1701 * 0.05) + (\text{Hours} \geq 1801 * 0.05)$

You can now specify a schedule like this:

From	To	Service
0	320	0.00
320	901	0.50
901	1001	0.55
1001	1101	0.60
1101	1201	0.65
1201	1301	0.70
1301	1401	0.75
1401	1501	0.80
1501	1601	0.85
1601	1701	0.90
1701	1801	0.95
1801	-	1.00

For other transformations, such as the linear transformation “(Hours / 1000) #min 1”, the service accrual fraction will still need to be defined using Define Field by Expression or Data Defaults.

- ◆ The “RP-2000+ Combined Mortality Table (dynamic)” has been added to the default mortality rates library.
- ◆ In Valuation Assumptions, salary merit scales can now be edited directly from the screens where you enter rates by coded field or calendar year.

## US Qualified Pension Plans

- ◆ ProVal has been updated to handle the provisions of the Pension Relief Act of 2010. For PPA, the Credit Balances and Waivers topic and the Shortfall Amortizations topics of the Asset & Funding Policy have new parameters. For multiemployer plans, the funding asset valuation corridor is now permitted to be up to 130%. For more, see [2010 Pension Relief Act](#) on page 13.
- ◆ In PPA funding Valuation Assumptions, a new option makes it easier to handle flat dollar benefits with mid-year increases without needing different Plan Definitions for funding and accounting. Funding liabilities will reflect the accrual rate changes effective during the valuation year as if they were effective on the first day of the valuation year. Accounting liabilities are unaffected. Example: utilizing a 1/1 valuation date, a change as of 7/1/2010 would be treated effective as of 1/1/2010. This treatment applies to accrual definitions with a Final Average accrual format and accrual rate changes (“new rates as of...”) that apply to all service.

**Liability Methodology**

Calculate Vested Liabilities

Benefits with expected increases (PUC) always greater than without (UC)

PUC equal to UC for cash balance and career average components

Reflect new accrual rates during the valuation year in PUC and UC liabilities

**PUC & UC Attribution Service - Linear Proration to Decrement**

Field:

Service Definition:

Timing assumed for Employee Contributions:

OK Cancel

- ◆ In the PPA Asset & Funding Policy contribution schedule, you can now specify which prior year contributions in the contribution schedule were added to the Prefunding Balance.
- ◆ In the PPA Asset & Funding Policy > Shortfall Amortization topic, there is a new lookup button to look up the yield curve at full year durations to override the shortfall amortization interest rates.
- ◆ Under PPA, there is a new input in the Asset & Funding Policy for FAS35 assets on the valuation date. These assets will now be developed without discounting the contributions receivable. In addition, the FAS35 discount rate has been added to the exhibits so that changes in the interest rate can be tracked by event.
- ◆ In the PPA Asset & Funding Policy > Credit Balance and Waivers screen, there is a new option to waive credit balances up to a user specified FTAP percentage. There is also the option to only waive if it is possible to achieve the desired FTAP percentage.

- ◆ In the PPA Asset & Funding Policy > Credit Balance and Waivers screen, there is a new option to waive funding balances to allow application of funding balances against the minimum required contribution in future years.

**Credit Balances and Waivers**

**Maintain:**

Funding Standard Carryover Balance

Prefunding Balance

Apply to Minimum Required Contribution, if eligible

Eligible to apply balances against MRC (80% funded last year)

**Waive balances to:**

Meet  AFTAP, if possible

Waive balances an additional 10%, if possible

Eligible for waive balances transition rule

Use  % minimum AFTAP for pre-10/1/2010 plan years

For 60% only (accelerated payments other than SSLI)

**Avoid At-Risk status, if possible**

Be eligible to apply balances against MRC in the following year (80% funded)

Meet  % FTAP

Do not waive balances if target cannot be met

**Non-HCE annuity purchases for AFTAP calculation:**

Year -1

Year -2

- ◆ There is a new option in Census Specifications to include the average annual accrued benefit on the Schedule of Active Participant data. This is useful for attaching to the 5500 Schedule SB for frozen plans.

## Belgium Pension Plans

- ◆ ProVal now values in-service benefits, sometimes known as Jubilee benefits (e.g. two weeks of pay after twenty five years of service).

**Benefit Definition - [new]**

Name:

Contingency initiating benefits:

Normal Payment Form:

Post-Decrement Probabilities apply

Select a topic to edit:

- Eligibility Requirements
- Benefit Formula
- Attribution & Vesting
- Optional Payment Forms
- 415(b) Maximum Benefit Limit
- Cost-of-Living Adjustments (COLAs)
- Benefit Formula for EAN Normal Cost

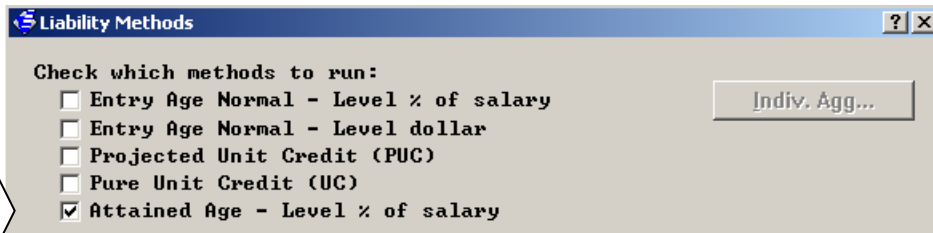
- ◆ Belgium insurance contracts with participation can now apply the Delta Capital and Delta Premium methods for incorporating prior contracts.
- ◆ In Universal Pension mode, a new option in Valuation Assumptions > Liability Methods lets you interpolate results to exact age. If checked, ProVal will make two passes for each participant

(one pass as though they were age last birthday on the valuation date, another pass as though they were age next birthday on the valuation date) and interpolate the two sets of results to exact age. For details, see the Technical Reference article “Interpolate Results to Exact Age”.

- ◆ ProVal now calculates the reserve and premium for term life insurance contracts, also known as death coverage.

## Canadian Registered Pension Plans

- ◆ The Attained Age – level % of salary liability method is now available in Canadian, Public, and Universal pension funding valuation assumptions. This supports the three additional cost methods that have been added to the Asset & Funding policies in these modes: “Attained Age, % of Salary”, “Aggregate Attained Age, % of Salary”, and “Aggregate Attained Age, Level \$”.



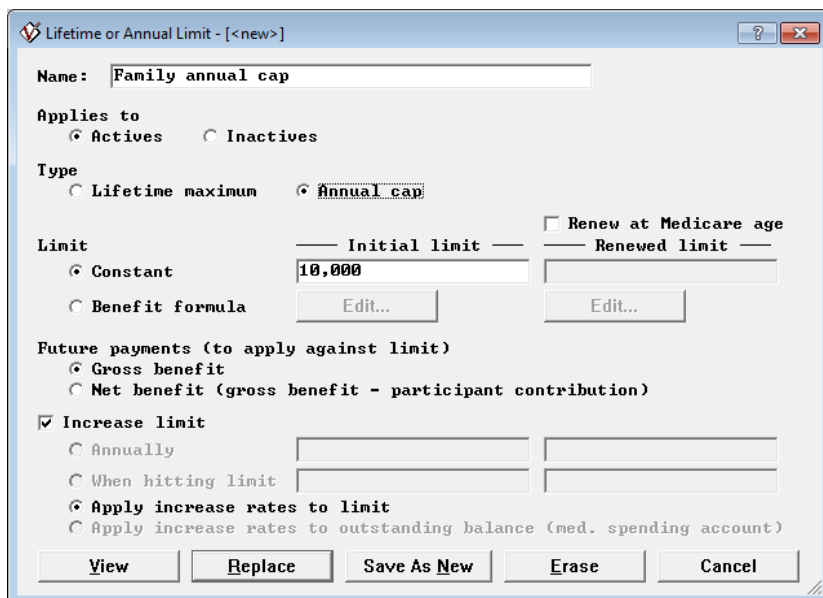
- ◆ Transfer value and annuity purchase solvency liability splits are now available as Custom Stochastic Variables.

