

MG•ALFA *MegaBytes*

Update from the Product Manager

As the industry contemplates the implications of a stochastic approach to reserve and capital determination, there are two aspects of this shift that will dictate a change in both hardware and software functionality: the sheer number and size of calculations and the need to balance control and flexibility.

The sheer number of calculations poses two issues - runtime and the ability to audit and validate the results. As an example, a 1,000 scenario model with reserves and capital based on 1,000 paths at each valuation point for a 30-year monthly projection requires the cash flows for each policy to be projected *360 million times*. The ability to run these types of projections will require significant changes in the hardware infrastructure at most companies. Many of you are already implementing grid computing solutions, with some companies running projections on grids with hundreds of engines. I am pleased to announce that we will be expanding our grid options to include Microsoft's Compute Cluster Server 2003 product. You should expect to see more information on this shortly.

Certainly, it is equally important to focus on the software being as efficient as possible. As you can see from the article summarizing the 6.4 enhancements, we have made significant progress in this regard, and are continuing to focus on efficiency. For example, in version 6.5, we will be automating the functionality provided by the "speed" option in the formula database, providing the benefit of this utility in every run without any effort on the user's part.

The ability to audit, analyze, and justify results in a rules-based environment is fairly straightforward, but in a stochastic environment this becomes more challenging. The modeling software must allow users to drill down through

and across various dimensions, providing access to as much detail as necessary for the actuary to understand and audit the calculations. The Nested Stochastic Embedded Value (NS-EV) Analyzer is a utility that provides direct access to summary level results, scenario detail, and path detail for nested stochastic calculations. In addition, audit reports are available for selected nodes, providing the tools necessary to understand and explain results and document assumptions.

While utilities such as the NS-EV analyzer provide the tools to analyze and audit the results, there is also the need to provide a controlled, locked-down environment for valuation. Most of us are used to, and appreciative of, the flexibility of MG-ALFA. However, as we start to utilize MG-ALFA as a valuation platform, it will be necessary to provide options and utilities to create a secure and auditable environment. Our current development efforts to rewrite the user interface will provide more options for file security and simplify the automation of refreshing files and assumptions from external sources. Obviously, we will not eliminate the flexibility afforded by the current environment, but will provide options so you can maximize your use of MG-ALFA throughout the organization.

As you can see, we have spent considerable time and effort to provide a system that is capable of meeting your immediate and future needs for PBA, Solvency II, MCEEV, and other stochastic approaches to the determination of reserves and capital. Please feel free to contact me with any questions or if you would like to learn more about the current and planned functionality to support these requirements.



Inside this Issue:

Preview of Revisions to the User Interface	2
From the Support Line	4
Release 6.4	6
Technician's Corner	7
Upcoming Events	8
Puzzler	9

A Preview of the Revisions to the User Interface

Moving the MG-ALFA User Interface to a Microsoft .Net platform adds much more than just a pretty face. Certainly it provides a more modern and familiar look and feel, but we are taking this opportunity to remove existing system limitations, add new features, and restructure the data model to allow for flexible characteristics, direct access to all files, and enhanced security features. Our approach is to gradually deliver the changes, allowing you to take advantage of the new features quickly and to reduce the learning curve that is often associated with a radical change in the front-end of a system. Following is a preview of some of

information about a particular variable in one location will be extremely useful. Additionally, each of the panes can be sized, hidden, and moved depending on the current task.

The elimination of modal forms simply means allowing for easy movement from one input form to another. This is one of the most common frustrations we hear about the current user interface – having to close the current form to move to another. Other than for a few select forms where changes to the data in those forms will have far-reaching implications to other views, it will be possible to have multiple forms

We are taking this opportunity to remove existing system limitations, add new features, and restructure the data model to provide additional security options.

