

ProVal version 2.15



September 1999

ProVal version 2.15 introduces several new features including a tool to perform experience studies and the ability to calculate quarterly contributions given a schedule of contributions already made to date. You'll find details about these and other new enhancements to ProVal below.

Experience Studies

The Tools menu now includes an item for Experience Studies. This tool compares actual and expected active decrements, post-decrement probabilities, salary growth, and inactive mortality. The results can be broken down by age groups, service groups, and sex and can even be graphed. (See the article on page 4 for a detailed discussion of this feature.)

Quarterly Contributions

ProVal now has the ability to calculate quarterly contributions given actual contributions to date. For example, if you are doing a January valuation during July and the client has already paid one quarterly, you can input what the client has already paid and ProVal will calculate the remaining quarterlies due, as well as any penalty interest on late quarterlies. (For details about Quarterly Contributions, see the article on page 8).

System

- Two-digit years entered in ProVal are now automatically converted to a four-digit year as soon as you leave the field. This has long been the case for most date fields; it will now be the case for dates in expressions as well. Following the date window convention used by Excel, years 30-99 are interpreted as 1930-1999, and years 00-29 as 2000-2029. (See the article on page 11 for details.)
- ProVal output can now be written directly to Excel XLS spreadsheets. This saves you the steps of exporting to a CSV file and opening the file in Excel.

Two new keywords, #VERSION and #NUMPAGES, have been added under the Titles button of the Page Setup dialog. They allow you to include the ProVal version and total page count in the header or footer of your ProVal output.

Database

- Expression Sets can now incorporate Define Field by Table entries. In addition, the expression set interface has been enhanced for easier use.
- Define Field by Expression now includes the ability to view and print library entries.
- In the Data Dictionary, a user-specified format for "social security number" fields has been added to accommodate Canadian and other international formats.
- The client name is now printed on the status reconciliation, compare fields, and compare status reports.
- The import command now recognizes "signed numeric data" (a.k.a. Cobol PIC S999 display format, e.g. 4K for -42). If this format is encountered during import, ProVal will offer to treat the field as signed numeric.

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Benefits

- Now it's easier to view and print parts of a Plan Definition through the use of a new "customize" button. This button appears when viewing a Plan Definition, Benefit Definition or Benefit Formula Component.
- When printing benefits, entries will be combined onto a single page, if possible, instead of using a separate page for each.
- ♦ A Plan Definition's "Date last modified" now reflects changes to any referenced objects, e.g. changes to Benefits or Components.

Valuations

When saving individual results, a new option allows you to automatically delete all records in the individual results database before processing. This ensures that the individual results database only contains records and results from the chosen valuation.

Valuation Sets

Additional inputs within Asset and Funding Policies offer additional control over contribution and cost calculations. These include:

- The ability to specify exact timing schedules for contributions in U.S. qualified mode. If a schedule is entered, quarterly contribution requirements and penalty interest calculations will reflect the known contributions and the assumption that all future contributions occur on or after the schedule date. The FAS 87 expected return on assets and the first year asset returns will reflect the actual contribution schedule. Expected return on any contribution receivable continues to be based on the "average time during the year that contributions are made" parameter.
- The Asset and Funding Policy "Update..." dialog has been streamlined for easier use. In addition, the copy procedure will determine contributions with interest if a schedule of employer contributions is entered and the roll forward will update prior year values related to quarterly contributions.
- Contributions under the "flat-percent" contribution policy are adjusted if needed to avoid expected assets becoming negative.

Exhibits

- The development of the minimum contribution now excludes interest on quarterly contributions and has been expanded to show penalty interest, the full funding credit, the minimum contribution both before and after reflecting the credit balance and a reconciliation of actual and expected employer contributions with the minimum requirement.
- If there is no contribution schedule, the minimum contribution exhibit now reconciles contributions to the Valuation Set output based on the contribution timing in the Asset & Funding Policy.
- New lines have been added to ProVal's pension expense exhibit that show the expected benefit payment amount and estimated contributions used to determine the interest cost and the expected asset return.