## Netherlands Pension Plans

- ◆ A new accrual format, “career average with indexing”, has been added for Netherlands plans. It is similar to the “cash balance” accrual format, but (if indexation is specified as occurring at “beginning of year”) the annual accrual gets a full year of interest, not just the existing account balance.

## OPEB Plans

- ◆ The “Lifetime and Annual Limits” library (formerly named “Lifetime Maximums”) now explicitly supports annual caps covering multiple benefits. This makes it easy to model annual family caps (single benefit caps can generally be written directly into the benefit formula, as in “claims #/min cap”). The annual caps can have increase rates applied.





## Sample Lives

- ◆ Sample lives in OPEB mode now contain reports for accrual basis components. In addition, benefit formula and accrual basis components can now be de-selected for viewing the sample life.
- ◆ If the field containing the number of lives selected for running sample lives is blank, the default is now to run 20 rather than 1.

## Forecasting

- ◆ Deterministic forecasts now support yield curve changes (e.g. spot rate curve) other than parallel shifts. For more, see [Non-Parallel Yield Curve Shifts](#) on page 22.
- ◆ In deterministic and stochastic assumptions, there is a new option to specify either “additional contributions” (current feature) or “target contributions” by year. Thus, if the amount of the contribution is known, you now have to iteratively run the forecast for 1 additional year at a time to determine the additional amounts required to obtain the target.

Year	Maximum Section 420 Transfer	Additional Contributions
1		10,000,000
2		10,000,000
3		0
4		0
5		

Additional contributions are treated as:

Additional amounts

Target amounts

For Target amounts: enter 0 to contribute the minimum; enter a blank to follow the contribution policy.

OK Cancel

- ◆ Duration-based interest rates are now available in all modes for accounting and in OPEB, Universal, and Public modes for funding (they were already available for PPA and Canadian solvency liabilities). *Restriction:* in OPEB mode, duration based interest rates are limited to valuations; they cannot currently be used in Core Projections or Gain/Loss Analysis.
- ◆ In stochastic assumptions, the expected return on assets can now be set to equal the asset mix rate of return. Previously, varying this assumption by asset mix meant running a separate stochastic forecast for each mix.

Accounting Expected Return on Assets

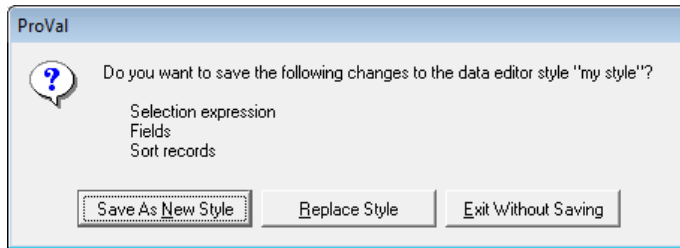
Vary based on Asset mix

Benchmark yield:

- ◆ The Efficient Frontier contains a new option to limit the number of mixes to a user-specified number.

## Census Data

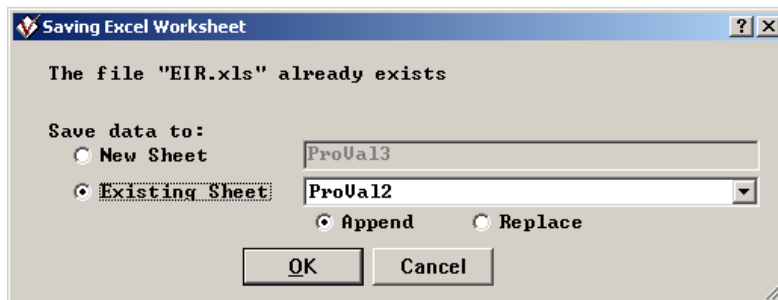
- ◆ In Spreadsheet Edit, when closing a database and the style has changed (selection expression, arrangement of fields, sorting of records, etc.), there is a new “Save as New Style” button and more information about what changed. Hopefully, this will avoid inadvertent changes to standard styles.



- ◆ The Check for Duplicate Keys command now contains a selection expression. This can be useful when a good primary key is not available. For example, you could look for duplicate inactive records by matching on LastName and Benefit along with a selection expression of "Status <> 1".
- ◆ In Screen Data, there is a new option to suppress the RecIDs list for data defaults in the output.

## Output & Reporting

- ◆ When saving output to Excel, you can now specify the sheet to save to.



- ◆ Dashes from SSNs have been removed when saving output to .csv/.xls files to be consistent with copy/paste from Spreadsheet Edit. This consistency enables easy lookups between screening test output and pasted data.

## Report Writer

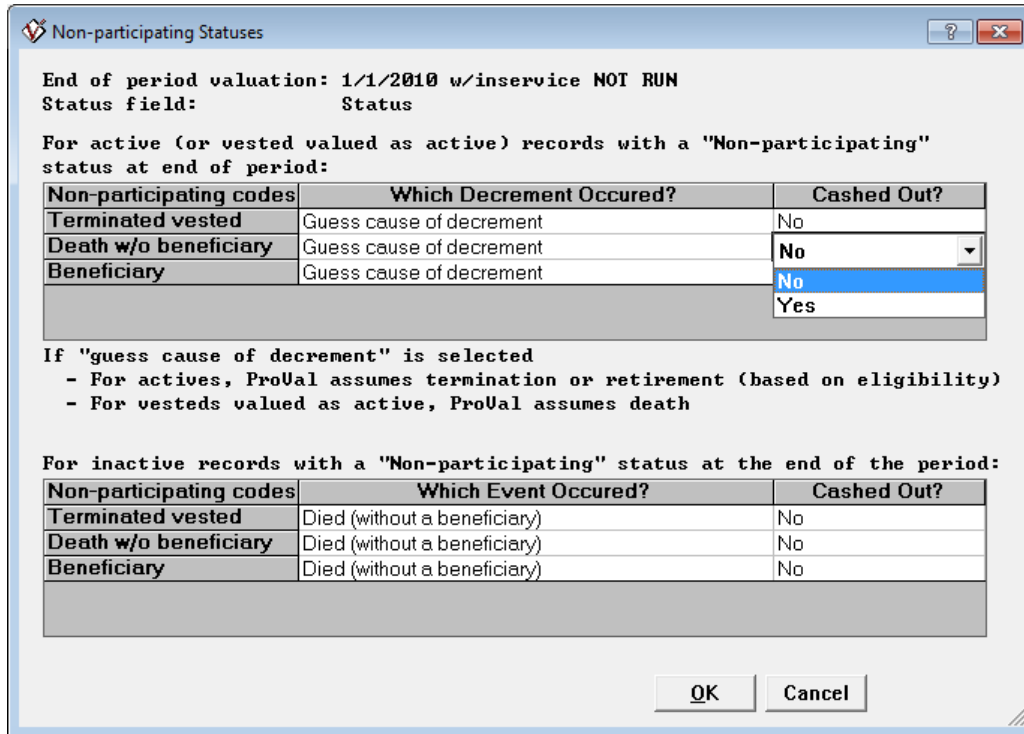
- ◆ The “Asset Returns” feature now allows entries of “Statement of Assets” and “Reconciliation of the Market Value of Assets” with multiple years side-by-side and automatic subtotaling.
- ◆ There are two new tabs under Review ProVal Data which allow you to view the valuation assumptions that underlie the Valuation Sets and Deterministic Forecast Exhibits. Now, all data available to the report writer (i.e., saved in Access) can be viewed within the Report Writer. This allows template authors to insert previously hidden data into template documents without having to write field specifications by hand.
- ◆ Overrides are now visually distinct. The changed cells will be marked with a red triangle in the upper left hand corner.

