

# MG-ALFA *MegaBytes*

## Update from the Product Manager

**H**appy New Year! A discussion of New Year's resolutions seems to generally be met with skepticism or even cynicism, but I still wake up every January 1<sup>st</sup> full of hope. The feeling of wiping the slate clean and establishing a big list of new goals is cathartic and invigorating. The MG-ALFA Team is starting the year with some lofty goals as well, so I thought I would share some of our resolutions for 2008.

### *Raise the level of our software support.*

We are extremely proud of the level of our software support, and receive very positive feedback from you regarding the quality and timeliness of our responses. We monitor our performance relative to the number of calls that are answered directly and the length of time it takes to return the calls that do go to voicemail. We track the volume of calls to make sure we are appropriately staffed. We also track the number of calls by type of call, looking for changes in distribution of categories such as IT vs. actuarial, navigation vs. business logic, or basic vs. advanced. It is critically important to have access to this information, but it can be time consuming to gather and analyze. In 2008, we will be implementing some new tools which will allow our support staff to focus more of their time on helping you rather than collecting and managing data, while simultaneously providing us with even more valuable information.

### *Deliver a new version of MG-ALFA that exceeds expectations.*

As you know, we are in the process of a significant re-write of the MG-ALFA user interface and data model. We are committed to building a system that will seamlessly take

you in to the next generation of actuarial software – a system that will be capable of meeting the requirements of a production valuation installation, while continuing to provide the agility and flexibility you are used to for your pricing and projection work.

### *Continue to build our client base.*

In the US, MG-ALFA is the clear market leader and we continue to broaden that lead, as evidenced by the fact that MG-ALFA accounted for 75% of the new US actuarial projection software sales in 2007. This success has allowed us to build a large and diverse client base that provides us with valuable input, as well as the funding to continue our rapid development pace and our outstanding support. In 2008 and beyond, we will be expanding our sales and marketing efforts in other markets, especially Europe and Asia, while

continuing to capitalize on the extensive opportunities in the US market. We feel strongly that our success will continue to be driven by the fact that we have a superior system architecture, already capable of performing the complex analytics necessary to support emerging requirements, such as Solvency II, Principles Based Approach to Reserves and Capital, and IFRS.

The entire MG-ALFA team is excited about our aggressive goals for 2008 and we are anxious to

work together to achieve them. We would welcome your feedback through the year on how we are doing. Best wishes for a happy New Year and best of luck in keeping your resolutions and achieving your goals.

### Welcome New Clients!

- Ability Resources
- American Enterprise
- Equitable Life & Casualty
- Northstar Financial
- Ohio National
- Shenandoah Life
- Transamerica Re
- Winterthur

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## Technician's Corner - Nested Stochastic Embedded Value

by Craig Roberts

Since MG-ALFA version 6.3, the Nested Stochastic Embedded Value projection tool ("NS-EV") has been available for use within MG-ALFA. This nested stochastic tool provides the ability to determine reserves and capital using a TailVar approach on the projection date and at specified future points, consistent with new and proposed regulations such as C-3 Phase II, VACARVM, and PBA.

NS-EV is included in the standard databases. In addition, the necessary calculation logic is distributed in a database export file (adx) which can be imported in to an existing database. At user specified intervals and for each scenario in the projection, NS-EV will generate a series of random economic scenario paths, project the liabilities and assets along each path, calculate and save the results, and return back to the projection cycle from which the paths were projected. This process continues until the projection of all 'outer' scenarios is complete. Product specifications, invested assets, and database formulas (even custom changes) continue to apply along the path calculations. The exceptions are that the reinvestment strategy along the path is specified separate from the projection strategy and the liability calculations on the path can not be directly linked to the path asset returns.

### Activating NS-EV:

You may parameterize the NS-EV settings via the projection input in the AIN file. Those variables prefixed with an "rpg" control the assumptions underlying the path generator, and those with "tar" prefixes define the frequency of the nested calculations, path reduction techniques, and other calculation control options. The items prefixed with "spg" provide the option of having the paths be input rather than generated on the fly.