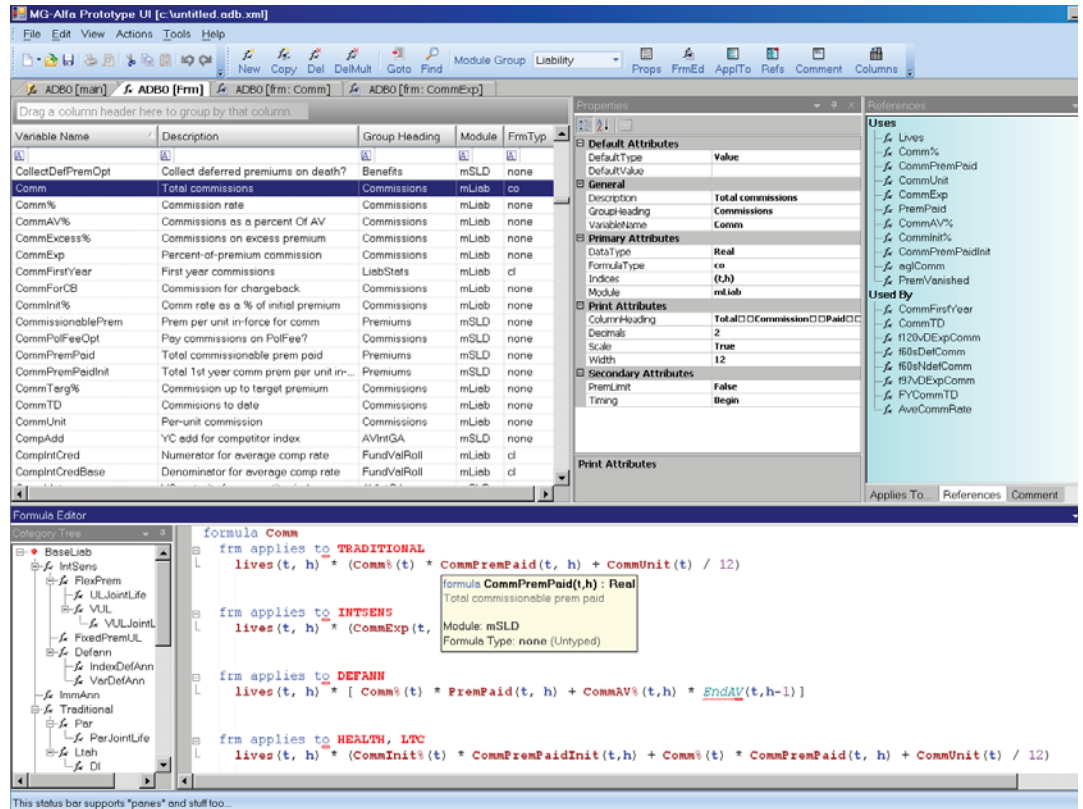


Diagram 1: The formula database editor

the “pretty face” features you can expect in the coming months.

Improved Accessibility:

One of the objectives of the AV interface rewrite is to provide a structure that gives easy access to information. This is being accomplished through expanded use of multi-pane views and the elimination of modal forms.

An example of the use of multi-pane views can be seen in Diagram 1. Having access to all of the

open simultaneously. As an example, if you are reviewing the formula for commissions, and want to see the formula for one of the variables being used in the commission formula, you can create a side-by-side view of the two variables, as shown in Diagram 2 on page 3. The tabs can be tiled vertically or horizontally, and could be different variables, the same variable from different databases, or any other forms you would want to see simultaneously.

continued on page 3

User Interface Preview *(continued from Page 2)*

Improved Formula Editing:

The formula syntax editor has been enhanced to provide a number of new features designed to make formula editing and reviewing easier.

Color-coding - Color-coding will be used to differentiate local variables from global variables, identify comments, and highlight reserved words. In addition, colors and visual cues will be used to identify how a variable is being used

errors or completing formula definitions. For example, if a formula references a variable that is not declared in the database, the smart tag will prompt as to whether or not to create a where clause to define the variable locally or create a new variable in the database.