## Gain/Loss Analysis

- ◆ Gain / Loss Analysis can now be run on PPA target liabilities. In addition, it now isolates the gain/loss due to implicit assumption changes (e.g., duration interest rates or dynamic mortality).

- ◆ The Non-participating Statuses topic now lets you identify records that were “cashed out” (either received a lump sum of their benefit or terminated without a vested benefit). For these participants, ProVal eliminates any would-be unreconciled liability (which may be zero in many cases) and adds this amount to expected benefit payments. This avoids inflating the unreconciled and benefit payment gain/loss categories by roughly equal but opposite amounts for plans that pay more (or less) in lump sums than assumed.

Also, the questions in the Non-participating Statuses topic have been clarified to ask “which decrement occurred?” for actives and “which even occurred?” for inactives.



- ◆ Individual results are now available for the actual beginning of period, expected end of period, and actual end of period actuarial liabilities.

## Nondiscrimination Testing

- ◆ The Coverage and General Tests command contains a new option to remove intermediate rounding when determining ratios.
- ◆ Nondiscrimination Coverage and General tests will now run with a database whose count field contains fractional values. This is helpful when running nondiscrimination tests on projected database files.

## System

- ◆ In Batch Execution, you can now control the order in which runs are executed. For example, you might place a long run at the top of the list to make sure it gets done first.
- ◆ In Batch Execution, the Cancel button now offers to cancel all remaining runs, not just the current run being processed.
- ◆ ProVal has now been tested under Windows 7 and Windows Server 2008.
- ◆ Application file names now consistently follow the pattern “proval.xxx”, making the .ini file parameters “Initial Workspace=” and “ADF=” optional (and no longer appear in the default .ini file that ships with ProVal). PROVALW.EXE has been renamed PROVAL.EXE, PROVALW.INI has been renamed PROVAL.INI, and PROVALW.BMP has been renamed PROVAL.BMP. This may

necessitate changes to existing network installation shortcuts, WinTech License Server installations, and/or ProVal Batch Server installations. You may need to:

- rename your existing PROVALW.INI files to PROVAL.INI.
  - update references to filenames in your existing ProVal shortcuts.
  - update references to filenames in your existing PROVAL.INI and WinTechService.License.INI for your existing License Server(s), and
  - update references to filenames in your existing PROVAL.INI and WinTechService.Batch.INI files for your existing Batch Server(s).
- ◆ The version of PVAPI.DLL that ships with ProVal 3.01 is not backward compatible with the one that ships with older versions of ProVal. For ProVal 3.01, you will need to register its own copy of PVAPI.DLL. We expect that this version should remain forward compatible unless we specify otherwise.

### **Batch Server**

- ◆ The batch server has been enhanced to synchronize over different time zones.

### **Changes Log**

- ◆ Be sure to read the changes log (see the "changes log.doc" file in the ProVal directory) about updates to certain calculations that may change results.

#### **New Member of the WinTech Team**

Craig Chu recently joined the WinTech Team. He is an experienced consulting actuary and, among other responsibilities, will be working on ProVal enhancements. Be sure to say hello to him if you reach him at ProVal support.

#### **WinTech's Virtual Back Office**

Need help with a forecasting project? Why not call upon WinTech's experienced actuaries to fill in? Contact Hank Freeman at (203) 861-5526 for details or to request a quote.



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# 2010 Pension Relief Act

The Preservation of Access to Care for Medicare Beneficiaries and Pension Relief Act of 2010 (“the Act”) was signed into law by President Obama on Friday June 25. Below is a description of the ProVal 3.01 enhancements to model the Pension Relief Act.

## Shortfall Amortization Extension

The Act makes available two alternative extensions for PPA shortfall amortizations: “2+7” and “15 years”. One of these choices can be made for up to two (2) eligible plan years. The Asset & Funding Policy > Minimum Funding > Shortfall Amortization topic has been enhanced to allow the user to:

- Select **Elect Amortization Relief**. The user chooses the desired Schedule and up to two (2) election Years.

If an election year is in the past relative to the valuation date, you should enter remaining Amortization Installments for these years. ProVal always assumes that bases begin in the valuation year, therefore, a negative adjustment may be required for a “2+7” schedule. For example, if a “2+7” schedule was established for 2009 with \$100,000 for 2 years and \$1,000,000 for the next 7 years, enter the following as of 2010:

Remaining Years	Amortization Installment
1	-900,000
8	1,000,000

If an election year is the current plan year or in the future, ProVal will create new amortization installments per the selected schedule in a Valuation Set or Forecast.

If you **Override amortization interest rates** (generally because you are using a full yield curve assumption at mid-year durations), the number of interest rates entered must be sufficient to evaluate the chosen schedule (i.e., at least 8 years for “2+7”, at least 14 years for “15”). (Rates should not reflect the effective interest rate as used under the “2+7” schedule because all yield curve rates are needed for the calculation.) The Look up... button can be used to fill in the necessary number of rates; it will now always populate 14 rates.

- Specify a **Current year acceleration** amount.
  - The minimum required contribution (MRC) will include this amount and it will be separately identified in the exhibit that develops the Shortfall Amortization Charge.
  - This amount will be ignored when calculating the quarterly contributions if relief applies to the current or a prior plan year.
  - If a current year shortfall amortization is created (which would typically be the case unless you entered the current year amortization into the Amortization Installments

spreadsheet), ProVal will calculate the new base and then adjust it for the value of the current year acceleration.

- A warning will be issued if the current year acceleration is greater than the difference between the shortfall amortization on the original and the relief schedules.
- ProVal will not attempt to adjust any shortfall amortization bases if relief does not apply to the current year. This may be an enhancement in a future ProVal release.
- ProVal does not currently have a way to forecast acceleration amounts. This may be an enhancement in a future ProVal release.

The Valuation Set Exhibits, Deterministic Forecast Exhibits, and Stochastic Trial Exhibits now include additional details illustrating these calculations.

## Lookback for Certain Benefit Restrictions

The Act allows a specific prior year AFTAP to be used in lieu of the current year AFTAP for determining whether certain benefit restrictions apply. In ProVal's Asset & Funding Policy > Minimum Funding > Credit Balances and Waivers topic, there are new parameters under the **Waive balances to:** section that become available if balances are maintained and the user chooses to waive balances to Meet 60% or 80/60% AFTAP, if possible.

There is a checkbox to specify a minimum AFTAP for plan years that begin prior to 10/1/2010. If the option to **Use xx% minimum AFTAP for pre 10/1/2010 plan years** is checked and you had chosen to **Meet 80/60% AFTAP, if possible**, you may also choose to apply the minimum AFTAP only for the 60% calculation. You would choose the checkbox **For 60% only (accelerated payments other than SSLI)** if your plan offered lump sums, for example, because lump sums are still potentially prohibited if the plan is not 80% funded on a current AFTAP basis.

If the option to **Waive balances an additional 10%, if possible**, is checked, ProVal will compare the specified minimum AFTAP against the 70% and 90% thresholds (in addition to the 60% and 80%).