### RPG and SPG Variables:

For those unfamiliar with economic scenario generators, documentation of the Milliman generator can be found in the *Milliman\_Stochastic\_Generator.doc* located in the Add-Ins directory of the MG-ALFA installation. In addition to the documentation, you will find additional information in the spreadsheet version of the generator, located in the same directory. The "Input" tab of the file (*Milliman\_Stochastic\_Generator.xls*) contains sample parameters in a form that can be directly copied and pasted in to the input settings.

For testing purposes, it may be desirable to define deterministic paths. This can be done using the specified path generator inputs (spg).

### TAR Variables:

Once the path assumptions are in place, set *TarCalcType* to *Yes* to enable the nested stochastic projections. Also set *TarCalcCycle* to 'Yes' for the projection cycles where nested stochastic calculations will occur. Due to the extensive calculations necessary to perform these nested stochastic projections, it may be desirable to minimize the frequency of the nested calculations. For example, determination of the *TailVar* annually for the first five years, and then every fifth year thereafter may be a reasonable compromise.

There are three separate TailVar results calculated from a single nested stochastic projection. These would typically be used for reserves, statutory surplus, and economic surplus. Note that while these values do not automatically plug back into the projection results, they can be reported on and examined in great detail through the use of the Nested Stochastic Embedded Value Analysis View after the run has completed. As an example, for setting the system to capture C-3 Phase II results, the following settings apply to set the statutory surplus value at the 90 CTE of the worst present value of after tax surplus:

```
tarSsurType = CTEposATsurp
tarSsurType% = 0.90
```

Users can tie these result values into the projection results by referencing the result items available in the formula database. The variable *tarSSur%* contains the *TailVar* result for the statutory surplus, expressed as a % of the working reserve.

### Path Reduction:

It is possible to substantially reduce projection run-time by using path reduction as an option. With *tarPredType* set equal to 'SelPaths', the variable *tarPredSelSurp* identifies the basis to be used in the path reduction (i.e. *PosATsurp* for the example given above), and the variable *tarPredSel%* chooses the worst X% of paths for future re-projection. The process is to run all paths at time zero, rank the scenarios based on the criteria specified in *tarPredSelSurp*, and then use the worst x% for all future nested calculations. Be careful not to choose a fraction

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*At user specified intervals and for each scenario in the projection, NS-EV will generate a series of random economic scenario paths, project the liabilities and assets along each path, calculate and save the results, and return back to the projection cycle from which the paths were projected.*

*Results can be reported on and examined in great detail through the use of the Nested Stochastic Embedded Value Analysis View after the run has completed.*

## Version 6.5 Enhancement Summary *by Brian Reid*

**M**G-ALFA version 6.5 was released in October. This release includes a number of user options to improve model runtimes, as well as some enhanced features, both actuarial and architectural.

### Dynamic Liability Projection (DLP) Mode

**Restructure:** In version 6.5, we delivered the initial changes to maximize performance for models run in DLP mode. These changes represent an increase in capacity of nearly 100%, increasing the average capacity of typical models from 100,000 to 200,000 model points.

### Option to automatically optimize at runtime:

A selection field has been added to the run parameters to allow the user to reduce runtimes by specifying which reports are to be supported by a given run. This feature is analogous to the database *Speed* toolbar button, but does not require creating and maintaining a separate database prior to running.

### Integration with Microsoft Compute Cluster

**Server:** We are now offering our third grid computing option with the completion of our implementation of support for Windows Compute Cluster Server. This is an extremely cost effective option for companies that are looking to create a dedicated grid computing solution for processing MG-ALFA models. For information on requirements and cost, contact Brian Reid.

**.NET Formula Editor:** Version 6.5 represents the first phase of our move to a new User Interface. In this release, users have the option of using the .NET formula editor for managing and modifying formulas from within the MG-ALFA formula database. As we gather your input on the structure, usability, and functionality of the new environment, we will be working on moving the table editor to the .NET framework.

### Guaranteed Minimum Benefit Stochastic

**Pricing Tool:** A new tool has been added to facilitate the pricing of variable annuities with guaranteed minimum benefits. It can be used to illustrate the sensitivity of the cost of the guarantees to various factors, such as product design, fund volatility, policyholder age, or policyholder behavior, and provide valuable information that is critical in understanding the risks and setting the price of these 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.