Error highlighting and warnings - Warnings and errors that were previously only captured upon

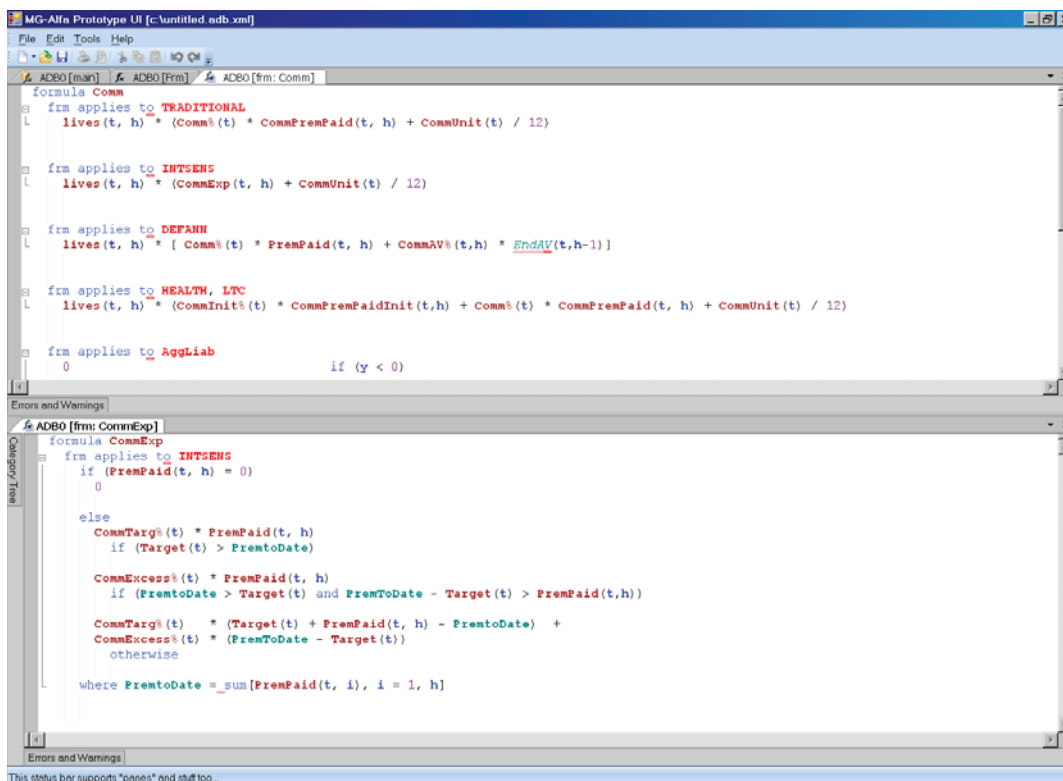


Diagram 2: Side-by-side view of multiple variables

for each line of business, as shown in Diagram 3 on page 4.

Efficiency tools - The smart editor provides assistance with formula definition, syntax, and variable reference to make database editing more efficient. Some examples of these tools include the option to auto-complete text from the variable dictionary, hint pop-ups as you hover over items (as seen in the bottom pane in Diagram 1), and easy options for copying formulas across lines of business.

Smart Tags - The editor will have "smart tags" to provide simple wizards to help in correcting

translation will be highlighted as a formula is edited, similar to spell check and grammar check in Microsoft Word.

Grid editing improvements:

When working in the variable list (the top right pane in Diagram 1), standard grid controls such as filtering and grouping are available. This will be extremely useful when trying to work on a targeted group of variables. In Diagram 4 (shown on page 4), the variable list has been filtered to show only the cash income formulas and then grouped by group header.

continued on page 4

The formula syntax editor has been enhanced to provide a number of new features designed to make formula editing and reviewing easier.

User Interface Preview

(continued from Page 3)

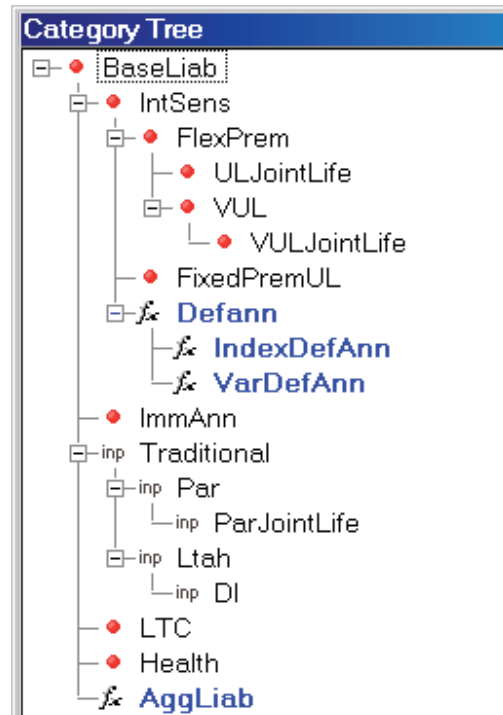


Diagram 3: The category tree uses color and visual cues to show which lines of business have been defined for a variable and whether the definition is input or formula.