**Credit Balances and Waivers**

**Maintain:**

Funding Standard Carryover Balance

Prefunding Balance

Apply to Minimum Required Contribution, if eligible

Eligible to apply balances against MRC (80% funded last year)

**Current Balance**

**Waive balances to:**

Meet **80/60%** AFTAP, if possible

Waive balances an additional 10%, if possible

Eligible for waive balances transition rule

Use  % minimum AFTAP for pre 10/1/2010 plan years

For 60% only (accelerated payments other than SSLI)

Avoid At-Risk status, if possible

Be eligible to apply balances against MRC in the following year (80% funded)

Meet  % FTAP

Do not waive balances if target cannot be met

**Non-HCE annuity purchases for AFTAP calculation:**

Year -1

Year -2

**OK** **Cancel**

## **Credit Balance rule lookback for Charities**

Certain charities can determine eligibility for applying credit balances against the MRC based on a specific funded ratio for two plan years. The existing Eligible to apply balances against MRC (80% funded last year) parameter on the Asset & Funding Policy > Minimum Funding > Credit Balances and Waivers dialog can be used to control the initial valuation year for a Valuation Set. It is possible that the first forecast year of a deterministic or stochastic forecast would be incorrect for such plans.

## **Multiemployer Plans**

The Act includes certain amortization extensions and asset valuation method provisions for multiemployer plans. The rules involve:

- Allowing 29 year amortization of certain investment losses. If applicable, such bases can be entered manually under ProVal's Asset & Funding Policy > ERISA Amortization > Minimum Funding Amortization Bases topic.
- Allowing the actuarial value of assets to be determined by smoothing certain investment losses over 10 years. ProVal cannot handle this directly, but the Weighting of Market Value and Expected Actuarial Value method could be used to value it in a Valuation Set.
- Expanding the asset corridor to 80% / 130% for certain plan years. ProVal 3.01 allows multiemployer plans to use 130%. However, ProVal cannot change the upper limit for certain years during a forecast.
- Amortizing over 30 years the change in the unfunded accrued liability attributable to any asset smoothing relief elected. If applicable, such bases can be entered manually under ProVal's Asset & Funding Policy > ERISA Amortization > Minimum Funding Amortization Bases topic.

# Optional Payment Forms

ProVal 3.01 allows multiple payment forms to be specified within a single Benefit Definition, removing the need to set up separate Benefit Definitions for each optional payment form. For example, suppose you value a choice of an annuity or lump sum for retirement. In version 2.30, this involved setting up two Benefit Definitions with different payment forms and benefit formulas (typically involving a lump sum factor) like this:

Ret – Annuity Benefit	
Payment Form	Life annuity commencing immediately
Benefit Formula	$ERF * (BASE + EXCESS)$
Ret – Lump Sum Benefit	
Payment Form	Lump Sum
Benefit Formula	$ERF * (BASE + EXCESS) * LSFactor$

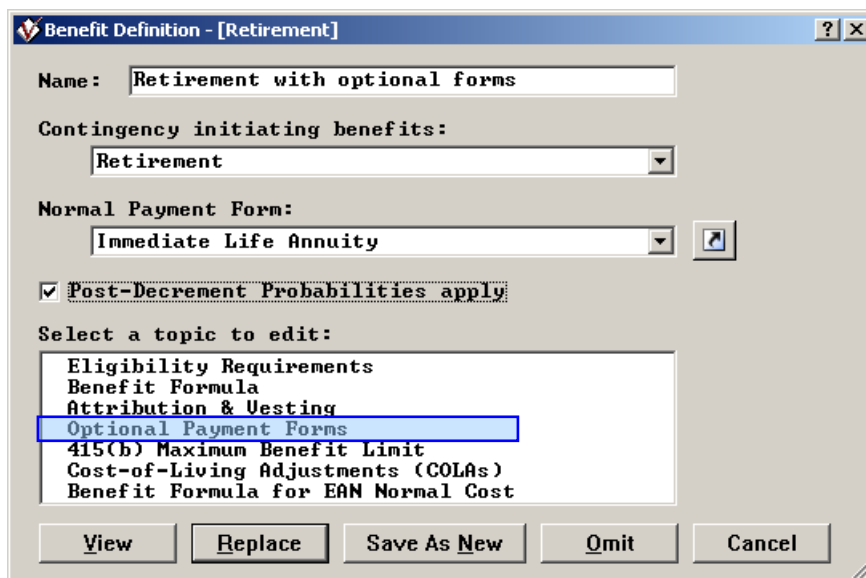
In version 3.01, you can do the same thing with a single Benefit Definition, like this:

Ret - Benefit Definition	
Normal Payment Form	Life annuity commencing immediately
Benefit Formula	$ERF * (BASE + EXCESS)$
Optional Payment Form(s)	Lump sum

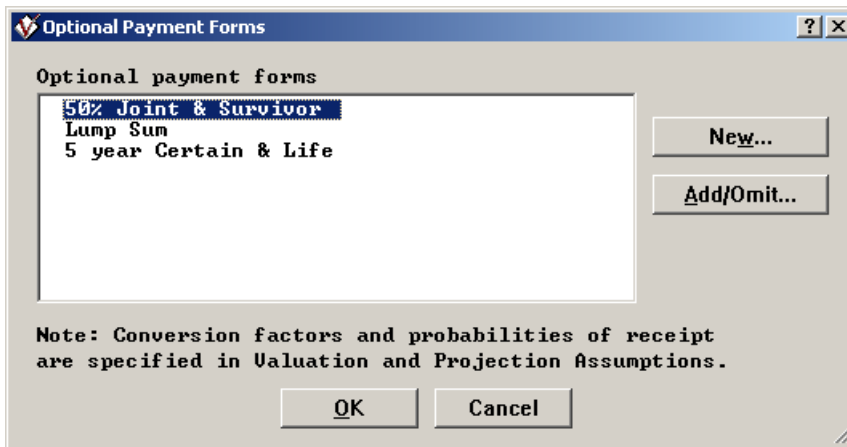
In both versions, the conversion basis (e.g., 417(e) mortality and 430 interest) and post-decrement probabilities (e.g., 20% annuities and 80% lump sums) are specified in Valuation Assumptions and Projection Assumptions.

## Benefit Definitions

To utilize this feature, first specify a Normal Payment Form and Benefit Formula in your Benefit Definition, just as you would in version 2.30. Then, click the “Optional Payment Forms” topic and select one or more entries from the Payment Form library.







Optional payment forms can differ from the normal payment form as follows:

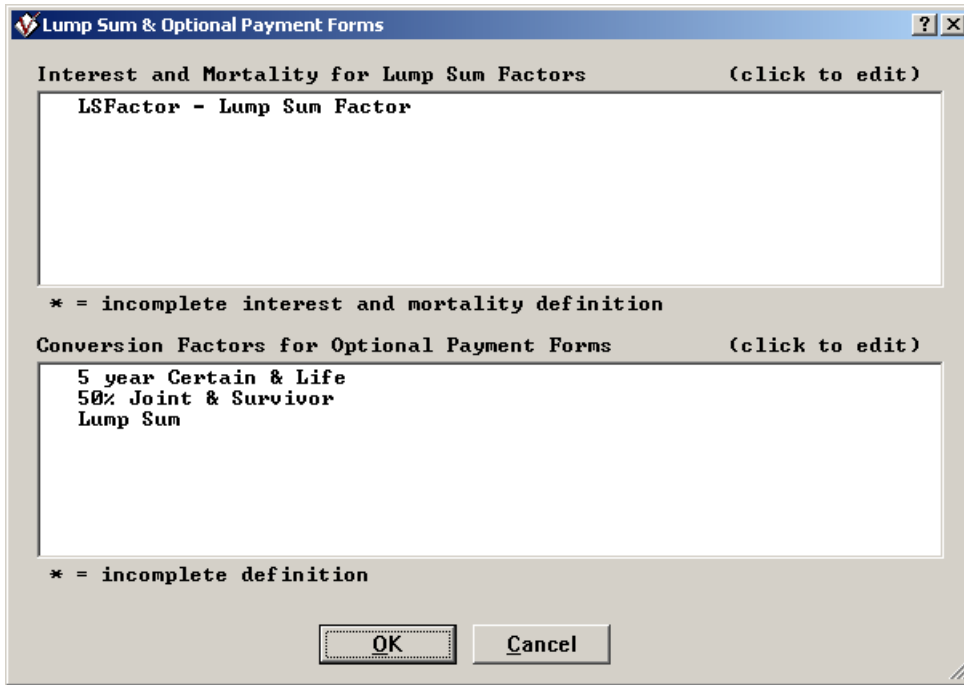
- Same commencement age, different basic form (most common case). For example, if the normal payment form is “immediate life annuity”, then the optional payment forms might be “immediate 50% joint and survivor annuity” and “immediate lump sum” (with conversion probably based on interest and mortality).
- Same basic form, different commencement age (while possible, the utility of this is limited). For example, if the normal payment form is a “deferred to 65 life annuity” then the optional payment form might be a “deferred to 55 life annuity” (with conversion probably based on an early retirement factor).
- Different commencement age and basic form (generally just for lump sums). For example, if the normal payment form is a “deferred to 65 life annuity” then the optional payment form might be an “immediate lump sum” (with conversion probably based on interest and mortality).