### Japan Variable Annuity Standard Formula

**Database:** A new standard database is now available for modeling Variable Annuities in the Japanese market. This database includes support for all of the Japanese regulatory requirements for VA products.

### Commutation Functions:

The commutation function formulae have been moved to the formula database, providing users with the option to modify these calculations and improving runtimes by approximately 15%. In prior versions, the commutation functions were a part of the core system structure. Upon conversion, the formula database will be updated to include the required formula variables.

### 64-Bit Factor Files:

Factor files have been migrated to a 64-bit structure, increasing the capacity from 4 gigabytes to virtually unlimited size.

### AFD SmartCalc Option:

The AFD SmartCalc feature provides the option to reduce seriatim model run time for Traditional business by 20% to 65%. This feature reduces runtime by eliminating duplicate reserve factor calculations. ●

*A new tool has been added to facilitate the pricing of variable annuities with guaranteed minimum benefits.*

## 2008 Upcoming Events

*March 27*  
9:00 a.m. - 5:00 p.m.  
**Asset Modeling**  
Waldorf Astoria, NYC  
In conjunction with SOA Investment Symposium

*April, dates to be determined*  
**New User Training**  
Chicago

*June 19*  
**MG-ALFA 201 for Small Company Actuaries, Advanced Database Concepts**  
Quebec City, Canada  
In conjunction with Life Spring Meeting

*July, dates to be determined*  
**Building Efficient MG-ALFA Models**  
Chicago

*September, dates to be determined*  
**New User Training**  
Denver

*September 25-26*  
**Valuation Actuary Symposium**  
**User's Group Meeting**  
Washington, D.C.

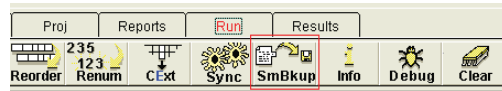
*The commutation function formulae have been moved to the formula database.*

## From the Support Line

Following are some ideas gathered from the MG-ALFA support staff to insure efficient and effective resolution of your issues.

### Sending a Model to Support

Sometimes the MG-ALFA support team will ask you to send your model to us for review. The smaller and more nimble this model is, the quicker we can track down your problem. The MG-ALFA system includes an automated utility to create a small backup of your model. The utility is accessed through the *SmBkup* toolbar on the *Run* tab. The *SmBkup* wizard will create a new *Ain* file, which contains only the data necessary to support the Run requested.



### Email Tips

The following tips are helpful when sending an email or model to the support line:

**Version Number** - Indication of the version number that you are using helps the support team immensely. Be sure to include the last three numbers of the MG-ALFA version as well. This indicates which patches you have installed.

**Run Number** - Please indicate the run number that replicates the issue. This will not be an issue if you use *SmBkup*, since only one run would be included.

**Save before Sending** - Again, this will only be an issue if not using small backup. However, if you have recently made changes to the model, be sure to save before sending to support. Using the backup utility within MG-ALFA will insure that necessary files are not missed.

**Double Check** that the model that you are sending replicates the issue before sending.

**FTP Site** - If you need to send a model to support and can not do a Small Backup, or the file resulting from the small backup is still quite large, the MG-ALFA team can create an FTP site for your company to send files to support.

### Voicemail Tips

When calling for support, if you have to leave a voicemail, the following will facilitate our ability to assist you quickly.

**Name and Telephone Number:** In most instances, the phone system will capture the caller's phone number. However, at times this fails or provides a generic company phone number. It is helpful to have it in the voicemail message.

**Name of the Support Representative:** If the call is a continuation of a previous issue, it is helpful to note this along with the name of the support technician that you were working with.

**Q** I would like to model an interest sensitive lapse rate, which is based on the differential between the current credited rate and the market rate. The following represents the lapse rate table. What is the best method for getting this into MG-ALFA?