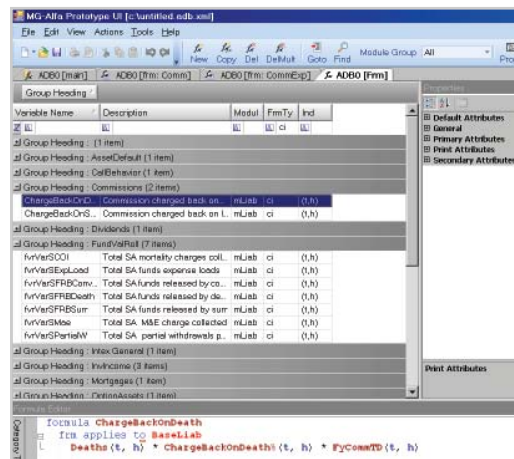


Diagram 4: Filtering and grouping in the grid views

We are anxious for your input and feedback on these changes. We believe the new look and feel will provide a more productive environment and a platform that is easier to learn, maintain, and enhance.

From the Support Line

Q I would like to take advantage of the UL Model Reg UDF, first introduced in version 6.2, but I would like to use my custom database rather than the standard. How would I go about doing this?

A The following are the instructions to update an existing database so you can use the UL Model Reg UDF.

1. Contact MG-ALFA support and obtain a copy of the UL Model Reg Adx.
2. Open the old database in the current version of MG-ALFA.
3. Import the Adx. Make sure any variable that is updated is standard code in the original database. If not, then you need to update the variable manually.
4. Delete the variables *ULStatRes*, *ULTaxRes*, and *ULModRegRes* from the database.

Finally, run using the *CycleCalc* option and compare results to the previous model. If the results are materially different, this needs to be investigated as we would expect results to match.

Q My starting actual statutory reserve is slightly different from the MG-ALFA calculated value. I would like to have the starting values match exactly and then grade off the difference over a specified number of years. How would I go about accomplishing this?

A There are several ways of achieving this in MG-ALFA, but the following method is the recommended approach:

1. Include the initial statutory reserve in your inforce file and link it to the input item *InitStatReserve*.
2. Add a new input variable, *ResGradeYrs*, to specify the number of years over which to grade the difference.
3. Create a new formula variable that captures the initial calculated value (*TabResInitialModelStat*). This is a (c) indexed item with the following formula:

$$\begin{aligned} & \text{TabRest}(t, s) && \text{if } (c \leq 0) \\ & \text{TabResInitialModelStat}(c-1) && \text{otherwise} \end{aligned}$$

4. Finally, create a formula variable that represents the difference. This variable is *ExtraTabRes* and it is a (t,s) variable with form-type of nil.

continued on page 5

From the Support Line

continued from page 3

The formula would read something like the following:

```

0                               if (yIssue > 0)
TabRes * (Ratio - 1) * ScalarAdj otherwise
where
ScalarAdj = 1                   if (date(y,m) <= ProjDate)
0                               if (ResGradeYrs = 0)
Max(0, (12 * ResGradeYrs - (y-1) * 12 - m) / (12 * ResGradeYrs)) otherwise,
Ratio = InitStatReserve / TabResInitialModelStat
                               if (TabResInitialModelStat <> 0)
1                               otherwise
    
```

Q I have table data and don't know if I should code it in an Atb file or an Afd file. What are the differences and things to consider?

A Afd files should be used for data that is determined at issue and that tends to be fairly unique by cell. Examples include reserve factors, premiums, load structures, and commissions. Atb files should be used for assumption data - information that will be updated over time. Additionally, data stored in Atb files tends to apply to groups of cells.