Output

- Valuation and core output now let you choose what input items to display at the top of the page. These inputs include the valuation date, the run date and time, and interest rates.
- Active liabilities can now be displayed by decrement, rather than solely by benefit, in valuation and core output.
- "Total future expected service", "Penalty interest" (U.S.), "full funding credit" (U.S.), and "APBO, fully eligible" (OPEB) have been added to valuation and core output.
- Within Valuation Set Output, if there are additional events, the cover page now provides the event names.
- When loading a saved output style, titles for runs that have been renamed will now be updated automatically (unless custom titles have been specified).

Gain/Loss Analysis

- Unreconciled gains and losses are now split by every possible status transition, making them easier to track down and explain.
- A new status reconciliation exhibit tracks status changes between the beginning and end of year. This exhibit makes explaining gains and losses

easier since so many are caused by status changes.

- The gain/loss summary exhibit now reconciles liabilities instead of unfundeds if assets are not entered (previously, this was not available if assets were not entered).
- ♦ For active terminations and retirements, improved methodology now allocates the gain/loss to the decrement matching their end of year status regardless of eligibility. The gain/loss amount, on the other hand, remains unchanged and is based on retirement eligibility (or lack thereof).

Help

- New and expanded Help documentation has been provided about the ProVal Graphs tool.
- Three new Technical Reference articles have been added to the Technical Reference section of Help. They are Expected Employee

Contributions, Interpolation of Liabilities in a Forecast and Rolling Forward the Market Value of Assets.

Changes Log

Be sure to read the changes log (see What's New in Help or the CHANGES.LOG file in the ProVal directory) about updates in version 2.15 which may produce different execution results. These changes include Canadian mode stochastic forecasts, stochastic discount rates, monthly adjustments for J&S annuities, gain/loss methodology, the 100% current liability minimum RPA additional funding charge calculation, public mode funding period, funding deficiencies, plans using less than the maximum RPA '94 current liability rate, flat percent of pay contribution policies, plan amendments involving a change in payment form, and age/service scatters.

The ProVal Team is Growing!

You may have heard some new voices recently on the support help line. Three new people have joined our ProVal team in the past few months: George Johnson, Iris Kazin and Michael Tortora. George is covering the technical administration of ProVal. If you need new hardware keys, call George. Iris and Mike will be answering your support calls, running training sessions, and writing more technical reference and help documents.

Using the Experience Study Tool

The experience study tool compares actual versus expected active decrements, post-decrement probabilities, salary growth, and inactive mortality given several years of historical data. The tool is designed to use the last "n" years worth of valuation data, with one database specified per year. In other words, if a valuation has been performed for each of the last "n" years (and consistent field names have been used from year to year), no additional data work should be necessary to run an experience study.

To run an Experience Study, choose **Experience Study** from the **Tools** menu. Each of

the Experience Study topics is discussed below. Depending on what you choose to study, some of these topics may not be necessary and will not appear.

Databases

You must specify a beginning and an ending valuation date, for example 1/1/1992 and 1/1/1999. The study must span an integral number of years; partial years are not permitted.

Next, you must provide a database for each year in the study period. Press the "Selection Exprs..." button if only a select number of records should be used from any database.

A key field is used to track records from year to year.

Unique keys are required in each database, but only among the records meeting the selection expression (if any).

Status Code Mappings

The Status Code Mappings topic is similar to that found in Census Specifications.

Status Code Mappings determine each record's status at the beginning and end of each year. By tracking changes in status, the actual experience for

active decrements and inactive mortality can be determined (see sidebar, *Active Decrements and Inactive Mortality*).

Valid statuses are:

 "Active", "Retired", "Vested", "Disabled", "Survivor", and "Non-participating". These are the same statuses used in Valuations and Core Projections. Records with a "nonparticipating" status at the end of the year will be treated as terminating, retiring, or dying depending on beginning-of-year status (see the sidebar for details).

xperience Study
Name: Sample experience study
Select the assumptions to study:
Actives: Pocrements Post-decrement probabilities Continuing actives: Salary growth Inactives: Mortality
Select a topic to edit: Databases Status Code Mappings Active Data Inactive Data Assumptions Benefits Received by Decrementing Actives Report Breakpoints Run View Replace Save As New Erase Cancel

• "Retired & cashed out", "Vested & cashed out", "Disabled & cashed out", and "Survivor & cashed out". These "cashed out" statuses are provided for inactives whose benefits are not subject to mortality, e.g. lump sums, certain only benefits, or zero benefits. For example, if an active terminates and receives a lump sum, an end-of-year status of "vested & cashed out" will allow ProVal to establish the year they decrement and avoid including the person in the inactive count in the following year.