Interest Sensitive Lapse Table	
Difference between the Current Credited Rate and the Market Rate (CR - MR)	Addition to Base Lapse Rates
-.020	.07
-.015	.06
-.010	.05
-.005	.02
000	00
.005	-.01
.010	-.015
.015	-.02
.020	-.03

**A** MG-ALFA does model interest sensitive lapses. However, the standard logic is formulaic, using an exponential formula rather than a tabular approach. A tabular lapse rate amount can be easily added to the database using A2d tables. A2d tables are designed to facilitate accessing tabular data when the indices of the table are different from a standard MG-ALFA variable index. When using A2d tables, the user specifies the dimension. In this example, the user-defined dimension or index is the interest rate differential (CR-MR).

**Step One - PHBDynLapseRate:** MG-ALFA provides a set of standard functions for calling A2d tables in the database. Since the table above has annual lapse rates, we will use the predefined function *A2dLookupTcol*, which assumes that the columns in the table change annually.

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*The smaller and more nimble this model is, the quicker we can track down your problem. The MG-ALFA system includes an automated utility to create a small backup of your model.*

*A tabular lapse rate amount can be easily added to the database using A2d tables. A2d tables are designed to facilitate accessing tabular data when the indices of the table are different from a standard MG-ALFA variable index.*

## From the Support Line

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Using A2dLookupTcol, we define a new variable *PHBDynLapseRate(t)* with the following formula:

=====PHBDynLapseRate(t)=====

A2dLookupTcol(PHBTable, A2dVbyCKey, row, year)

Where

row = CR - MR,

year = t,

CR = RoundR(iCurr(t,h),3),

MR = RoundR(iCurrMarket(t,h),3)

*PHBTable* will be a new input variable containing the name of the lapse rate table. *A2dVbyCKey* passes the cell-key to the function in order to process the current cell. *Row* is the user-defined key to accessing the tabular values. It should match one value in the first column of the A2d table. *Year* is the current policy year.

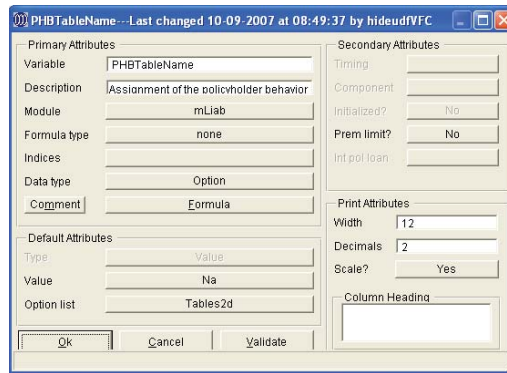
**Step Two - Modify wmo(t,h):** Once we have added *PHBDynLapseRate(t)*, we will need to modify the existing variable *wmo(t,h)* to reference it, adding it to the base rate, *wx(t)*.

**Step Three - Creating the Table:** The final step is to create the A2d Table itself and add it to the list of A2d tables available for use in the database. Open an Atb file and add a table. The key here is to make the Index Type of the Table = (i,j). The Num Col field will be set to 9 2, representing the 9 rows and 2 columns of the table.

Upon completion, the table will look like the table below. The first column, or the column labeled (j) is the user-defined index, or in this example, credited rate less the market rate. The first row measures time in years. If the lapse rates varied over time, then additional columns could be added. The cell in the uppermost left-hand corner of the grid will always be zero.

	j	1
i	0.0000	0.0000
1	-0.0200	0.0700
2	-0.0150	0.0600
3	-0.0100	0.0500
4	-0.0050	0.0200
5	0.0000	0.0000
6	0.0100	-0.0100
7	0.0150	-0.0150
8	0.0200	-0.0200
9	0.0000	-0.0300

**Step Four - Adding the Table:** The final step in the process is to update the database, adding the table created in Step Three to the A2d tables list and adding the input variable to reference it. This is done by navigating to the *Misc* tab and selecting the *Tables2d* row. Once the table has been added, create an input variable *PHBTable* which will point to the list of available A2d tables (Option List = *Table2d*). *PHBTable* is the mechanism which allows the user to assign the lapse rate table in the cellular input.