Although either can be used, the choice might impact runtime. Because Atb files are shared by many cells, the required data is read into memory at the start of a run and remains there. If the files are large, this can impact runtime. Afd files are read as needed.

It is a good idea to stay away from complicated varies by structures in cellular input and perm files. You should put the varies by in one place or the other, but not in both. This will help with runtime.

Utilities exist to convert Atb files to Afd files and to build Afd files from cellular input if you want to clean up an existing model.

Q How can I debug the values in a where clause of a database formula?

A Here's an example using the variable COI, from the standard database:

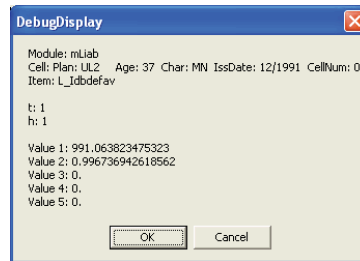
```

qCurr(t) * NAR / 12 + temp
where
temp = DebugDisplay(t, h, NAR, Disc, 0, 0, 0),
NAR = (DBdefAV(t, h) - Max(0, BegAV(t,h)))
if(CoiNarDbType = Undiscounted)
DBdefAV(t, h) * Disc - Max (0, BegAV(t, h))
otherwise,
Disc = 1 / (1 + iGuar(t,h)) ^ (1 / 12)
    
```

Add a variable, like "temp," to the formula as shown in the first line. You also need to define the variable as the **first** line of the where clause.

The *DebugDisplay* function requires 7 arguments: t and h, plus 5 values to display. If you don't use 5, then pad with zeros.

When you run using this code, MG-ALFA will pause processing every time this code is executed. A pop-up screen will appear with the values selected in the *DebugDisplay*.



NAR is displayed as *Value 1* and Disc is displayed as *Value 2*.

The user can click on *OK* to advance to the values at the next instance. Click on *Cancel* to exit the *DebugDisplay* functionality and complete the run without pausing. The values are written to the debug log and can be viewed in the "warnings and errors" messages under Run Status.

Q What does the index (t,s) represent? How is it different from (t) or (t,h)?

A The index (t, s) represents a policy year variable, with an exact time "s" elapsed during the year that corresponds to the end of the current cash cycle. Since policies can be issued at any point during a month, the (s) index is used to convert a (t) or (t,h) variable to a value that corresponds to the variable as of the end of the cash or reporting cycle. The formula for the variable *MVStat(t,s)* is an example of this application:

```

_____ 1 TRADITIONAL.* ____ See attached
(1 - s) * [Vstat(t-1) + NPstat(t)] + s * Vstat(t) + PEAdj
if (ResFloorStat = None)
Max((1 - s) * [Vstat(t-1) + NPstat(t)] + s * Vstat(t) + PEAdj, flr)
otherwise
    
```

You will frequently see (t,s) index variables using the variable *ISP* in the formula to perform the proper *interpolation* of the (t) variables. The formula for *CLRes(t,s)* is an example of this.

```

_____ 4 LTC.Stat ____ See attached
ISP * clrCIResStat(t, h - 1) + (1 - ISP) * clrCIResStat(t, h) +
ISP * dlrCIResStat(t, h - 1) + (1 - ISP) * dlrCIResStat(t, h)
    
```

Afd files should be used for data that is determined at issue and that tends to be fairly unique by cell.

The index (t,s) represents a policy year variable, with an exact time "s" elapsed during the year that corresponds to the end of the current cash cycle.

Release 6.4

The MG-ALFA Version 6.4 release includes a number of improvements and enhancements, summarized below:

Completion of ILP Restructure: Over the past several releases, we have focused on restructuring the MG-ALFA calculation engine to maximize performance for models run in Independent Liability Projection (ILP) mode. These efforts were completed in Version 6.4, resulting in runtime reductions of 40-60%. The most significant benefit of the changes included in Version 6.4 is the reduction in the runtime differential between annual and monthly projections.