• "Death". This status provides a convenient way to identify records that have died with no additional benefits payable.

Active Data

The Active Data topic is similar to that found in Census Specifications.

Active Data determines the age, hire age, and sex of active members. These are used to look up decrement probabilities, post-decrement probabilities, and salary scale as well as to group the results.

Salary fields are required if you are studying salary growth for continuing actives. A different field name may be used in each year's database, e.g., PAY92, PAY93, PAY94, etc.

Inactive Data

The Inactive Data topic is similar to that found in Census Specifications.

Inactive Data determines the age and sex of inactive members. These are used to look up mortality probabilities and group the results.

If you wish, you can also specify age and sex fields for beneficiaries (of a joint & survivor benefit where the member is still alive). If provided, ProVal will track their mortality. If the beneficiary's age and sex are non-missing, the beneficiary is assumed to be alive. If the beneficiary's age or sex is missing, the beneficiary is assumed to be dead.

Assumptions

You must specify the Valuation Assumptions to be studied. Typically, these are your current valuation assumptions, rather than assumptions used in prior years' valuations. The assumptions might also be proposed valuation assumptions that you wish to compare to experience. In any case, the valuation assumptions will specify assumed active decrements, post-decrement probabilities, salary scale, and inactive mortality. A Plan Definition is used to specify eligibilities for active benefits. Principally, this determines when termination decrements "turn off" and retirement decrements "turn on". It also impacts the applicability of post-decrement probabilities (an active must decrement and be eligible for a benefit in order for post-decrement probabilities to apply).

Benefits Received by Decrementing Actives

This topic is applicable only if you are studying post-decrement probabilities (e.g., duty versus nonduty disability probabilities). It lets you identify which benefits eligible decrementing actives receive by using a database field code.

Report Breakpoints

Report Breakpoints let you control how results are grouped. For example, you might group the retirement decrement by ages "from 55 to 65 step 1" but group the termination decrement by ages "from 20 to 65 step 5".

Each report can be grouped by age, service, and/or sex. You might, for example, group the termination rates further by service "from 1 to 5 step 1" to see how terminations depend on service.

Note several important aspects of age and service breakpoints:

- Breakpoints must be integers. If fractional breakpoints are entered, they will be rounded.
- Breakpoints always include totals. Blank breakpoints will be interpreted as "totals only". Note that this behavior is different from that in Descriptive Statistics, Group Data, etc., where blank breakpoints are interpreted as "use every encountered value as a breakpoint".
- ♦ Age breakpoints refer to near age. Service breakpoints refer to service from hire (i.e., near age minus near hire age).

The subtotal field lets you group the results into subgroups, e.g., salaried and hourly employees. For records where the subtotal field changes from year to year, the beginning-of-year value governs.

Output

A report is generated for every item being studied. To select fewer reports, press the "Customize..." button.

All reports except the salary growth report have columns for counts (exposed, actual, and expected), probabilities (actual and expected), and the ratio of actual over expected. In the salary growth report, counts are replaced by salaries and probabilities are replaced by increases. Note that when an exposed count is 0, the actual and expected counts will be 0 too. These should be excluded from any statistical analysis performed on the results.

The "Graph..." button plots actual and expected probabilities (or increases if graphing salaries).