Before you exit the Benefit Definition dialog box, make sure to check that Post-Decrement Probabilities apply (ProVal will remind you if you forget).

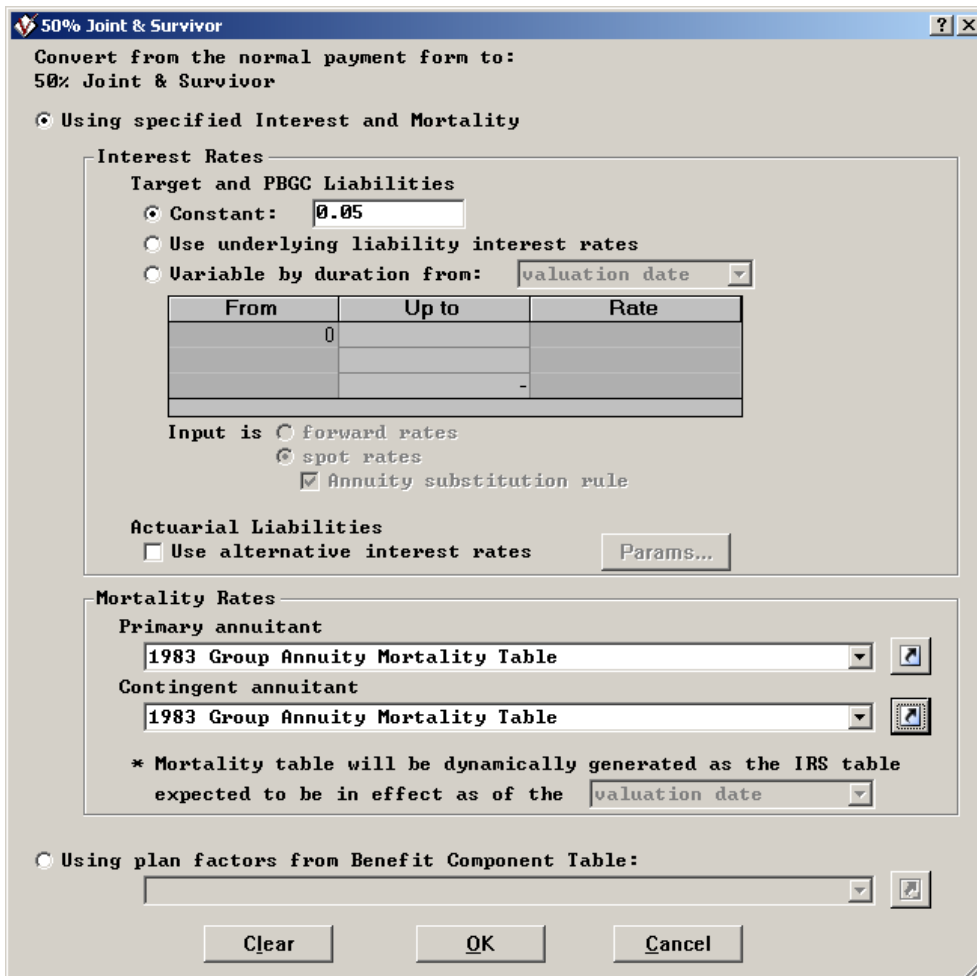
*Restrictions:* Life insurance, Post-Decrement Death Benefit and Deferred Lump Sum payment forms cannot be used in conjunction with optional forms (including the normal form). In a core projection, if a benefit definition with optional payment forms is replaced in a plan amendment, the replacement benefit definition must contain identical optional payment forms.

### **Valuation & Projection Assumptions: Conversion basis**

To specify the conversion basis, select an optional payment form in the “Lump Sum & Optional Payment Forms” topic (previously called “Lump Sum Interest & Mortality”) in Valuation Assumptions or Projection Assumptions. Note that optional payment forms which are either hidden in the payment form library or referenced by hidden Benefit Definitions will not appear in the dialog box.



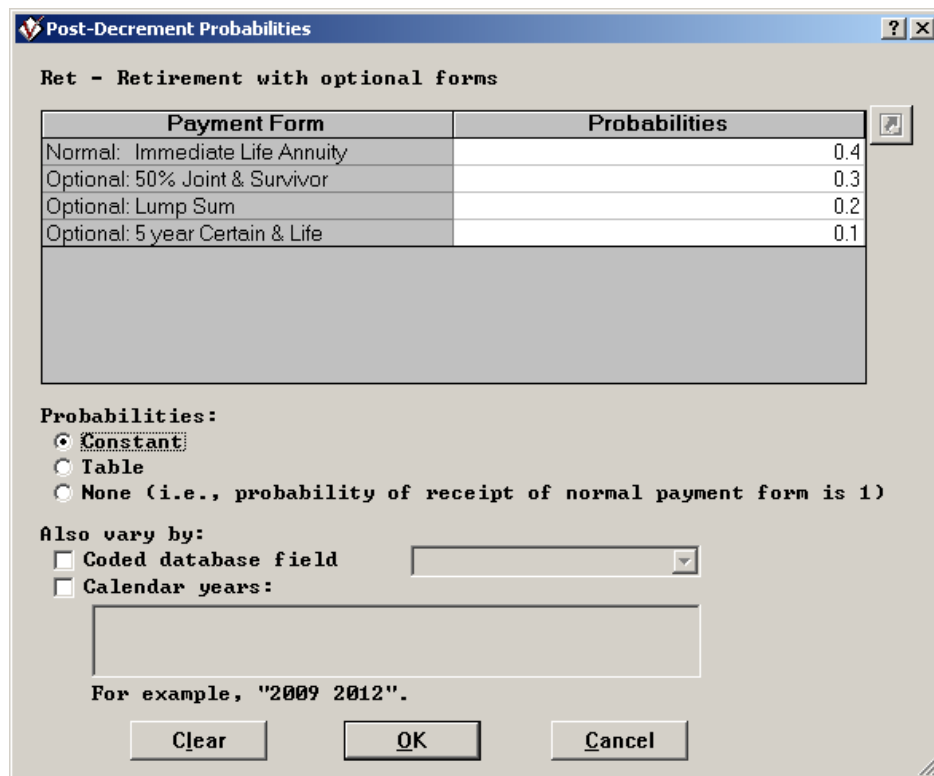
Select the applicable radio button to specify conversion using Interest and Mortality or using a Benefit Component Table. Here is the dialog box from Valuation Assumptions in U.S. Qualified mode for the PPA law type:



ProVal will convert the benefit formula, after any regulatory limits are applied (e.g., 415 limit), by applying a conversion factor. If Interest and Mortality is selected, the conversion factor is the ratio of a lump sum factor based on the normal payment form over a lump sum factor based on the optional payment form. In general, COLA assumptions are ignored for this purpose. The one exception is if the normal payment form is an annuity with a COLA applied and the optional payment form is a lump sum. In that case, the conversion numerator will reflect the COLA assumption.