Following is a summary of the runtime improvements achieved with the ILP restructure for a sample traditional life statutory projection:

Version	1 Million Cells (in hours)
	Annual/Monthly
6.0	3.07/6.48
6.1	2.58/4.73
6.2	2.43/4.20
6.3	2.05/3.87
6.4	1.83/2.48

Job Threading: A new threading option has been added in Version 6.4 to improve performance on multi-core machines. For a stand-alone run on a multi-core machine, this option will automatically thread tasks to utilize as many CPU's as are available. For example, using a dual processor, quad core machine, the system will automatically thread a job to utilize the 8 CPU's, resulting in runtimes that are reduced to almost 1/8th of stand-alone runtimes.

The following table demonstrates the benefits of threading on a variety of machine configurations:

Machine Configuration	Without Threading	With Threading
Single processor/Dual Core Intel Core Duo T7600 at 2.33 Ghz processor 4 MB L2 cache	2.18	1.15
Single processor/Dual Core 1 Intel Xeon dual core 2.66 Ghz processor 4 MB L2 cache	1.92	1.00
Dual processor/Quad Core 2 Intel Xeon quad core 2.66 Ghz processors 8 MB L2 cache per CPU	1.83	0.25

Enhanced Debugging Tools: The MG-ALFA Debug View and Result Template editors have been redesigned to provide a more intuitive and functional structure. Both forms provide the option to view, modify, and refresh results from a single form, making debugging formulas and reports much easier.

Exposure Formulae: The exposure formulae have been moved to the formula database, providing users with the option to modify these calculations.

Expansion of "Corporate Segment" Functionality: Several releases ago, we added functionality to model transfers of shareholder dividends from one segment to another. Based on your feedback, we have expanded the corporate segment functionality to allow for the selection of multiple variables for import, as well as the option to define the variable or account to update with the imported variables. In addition, a new option has been added that allows for the import item to be all liability items. When this is chosen, the liability financial and semi-financial variables in the new projection are populated with the results from the specified projection, eliminating the need to re-process the liabilities. This is useful when testing investment strategies or running stochastic scenarios with liabilities that are not interest sensitive.

Enhancements to the F97Valuation Process: As more companies choose to use MG-ALFA as a production valuation system, and anticipating that this trend will accelerate with the shift to a principles-based approach for reserves and capital, the need to provide automated and controlled processes in MG-ALFA is becoming a high priority. Several significant enhancements have been added in Version 6.4 related to the F97Valuation process and the dynamic unlocking functionality introduced in Version 6.3. These enhancements include:

Valuation date refresh utility - a new utility has been included that will automate the process of updating and refreshing F97Valuation models on a new valuation date.

Cohort collapsing - the ability to collapse cohorts has been added in Version 6.4.

Changes to reporting between unlock dates - an option has been added to use the actual gross profits to determine the amortization of DAC, and unearned revenue between unlock dates.

F97 history file comparison utility - a new utility, similar to the ARSCompare utility, has been included to compare F97 history files.

The ILP restructure, completed in Version 6.4, resulted in runtime reductions of 40-60%.

A new threading option has been added in Version 6.4 to improve performance on multi-core machines.

Technician’s Corner: Guaranteed Minimum Benefit Stochastic Pricing Tool *by Valea Coyne*

When pricing variable annuities with guaranteed minimum benefits, illustrating the sensitivity of the cost of the guarantees to various factors, such as product design, fund volatility, policyholder age, or policyholder behavior provides valuable information that is critical in understanding the risks and setting the price of these benefits. In the next release of MG-ALFA, a new tool will be

The GMBsp Analyzer allows for the review of information at three levels – cellular summary results, cell results by scenario, and cell/scenario information on a period-by-period basis. Illustration I shows the cellular analysis. The cellular summary results can be aggregated across characteristics to provide the information needed to understand the sensitivity of the benefits to anything from age to the investment

The GMBsp Analyzer allows the user to slice and dice the results across characteristic combinations, and to drill into the results at the cell and scenario level.