🐗 Experienc	e Study								
Print Review File La Graph Customize X Close									
Active decu Termination	rements n probabil:	ities							
Near age	 Exposed	Actual Terminations	Expected	Actual q's	Expected q's	Ratio: Actual over Expected			
<25 25-29	27 90	1 9	2.35 4.88	0.037037	0.087025 0.054213	0.426			
30-34 35-39 40-44	155 123 93	6 3 3	6.34 3.10 1.80	0.038710	0.040926	0.946 0.968 1.667			
45-49 50-54 55+	71 54 37	3 2	0.98	0.042254	0.013863	3.048 6.114			
<pre>Cotal></pre>	650	29	19.95	0.044615	0.030691	1.454			
 •									



ACTIVE DECREMENTS AND INACTIVE MORTALITY IN EXPERIENCE STUDIES

The following logic determines experience for active decrements, δ_x^k , and inactive mortality, δ_x , by tracking changes in status. Note that:

- Valid statuses are "active", "retired", "retired & cashed out", "vested", "vested & cashed out", "disabled", "disabled & cashed out", "survivor", "survivor & cashed out", "death", or "non-participating".
- The status "non-participating" includes a participant who is omitted from the data, is missing status, or is non-participating.
- The "cashed out" statuses only affect end-of-year results; they do not affect the following year's beginning-of-year counts.

Active decrements

For participants with beginning-of-year status "active",

$$\delta_x^r = 1 \text{ if } \begin{cases} \text{end-of-year status is "retired", "retired & cashed out", "vested", "vested & cashed out" or "non-participating" and the participant is eligible for retirement at the beginning-of-year
$$\delta_x^t = 1 \text{ if } \begin{cases} \text{end-of-year status is "retired", "retired & cashed out", "vested", "vested & cashed out" or "non-participating" and the participating" and the participating is not eligible for retirement at the beginning-of-year end-of-year status is "survivor", "survivor & cashed out" or "death"
$$\delta_x^s = 1 \text{ if } end-of-year status is "disabled" or "disabled & cashed out" the tashed out" the tashed out" end-of-year status is "disabled" or "disabled & cashed out" the tashed out" the tashed out" tashed out tashed out$$$$$$

Inactive mortality

For participants with beginning-of-year status "retired", "vested", or "disabled",

 $\delta_x = 1$ if end-of-year status is "survivor", "survivor & cashed out", "death", or "non-participating"

For participants with beginning-of-year status "survivor",

 $\delta_x = 1$ if end-of-year status is "death" or "non-participating"

For participants with a contingent annuitant (i.e. a beneficiary) at the beginning-of-year,

δ_y = 1 if
no contingent annuitant exists at the end-of-year exceptions:
1) If δ_x = 1 and end-of-year status is "retired", "retired & cashed out", "vested", "vested & cashed out", "disabled", "disabled & cashed out", "survivor", or "survivor & cashed out" (i.e., inactive) then δ_y = 0. In other words, if the member died but the record is still inactive, then the beneficiary must still be alive.
2) If beginning-of-year status is "retired," "vested" or "disabled" and end-of-year status is "active" (i.e., rehired) then δ_y = 0.

Quarterly Contributions

With release 2.15, ProVal's handling of quarterly contributions has been significantly improved. Under prior versions of ProVal, quarterly contribution requirements were displayed in Valuation Set Exhibits, but quarterlies were always assumed to be the required amount paid on the required day.

Beginning with version 2.15, you can enter the actual contributions made through a specified date. If this option (a is selected, ProVal will (b calculate the penalty interest, if any, on any late quarterly contributions and will determine the amount of any future quarterly contributions (c required based on the schedule of contributions already made.

Should you choose to use a **schedule of contributions,**^(d) there are a few issues to be remembered relative to

Valuation Set calculations and the Asset & Funding Policy's Contribution Policy screen:

If you reflect a schedule of contributions, ProVal will assume that the minimum contribution will be made (but not less than the scheduled contributions), except that **Contribution**^(b) Additional anv specified will be reflected (assuming end of year payment). Thus, the **Contribution Policy**^(a) parameter will have no effect on Valuation Set contributions, though it will affect forecast contributions after the first

year. (Note that *if you do not reflect a schedule of contributions*, the contribution timing parameter will be used in a valuation set to determine contributions with interest to plan year-end).

• For a Valuation Set, the contribution timing parameter ("fraction of year from Valuation

Date to average date contributions are made^{(c)"}) will be used only for the accounting expected return on contributions receivable. During a forecast, the contribution timing parameter will be used for funding contributions after the first year.