## Valuation & Projection Assumptions: Post-decrement probabilities

In addition to specifying the conversion basis in Valuation and Projection assumptions, post-decrement probabilities must be specified. The Valuation and Projection Assumption screen to enter post-decrement probabilities for a benefit has been modified to list the normal and optional payment forms for that benefit. (Also, note that you can now specify constant probabilities that vary by coded field or calendar year. In previous versions of ProVal, the constants had to first be entered in a table.)



Payment Form	Probabilities
Normal: Immediate Life Annuity	0.4
Optional: 50% Joint & Survivor	0.3
Optional: Lump Sum	0.2
Optional: 5 year Certain & Life	0.1

**Probabilities:**

Constant

Table

None (i.e., probability of receipt of normal payment form is 1)

**Also vary by:**

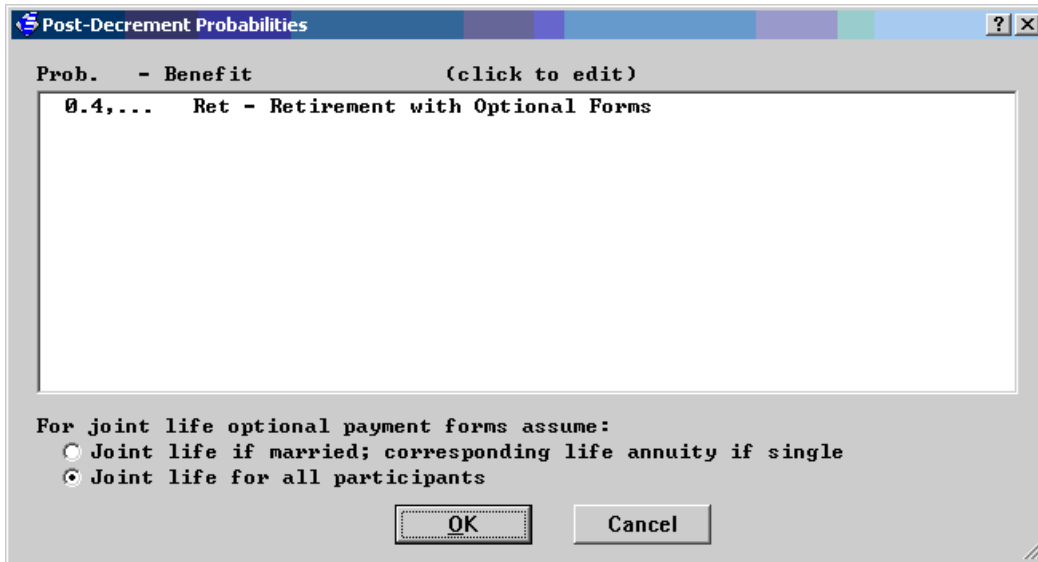
Coded database field

Calendar years:

For example, "2009 2012".

Clear OK Cancel

*Different payment forms for married vs. single participants:* In Valuation Assumptions, the main post-decrement probability screen contains a new option to apply or ignore the percent married assumption for joint life optional payment forms. If "joint life if married; corresponding life annuity if single" is selected, then the fraction of the population that is married and the fraction of married population electing the J&S option will be applied when valuing a joint life optional payment form. If the "joint life for all participants" option is selected, each joint life optional payment form will be valued assuming 100% of the population is married and 100% elect the J&S option.



Setting this to “joint life for all participants” makes it much easier to value the following situations:

- Different payment forms for single vs. married participants. For example, single participants receive a 10 year certain and life payment form and married participants receive a 50% joint and survivor payment form.
- Subsidized benefits. For example, single participants receive a life annuity and married participants receive a subsidized joint and survivor benefit.

In both cases, set the normal form of payment to the single form of payment and an optional form of payment to the married form of payment. Set the post decrement probability of the normal form equal to 1-the percent married and the optional form equal to the percent married. Elect to convert from the normal form of payment using a Benefit Component Table. Then, to value different payment forms, select a benefit formula component table of all 1s (no conversion) or to value subsidized benefits, select a benefit formula component table with conversion factors.

### Sample lives and output

Liability sample life reports have been enhanced to display either the benefit component table or the numerator and denominator values so that conversion factors are easy to verify. Each optional payment form will be displayed in its own sample life report.

PV of Future Benefits (Active)

Benefit: Ret - Retirement with optional forms <50% Joint & Survivor>

RecID: 15

Year	Member Age	Interest Discount	Prob. of Remaining Active	Eligibility	Prob. of Decrement	Post-Decrement Factor	Payment Form Value	Conversion Numerator: Normal Form	Conversion Denominator: Optional Form	Projected Benefit	PV Benefits
2009	50	1.000000	1.000000	0	0.000000	0.000000	11.947614	16.223278	16.604001	2,222.64	0.00
2010	51	0.925926	0.992363	0	0.000000	0.000000	11.872477	16.034522	16.425201	2,557.10	0.00
2011	52	0.857339	0.990584	0	0.000000	0.000000	11.792461	15.838385	16.239018	2,917.38	0.00
2012	53	0.793832	0.988654	0	0.000000	0.000000	11.707242	15.634569	16.045157	3,294.48	0.00
2013	54	0.735030	0.986559	0	0.000000	0.000000	11.616521	15.422867	15.843377	3,686.80	0.00
2014	55	0.680583	0.984275	1	0.099873	0.300000	11.520036	15.203183	15.633512	4,092.57	920.23
2015	56	0.630170	0.883597	1	0.049930	0.300000	11.417546	14.975476	15.415437	4,919.78	455.13
2016	57	0.583490	0.837064	1	0.049922	0.300000	11.308836	14.739767	15.189083	5,833.75	468.31
2017	58	0.540269	0.792743	1	0.049914	0.300000	11.193690	14.496076	14.954392	6,852.67	476.87
2018	59	0.500249	0.750514	1	0.049904	0.300000	11.071887	14.244403	14.711314	7,983.63	481.08
2019	60	0.463193	0.710264	1	0.199576	0.300000	10.943201	13.984727	14.459804	9,234.13	1,925.06
2020	61	0.428883	0.565801	1	0.199530	0.300000	10.807397	13.716997	14.199823	10,487.20	1,590.33
2021	62	0.397114	0.450513	1	0.349088	0.300000	10.664225	13.441119	13.931323	11,856.25	2,285.59
2022	63	0.367698	0.291308	1	0.249279	0.300000	10.513459	13.157028	13.654301	13,348.58	1,083.22
2023	64	0.340461	0.217220	1	0.249202	0.300000	10.354872	12.864656	13.368773	14,971.86	824.84
2024	65	0.315242	0.161875	1	1.000000	0.300000	10.188240	12.563953	13.074762	16,734.17	2,508.07
Total											13,018.74

Throughout ProVal, Benefit Definition results are available separately by optional payment form. The naming convention is to append the payment form name in < > brackets to the end of the Benefit Definition's name. An example is shown in the title of the sample life report above (second line).

# Non-Parallel Yield Curve Shifts

The methods for forecasting future valuation interest rates in a Deterministic Forecast have been expanded in ProVal version 3.01 to include forecasting to a yield curve that is not a parallel shift from the original valuation interest rate assumption. To facilitate this, a Forecast Yield Curves Library is now available that allows you to create forecast yield curve assumptions that may subsequently be referenced in Deterministic Assumptions.