Cell Key and Number	Revenue:			Total Claims	Net Profit
	Guar Charge	IMF Profit	Gross Revenue		
GMAB10035FAB 2007 1-0000001	2.62	0.40	3.02	1.67	1.35
GMAB10035MAB 2007 1-0000002	1.43	0.22	1.65	0.91	0.74
GMAB10045FAB 2007 1-0000003	5.17	0.79	5.96	3.29	2.67
GMAB10045MAB 2007 1-0000004	2.78	0.42	3.21	1.77	1.44
GMAB10055FAB 2007 1-0000005	15.51	2.37	17.87	9.88	8.00
GMAB10055MAB 2007 1-0000006	8.35	1.27	9.62	5.32	4.31
GMAB10065FAB 2007 1-0000007	16.70	2.55	19.25	10.64	8.61
GMAB10065MAB 2007 1-0000008	11.13	1.70	12.83	7.09	5.74
GMAB10075FAB 2007 1-0000009	9.54	1.46	11.00	6.08	4.92
GMAB10075MAB 2007 1-0000010	6.36	0.97	7.33	4.05	3.28
Total	79.61	12.14	91.76	50.70	41.06

Control Panel: Varies By: PAXM12345678YNC; Column Type: Amount; Benefit Type: GMAB; Include IMF: Yes; Scaling: Millions; Decimals: 2

Illustration I: Cellular Summary Results

included to facilitate the pricing of guaranteed minimum benefits. The Guaranteed Minimum Benefit Stochastic Pricing (GMBsp) Analyzer provides a dashboard view of the results of a stochastic projection of one or more guaranteed benefits and allows the user to slice and dice the results across any characteristic combinations, and to drill into the results at the cell and scenario level. Following is a description of some of the important features of this new utility.

risk profile of the policyholder to dynamic behavior assumptions. As can be seen from Illustration I, the information provides a summary of the revenue, cost, and profit associated with the benefits being evaluated, providing a quick reference summary of the profitability.

Drilling down into the scenario view for a *continued on page 8*

The cellular summary results can be aggregated across characteristics to provide the information needed to understand the sensitivity of the benefits.

Scenario	Revenue:			Total Claims	Net Profit
	Guar Charge	IMF Profit	Gross Revenue		
073	2,092.40	321.91	2,414.31	1.19	2,413.12
074	2,002.13	308.02	2,310.15	2.42	2,307.73
075	1,397.71	215.03	1,612.74	3,570.44	-1,957.70
076	1,276.32	196.36	1,472.68	10,709.40	-9,236.72
077	1,840.50	283.15	2,123.65	3.34	2,120.32
078	1,514.65	233.02	1,747.67	28.82	1,718.85
079	1,389.74	213.81	1,603.54	33.42	1,570.12
080	1,034.28	159.12	1,193.41	10,357.86	-9,164.45
081	908.05	139.70	1,047.75	18,552.86	-17,505.10
082	1,514.43	232.99	1,747.41	26.93	1,720.49

Illustration II: Viewing the distribution of results for a specific cell or group

Drilling down into the scenario view for a particular cell or cell group allows for the analysis of the distribution of results.

Technician's Corner *continued from page 7*

particular cell or cell group allows for analysis of the distribution of results, as seen in Illustration II. This view allows you to assess the volatility of revenue, claims, and profit associated with the guarantees for a particular cell or cell group.

Being able to drill further and understand what is driving the bad scenarios is obviously critical in understanding the profitability and the risks associated with the benefits. The third

the drivers behind the bad results. As can be seen in Illustration III, the final level of detail allows for evaluation of the underlying cash flow data, as well as the scenario information, to fully understand what is driving the results.

Whether pricing a complex benefit, looking at the impact of dynamic hedging, or understanding capital requirements, having the ability to move

The third level of information in the GMPsp analyzer provides period-by-period data for each cell/scenario combination.