• Any quarterly contributions due and unpaid by

	Contribution Policy
	Actuarial Cost Method: Projected Unit Credit (PUC)
(a)	Contribution Policy: Normal Cost + Supplemental Cost 💌
(b)	Additional Contribution: 0
	Fraction of year from Valuation Date to end of Plan Year: to end of Tax Year:
(c)	Timing of contributions Fraction of year from Valuation Date to average date contributions are made: 0.5
(d)	Reflect contribution schedule for current Plan Year <u>Cont. Schedule</u>
	Add'l Params <u>O</u> K Cancel

Current Plan Year contributions through the schedule date: Date Amount 5/12/1999 250,000 For penalty interest, 175% of the Federal mid-term	Sc No	hedule date: 7717 te: All required will be consi	(1999) contributions after th dered paid when due	ne schedule date
Date Amount 5/12/1999 250,000 For penalty interest, 175% of the Federal mid-term	Cu	rrent Plan Year c	ontributions through t	he schedule date:
5/12/1999 250,000 For penalty interest, 175% of the Federal mid-term		Date	Amount	
For penalty interest, 175% of the Federal mid-term		5/12/1999	250,000	
interest vate: 0.0819 Look up rate				
	For	penalty interest nterest rate: 0.0	, 175% of the Federal 0819 Look up rate	mid-term e

the **schedule date**^(e) will be assumed to be made *on* the schedule date. If contributions greater than the required quarterlies have been made by the schedule date, no future contributions will be assumed made until the earlier of the end of the plan year or the next date when a non-zero quarterly contribution balance is required. The Funding Standard Account Credit Balance, if any, is always used first to satisfy any quarterly contribution requirements.

The Valuation Set Exhibits have been enhanced to display the new quarterly contribution calculations. The exhibit that develops the minimum contribution now:

- 1. Develops the minimum both before and after application of the credit balance;
- 2. Displays any interest penalty for late quarterlies;
- 3. Displays the full funding credit;
- 4. Develops required quarterly contributions; and
- 5. Reconciles actual contributions and expected contributions to the minimum required contribution, including interest and penalty interest if any.

1.	Accumulated funding deficiency on January 1, 1999	\$0
2.	Normal cost	188,539
з.	Net amortization charges/(credits)	457,805
4.	Interest at 8.00% to December 31, 1999 on (1), (2) & (3)	51,708
5.	Additional funding charge	615,562
6.	Preliminary minimum: (1)+(2)+(3)+(4)+(5)	1,313,613
7.	Interest penalty for late quarterly contributions	32
8.	<pre>Full funding limitation (a) Based on actuarial accrued liability (b) Based on OBRA '87 current liability (c) Based on RPA '94 current liability (d) Lesser of (a) and (b), but not less than (c) (e) Full funding credit: (6)-(d) (f) Adjusted full funding credit: (e)+(7) if (e)>0</pre>	2,327,980 3,859,983 2,003,962 2,327,980 0 0
9.	Preliminary minimum after FFL: (6)+(7)-(8)(f)	1,313,645
10.	Credit balance (a) Credit balance on January 1, 1999 (b) Interest at 8.00% to December 31, 1999 on (a) (c) Credit balance with interest: (a)+(b)	30,000 2,400 32,400
11.	Minimum required contribution December 31, 1999: (9)-(10)(c)	1,281,245
12.	Required quarterly contributions (a) Prior year current liability funded ratio (b) Are quarterly contributions required? (c) Prior year end-of-year minimum required contribution (d) Current year beginning-of-year minimum required contribution: (9)/(1+8.00%) (e) Required annual payment: lesser of (c) and .9x(d) (f) Amount of required quarterly contributions: .25x(e)	80.00% Yes 1,200,000 1,216,309 1,094,678 273,669
13.	Employer contributions as of December 31, 1999 (a) Actual contributions through July 1, 1999 (b) Expected contributions after July 1, 1999 (c) Total employer contributions: (a)+(b) (d) Interest credit to December 31, 1999 (e) Employer contributions with interest to December 31, 1999: (c)+(d)	250,000 1,004,506 1,254,506 26,739 1,281,245

Summary of Minimum Required Contribution Limits

The old quarterly contribution exhibit has been replaced with a new Schedule of Employer Contributions exhibit that details the credit balance and each contribution, with interest thereon and application to the quarterly contribution requirement. If penalty interest is applicable to any contribution, that contribution is flagged, and a penalty interest schedule is developed showing the penalty interest for late quarterlies.