The Forecast Yield Curves Library may be accessed through Input > Reference Tables > Forecast Yield Curves, in shortcuts under Deterministic Assumptions, or in Deterministic Assumptions through the backdoor edit button.

**Name:** Illustrative Yield Curve Library entry

— Bendpoints (\* = optional) —

**Rates:** 0 5\* 20\*

Year	Rate at duration 0	Rate at duration 5	Rate at duration 20
1	0.02	0.025	0.03
2	0.03	0.035	0.04

**Note:** Assumptions for last year specified will be used for all subsequent years.

**Type:**

- segment rates (constant between bendpoints)
- full yield curve (fit curve to bendpoints)

If the valuation assumption is a constant interest rate, the rates above are:

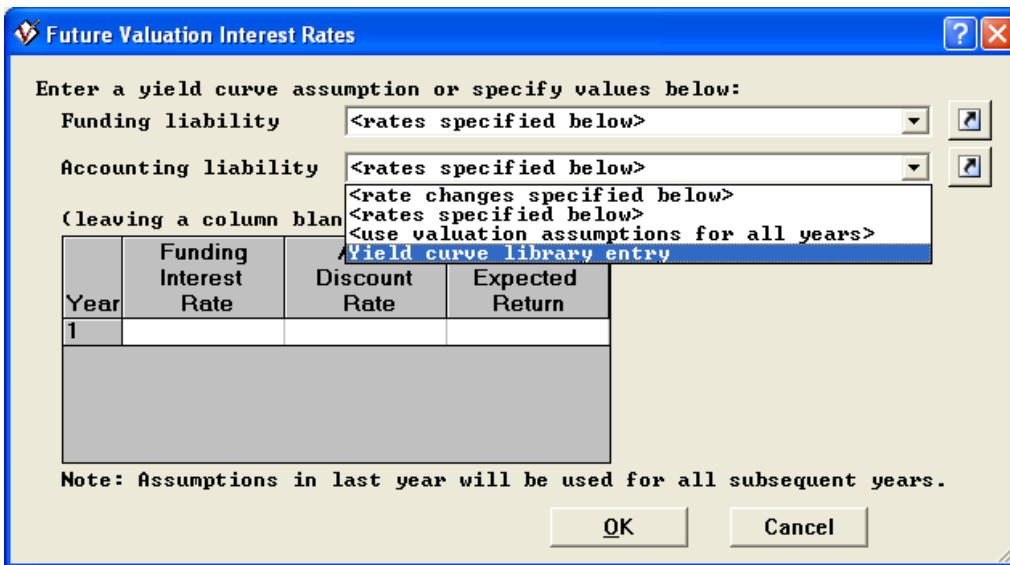
- spot rates
- forward rates

Buttons: View, Replace, Save As New, Erase, Cancel

To create a yield curve (duration-based interest rate assumption) for each forecast year, input the interest rate at duration 0 for each forecast year and up to two additional durations or “bendpoints”. You may then instruct ProVal to create segment rates by keeping the specified interest rates constant between the bendpoints, or create a full yield curve by fitting a curve to the bendpoints.

The nature of the valuation assumption interest rate determines the interpretation of the forecasted yield curve in a forecast. If the valuation interest rate is spot rates, the forecasted yield curve will be interpreted as spot rates; if the valuation interest rate is forward rates, the forecasted yield curve will be interpreted as forward rates. The only ambiguity is when the valuation interest rate is a constant. The last yield curve parameter resolves this ambiguity by letting you specify whether the rates should be interpreted as spot rates or forward rates in the

case of a constant interest rate valuation assumption. If the valuation assumption is not a constant interest rate, this parameter will have no effect.



Forecast yield curve assumptions (where available) are specified under the Future Valuation Interest Rates topic of Deterministic Assumptions. Any forecast yield curve library entries created will appear in the multi-choice list for the relevant liabilities: U.S. Qualified mode PPA liabilities; Canadian Transfer Value solvency liabilities; funding liabilities in OPEB, Universal, and Public modes; and accounting liabilities in all modes except Public. In addition to the yield curve library entries (where available), all liabilities now have the following choices for future interest rates: <rates specified below>, <rate changes specified below>, and <use valuation assumptions for all years>.

Please note that there is a requirement to have all interest sensitivity fractions in Projection Assumptions be zero when forecasting to a yield curve library entry. This is because ProVal needs to be able to determine the change in the liabilities due solely to interest rate changes in order to determine the effective duration of the liabilities, which it needs to make an accurate non-parallel yield curve shift forecast.

In ProVal PS, full yield curve forecasting was extended to the PPA target interest rate and the Solvency transfer value interest rate but not, for example, to the accounting discount rate. Because yield curve forecasting is not supported when non-zero sensitivity fractions are specified in projection assumptions, ProVal PS is limited to parallel shifts when sensitivity fractions are present. This is accomplished by ghosting all of the anchor points except the first one, so that all of the interest rates move in a parallel fashion when the user moves one interest rate. When full yield curve forecasting is available in ProVal PS, the anchor points are fixed at 0/5/20 for PPA target and 0/10 for Solvency transfer value. To create a full yield curve from the interest rate “spinners” available to the user in ProVal PS, for each forecast year PS measures the difference between the input rate and the rate at that duration for the interest rate curve used for the baseline deterministic forecast, then linearly interpolates these “deltas” and applies them to the baseline yield curve to determine the new curve. An exception to this rule however is that at any durations where the baseline curve was flat, the new curve is forced to be flat. The result of this is that if the baseline curve was segments, the new curve will always be segments and if the baseline curve was a fully graduated curve so will be any new curves that are forecast in ProVal PS. Note that because PS uses the baseline curve in this way, the forecasted curve it arrives at may differ from a forecast yield curve created within the ProVal forecast yield curve library using the same anchor points and rates.

# Average Expected Future Service & Lifetime

This article discusses the background and rationale behind changing ProVal's calculation of average expected future service for those expected to receive benefits (AEFS). These changes affect AEFS (a) whether counting service to retirement or to full eligibility (in OPEB mode) and (b) whether assuming beginning or middle of year timing of decrements.

The calculation of total expected future service (TEFS) for those expected to receive benefits remains unchanged.

The focus here is on future service calculations, but similar changes apply to future lifetime calculations.

## Background

ProVal's previous and new calculations are based, in large part, on a good faith reading of Actuarial Compliance Guideline (ACG) No. 1 and No. 3.

Note: While ACG No. 1 and No. 3 were repealed effective in 2003, we believe the formulas contained in the ACGs are consistent with the Actuarial Standards of Practice (ASOPs) that are still in force. What's more, the ACGs contain the only published formulas we are aware of (e.g., formulas do not appear in the ASOPs). For more information:

- ACG No. 1: [http://actuarialstandardsboard.com/pdf/acgs/acg1\\_old.pdf](http://actuarialstandardsboard.com/pdf/acgs/acg1_old.pdf)
- ACG No. 3: [http://actuarialstandardsboard.com/pdf/superseded/acg3\\_old.pdf](http://actuarialstandardsboard.com/pdf/superseded/acg3_old.pdf) (unfortunately, the online version does not contain the formulas)
- Repeal of the ACGs: <http://actuarialstandardsboard.com/acgs.asp>.

Per ACG No. 3, the general formula for calculating each employee's total expected future service is as follows. [The calculation of TEFS remains unchanged under version 3.01. It is presented here because it is the numerator to AEFS.]

$$[1] \quad \sum_{t=0}^{u-x-1} \left\{ \sum_{s=t}^{r-x-1} \left[ {}_s p^{(T)}_x \sum_d q^{(d)}_{x+s} \cdot E^{(d)}_{x+s} \right] \right\}$$

for all decrements  $d$ , where:

$x$  = attained age

$r$  = the age when the probability of retirement is 1

$u$  = the ending date for counting service, i.e., either the full eligibility age or  $r$ .