(y,m)	Disc Rate	Disc Factor	Revenue:			Total Claims	Net Profit	Scenario				
			Guar Charge	IMF Profit	Gross Revenue			Equity Index	Yld Curve 1-YTM	Yld Curve 7-YTM	Yld C 30-Y	
NPV			908.05	139.70	1,047.75	18,552.86	-17,505.11					
(1,1)	0.0250	1.0000	13.54	2.08	15.63	0.22	15.41	982.75	0.0250		0.0378	
(1,2)	0.0226	0.9979	13.28	2.04	15.32		15.32	1041.93	0.0226		0.0396	
(1,3)	0.0258	0.9961	14.05	2.16	16.21		16.21	1042.92	0.0258		0.0419	
(1,4)	0.0253	0.9939	14.03	2.16	16.19	0.03	16.15	1020.46	0.0253		0.0394	
(1,5)	0.0250	0.9919	13.70	2.11	15.80		15.80	1031.68	0.0250		0.0423	
(1,6)	0.0268	0.9898	13.81	2.13	15.94	0.12	15.82	1023.53	0.0268		0.0384	
(1,7)	0.0276	0.9876	13.67	2.10	15.78		15.78	1210.89	0.0276		0.0402	
(1,8)	0.0292	0.9854	16.15	2.48	18.63		18.63	1124.10	0.0292		0.0388	
(1,9)	0.0283	0.9830	14.95	2.30	17.25		17.25	1290.74	0.0283		0.0375	
(1,10)	0.0270	0.9807	17.13	2.64	19.77		19.77	1390.99	0.0270		0.0394	
(1,11)	0.0279	0.9785	18.43	2.83	21.26		21.26	1261.49	0.0279		0.0369	
(1,12)	0.0276	0.9762	16.67	2.56	19.23		19.23	1364.33	0.0276		0.0418	
(2,1)	0.0266	0.9740	17.99	2.77	20.76		20.76	1239.36	0.0266		0.0385	
(2,2)	0.0261	0.9719	16.30	2.51	18.81		18.81	1276.59	0.0261		0.0385	

Illustration III: Cyclical results for each cell/scenario combination allows for a thorough understanding of what is driving profits and volatility.

level of information in the GMPsp analyzer is exactly that - the period-by-period data for each cell/scenario combination. Looking at the information from Illustration II, you may want to drill into scenario 81 to understand

from a summary view to the details is a necessity. The GMBsp Analyzer, like the NS-EV Analyzer, provides the tools you need to quickly and efficiently evaluate, explain, and audit results. ●

In the Development Pipeline

Following are some of the major enhancements currently under development:

- Modifications are underway to significantly increase capacity for projections run in Dynamic Liability Projection (DLP) mode.
- The commutation functions are being moved in to the formula database, providing access for easy modification and audit.
- As described in the Technician's Corner, a new utility to support the pricing of guaranteed minimum benefits has been incorporated in to the system.

2007 Upcoming Events

September 17, 7:30 p.m - 10:00 p.m.

Valuation Actuary Symposium
Hilton, Austin, Texas
Milliman Hospitality Suite

September 18, 6:00 p.m. - 7:30 p.m.

Informal Reception for Users' Group Meeting attendees
Hilton Austin

September 19, 8:00 a.m. - 2:00 p.m.

Annual Users' Group Meeting
Hilton Austin

September 26-27

New User Training
Chicago Hilton O'Hare
Registration information will be sent via email 4 weeks prior to the session.

October 14-16

SOA Annual Meeting
MG-ALFA Exhibit Booth
Washington, D.C.

February Puzzler



The February Puzzler was designed to emphasize using conditionals in database formulas to prevent references to invalid variable indices.

2067(E): t,h (0,1) out of range

```
-----f60sModifiedNetPremium-----
0                                     if (c<0)
LivesInforce(t,s)*NetPrem(12*t)(h-1) otherwise
```

Where

NetPrem = f60fAcqExpNp(Dur,1) * GPMMode if (f60sFactor = Yes)

0 otherwise,

Dur = min(tEndCycle(c), PremPeriod)

The error is occurring because the indices for a policy year and month index variable begin at (t,h) = (1,1) not at (0,1). The where clause variable Dur is passing a 0 to the f60fAcqExpNp causing the index for f60fAcqExpNp to be set as (0,1) which is invalid. A simple conditional will remove the problem. The solution is to change the definition of NetPrem to the following:

```
NetPrem = f60fAcqExpNp(Dur,1) * GPMMode   if (f60sFactor = Yes and Dur>0)
1                                     otherwise
```



July Puzzler

The July puzzler is based on a question in the "From the Support Line" section of this edition of the newsletter. The question details the use of (t,s) indexed variables in the MG-ALFA database.

A (t,h) index variable can not directly reference a (t,s) variable. How can a formula work around this?

A MILLIMAN GLOBAL FIRM



Milliman

Consultants and Actuaries

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