Contributions					Application to Quarterly Requirements							
					FSA intere	st credit		Cont	ribution app	lied		
		w/ int.	Applied									
Date	Amount	to EOPY	Against	From	То	On	Amt.	Required	Avail.	Applied		
Credit balance (CB):		•										
Fri 1/01/1999	\$30,000	\$32,393	4/15/1999 Q	1/1/99	4/15/99	\$30,000	\$665	\$273,670	\$30,665	\$30,665		
Actual contributions:												
Wed 5/12/1999	\$250,000	\$262,589	4/15/1999 Q*	5/12/99	4/15/99	\$250,000	\$0	\$243,005	\$250,000	\$243,005		
			7/15/1999 Q	5/12/99	7/15/99	\$6,995	\$95	\$273,670	\$7,090	\$7,090		
Exp. quarterly conts.:												
Thu 7/15/1999	\$266,580	\$276,251	7/15/1999 Q	7/15/99	7/15/99	\$266,580	\$0	\$266,580	\$266,580	\$266,580		
Fri 10/15/1999	\$273,670	\$278,149	10/15/1999 Q	10/15/99	10/15/99	\$273,670	\$0	\$273,670	\$273,670	\$273,670		
Sat 1/15/2000	\$273,670	\$273,670	1/15/2000 Q	1/15/00	12/31/99	\$273,670	\$0	\$273,670	\$273,670	\$273,670		
Final contribution:												
Fri 12/31/1999	\$190,587	\$190,587	Final cont.	12/31/99	12/31/99	\$190,587	\$0					
Total excluding CB:	\$1.254.507	1.281.246										

* Late penalty interest applies

Interest Penalty on Late Quarterly Contributions

	Total	at penalty	FSA	interest of			
Underpayment	From	То	Amount	From	То	Amount	Late int. penalty
\$243,005	4/15/99	5/12/99	\$1,419	4/15/99	5/12/99	\$1,387	\$32 \$32

As to some very technical issues:

- Interest is calculated geometrically based on the number of days (i.e., compound, not simple, interest).
- The number of days is 365 except for leap years. In determining whether the year is a leap year, the applicable year is deemed to be the prior year if the plan year ends before 2/28.
- Interest is credited to the last day of the plan year.

WinTech's Virtual Back Office!

A little-publicized service offered by WinTech to our clients is a kind of virtual back office. Need help bringing up new clients, converting cases or just help during the busy season? Why not call upon WinTech's experienced actuaries to fill in?

Contact Debbie Benner at (203) 661-0275 for details or to request a quote.

Dates in ProVal

With the new millennium approaching, we recognized that users will want to be able to abbreviate the current year as two digits, and ProVal would interpret the year 00 as 1900, not 2000. To address this, we have implemented the following changes:

Throughout ProVal, two-digit years entered by the user will be converted automatically to four-digit years as soon as you leave the field. This has long been the case for most date fields; it will now be the case for dates in expressions as well. Thus, you will get immediate feedback about what value is implied when you enter a two-digit year.

- Updating a client (that was developed under a previous version of ProVal) will convert two-digit dates in existing expressions to four-digit dates using the old 19yy rule, thereby preserving the meaning of these expressions.
- The old 19yy rule will be replaced by a new ٠ "sliding window" rule. Two digit years will be converted to years falling in a range such as 1930 to 2029. For example, 45 becomes 1945 and 01 or 1 becomes 2001. The two-digit date window is not fixed, but moves with time to keep the rule from becoming stale. The window slides according to the same rule used by Excel: the window extends roughly 30 years into the future and 70 years into the past. It remains fixed for 10 years, then jumps ahead a decade. Currently, the window is from 1930 to 2029. On 1/1/2005, it will become 1940 to 2039.
- The Import Data command, with its user-specified date window, is not affected by these changes.



500 West Putnam Avenue Greenwich, CT 06830

tel: (203) 661-0275 fax: (203) 661-0659 email: support@winklevoss.com website: www.winklevoss.com