$E^{(d)}_{x+s}$  = 1, if a positive employer-provided benefit is projected to be payable based on termination of employment by decrement  $d$  at age  $x+s$ .

= 0, otherwise

Per ACG No. 1 and 3, "if level amortization over the average future years of service is contemplated ... it is also necessary to compute the total number of employees expected to receive benefits. Each employee's contribution to the total is computed for all decrements  $d$  as":

$$[2] \quad \sum_{t=0}^{r-x-1} \left\{ \sum_d t p^{(T)}_x \cdot q^{(d)}_{x+t} \cdot E^{(d)}_{x+t} \right\}$$



Thus, AEFS is the ratio (Sum of [1] for all employees)/(Sum of [2] for all employees). Note that [2] is simply the first term from [1], i.e., when t=0.

### ProVal's prior calculation of AEFS

To determine TEFS and the numerator for AEFS, ProVal previously used [1] with a couple of corrections for what were judged to be typos.

$$[3] \quad \sum_{t=1}^{u-x} \left\{ \sum_{s=t}^{r-x} \left[ sP^{(T)}_x \sum_d q^{(d)}_{x+s} \cdot E^{(d)}_{x+s} \right] \right\}$$

These corrections were necessary to make the following statement from ACG No. 1 hold: "[total expected future service] will be the present value of \$1 per year of future service at a zero interest rate ... if there are benefits payable for all decrements at all durations".

Put another way, if E=1 for all ages, then [3] simplifies to:

$$\sum_{t=1}^{u-x} tP^{(T)}_x$$

To determine the denominator for AEFS, ProVal previously used the first term of [3], i.e., when t=1. This is the same as [2], except for the corrections as made in [3].

$$[4] \quad \sum_{t=1}^{r-x} \left\{ \sum_d tP^{(T)}_x \cdot q^{(d)}_{x+t} \cdot E^{(d)}_{x+t} \right\}$$

Note that if E=1 for all ages, then [4] simplifies to:

$$P^{(T)}_x$$

Thus, ProVal previously calculated AEFS as the ratio (Sum of [3] for all employees)/(Sum of [4] for all employees).

Here's an example with one decrement and one employee. Let's assume that 50% of the employee decrements immediately with \$0 benefit (E=0). The other half of the employee retires in 10 years with a positive benefit (E=1). Total expected future service is 5 years, which makes sense since 0.5 \* 0 years + 0.5 \* 10 years = 5 years. Average future service for the portion of the employee expected to receive benefits is 10 years. This makes sense since only 50% of the employee is expected to receive benefits, and that portion of the employee will work 10 years.

Age	Q	$tP_x$	E	Expected Future Service	Num. Exp. to Receive Benefits
55	0.5	1	0		
56	0	0.5	1	0.5	0
57	0	0.5	1	0.5	0
58	0	0.5	1	0.5	0
59	0	0.5	1	0.5	0
60	0	0.5	1	0.5	0

61	0	0.5	1	0.5	0
62	0	0.5	1	0.5	0
63	0	0.5	1	0.5	0
64	0	0.5	1	0.5	0
65	1	0.5	1	0.5	0.5
Total				5	0.5
Average				10	

Let's repeat the example, but change it so that the 50% of the employee that decrements immediately receives a positive benefit (E=1). ProVal's prior calculation yielded the same answer for AEFS (10) as in the previous example. Intuition tells us that since the employee is expected to receive a benefit at all ages, AEFS should equal TEFS (5). This example points out a weakness in ProVal's prior calculation.

Age	Q	${}_t p_x$	E	Expected Future Service	Num. Exp. to Receive Benefits
55	0.5	1	1		
56	0	0.5	1	0.5	0
57	0	0.5	1	0.5	0
58	0	0.5	1	0.5	0
59	0	0.5	1	0.5	0
60	0	0.5	1	0.5	0
61	0	0.5	1	0.5	0
62	0	0.5	1	0.5	0
63	0	0.5	1	0.5	0
64	0	0.5	1	0.5	0
65	1	0.5	1	0.5	0.5
Total				5	0.5
Average				10	

### Revised calculation of AEFS

To correct for this weakness, we have changed the denominator in [4] to include the current age, when  $t=0$ . This not only corrects for the weakness noted above, but faithfully computes the "total number of employees expected to receive benefits". The denominator becomes:

$$[5] \quad \sum_{t=0}^{r-x} \left\{ \sum_d t^p(T)_x \cdot q^{(d)}_{x+t} \cdot E^{(d)}_{x+t} \right\}$$

Another way to view this change is that if  $E=1$  for all ages, then the denominator simplifies to 1 (i.e., headcount at the beginning of the year) instead of  $p_x$  (i.e., headcount at the end of the year).

AEFS becomes the ratio (Sum of [3] for all employees)/(Sum of [5] for all employees).

If we revisit the examples above, AEFS in the first example remains unchanged. However, AEFS in the second example changes to 5 rather than 10.

## Middle of year decrements

The formulas above apply under a beginning of year decrement assumption. As it states in ACG No. 3, "modifications to the formulas ... are appropriate to reflect the time during the year when the decrement is assumed to occur." For the variations of [3] and [4] previously used by ProVal under a middle of year decrement assumption, see the Technical Reference article "Expected future service" in ProVal's help.

The denominator for AEFS under a middle of year decrement assumption has been revised from the first term of the TEFS (as found in the help) to [5]. That is, the same denominator as under a beginning of year assumption (the only difference being that  $E$  is evaluated at the point of decrement). The numerator for AEFS (i.e., TEFS) under a middle of year decrement assumption remains unchanged.

## Average life expectancy

In many ways, the average life expectancy calculation is parallel to the average expected future service calculation. In particular, ProVal previously used the first term of the numerator for the denominator, just like it previously did for AEFS. For ProVal version 3.01, parallel changes have been made to the average life expectancy calculation. Thus, the denominator for the average is now the number of participants expected to receive a benefit at decrement (or on/after the valuation date for current inactives) rather than the number of participants alive at the end of the year. For additional details, see the Technical Reference articles "Life expectancy for actives" and "Life expectancy for inactives" in ProVal's help.

In addition to this methodology change, life expectancy calculations in pension modes now include some participants that were previously excluded. In valuations and core projections, participants valued using the ProVal status "Vested Valued as Active" are now included. In core projections, emerging inactives are now included.

## Transition considerations

For average expected future service/lifetime calculations, the denominator is likely to be higher than it was in previous versions of ProVal. The extent of the change on the average depends on the plan. Typical plans should see slight decreases in AEFS/L. Other plans, such as those plans with populations skewed toward 100% retirement age, may see a more significant change.

To minimize disruptions for ongoing projects, an option has been added under Asset & Funding Policy > Accounting Methodology > Future Amortizations button. This option allows you to select the method for computing the denominator of the average calculations (expected future service and expected future lifetimes) in Valuation Sets and Deterministic & Stochastic Forecasts.

- "Headcount expected to receive benefits" is the method described in the Revised Calculation of AEFS section above. When client files are updated to version 3.01, existing Asset & Funding Policies will be updated to use this option. However, you will need to rerun the valuation or core projection to see a change in results.
- "Expected headcount at end of year (not recommended)" is ProVal's prior methodology.

## Other changes

For a complete list of changes to the future working lifetime and expected lifetime calculations, see the "Changes Log.doc" file in the ProVal directory. Additional details on the calculations can also be found in the following Technical Reference articles:

- Life expectancy for actives
- Life expectancy for inactives
- Expected future service