*Since the table above has annual lapse rates, we will use the predefined function A2dLookupTcol, which assumes that the columns in the table change annually.*

### More Information on A2dLookUpTcol

A2dLookupTcol

(TableNum, TableVbyNum, Row, Time)

is used to retrieve a value from an A2d (Arbitrary 2-dimensional) table where the column headings in the table are assumed to measure time in years. The arguments to this function are:

- *TableNum* is a variable with an integer value corresponding to the table that you wish to access. Typically you will use an MG-ALFA input option variable for this argument. See the User Reference section "5.4.3.1 - General information on accessing A2d tables" for more explanation.
- *TableVByNum* is a variable containing the row number of the cell key in your table. Typically this argument will be the predefined function *A2dVbyCkey*.
- *Row* is the row key in the table that you wish to access. It should match one value the first column in your two-dimensional table, typically an age.
- *Time* is time measured in years. You will often use a function of *t* as the argument here.

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## From the Support Line

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**Q** I tried to make my lapse rates vary-by scenario, but I noticed that my results did not change until the second projection year. What is causing this?

**A** The reason why your lapse rates did not change by scenario until the second projection cycle is that assumptions on and before the projection date are always defined based on the first scenario. If an assumption changes on a policy year basis, the assumption for the policy year coinciding with the projection year will be the same for all scenarios. The rate will change on the first policy anniversary **after** the projection date.

To illustrate, assume your model consists of a single cell that was issued in July, 2005 and the projection date is December, 2007. Data items with a (t) index change on the **policy** anniversary, or in July of each year in this example. Consequently, the lapse rate in effect on the projection date is the rate from July, 2006. MG-ALFA assumes that the assumptions set prior to the projection date can not differ by scenario since scenario variation occurs in the future. In this example, the lapse rate will begin to vary by scenario in July, 2008. If the data item that was set to vary by scenario had a policy month (t,h) index, then the values would begin to vary by scenario in the first month following the projection date.

**Q** How do I model bonds with *put options* in MG-ALFA?

**A** A puttable bond is modeled in the same manner as a callable bond, with the only difference being that the determination of the call probability is done from the position of the bond holder rather than the issuer. The rest of the database logic would be the same. •

## Technician's Corner

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lower than one minus the CTE or the percentile measurement desired.

### Analysis View of Results:

With *tarAFDout* set to capture Type A (low detail), AB (medium), or ABC (high) results into a factor file (ProjName.Run.XXX.Tarproj.AFD), the nested path results can be viewed from the Setup tab of the AIN. From the factor file line, link to the created factor file, and click on the *NS-EV* button from the top. This will take you to a top level view of embedded value results. The settings to the right of this screen control the assumptions driving each *TailVar* result, as shown for each scenario within its own drill-down screen. This means that while the above example settings for C-3 Phase II apply for purposes of reporting within projection results, there is additional flexibility within this view to see results at a different CTE, percentile level, or under an alternative definition of surplus basis. Where grey buttons exist on each screen, *TailVar* details for each scenario can be accessed all the way down to individual path results generated from a particular starting cycle (assuming Type ABC records were captured in the projection). Note that when organizing a column by CTE level, the *TailVar* values shown for each path are presented as accumulated averages of all individual paths with a higher *TailVar* result. If viewing a column that is ranked by percentile, the results for each path shown reconciles exactly to the starting required surplus in the drill-down view.

Early familiarization with the NS-EV tools available in MG-ALFA will help those who wish to prepare for the challenges presented by principles-based reserves and capital, and allow pricing and valuation actuaries already falling under C3-Phase 2 requirements to anticipate the future impact of capital requirements on their projected block. •

### In the Development Pipeline

In addition to the redesign of the user interface, following are some of the other major enhancements currently under development:

- Expansion of the definition of cell keys, removing the limitations and constraints of the current structure
- Forward referencing formulas in DLP mode
- Inclusion of reserve variables in the profit solve utility

## January Puzzler

An MG-ALFA user was working with a database that had a formula with the following structure:

```
Form1 if (Condition 1)
Form2 if (Condition 2)
Form3 otherwise
```

His supervisor asked him to change the formula to put "0 if (Condition 4)" as the first line of the formula for each asset class. The goal was to return 0 whenever condition 4 is true. This was done correctly, but one class used Forward syntax instead of Reverse syntax. Before the change, this formula looked like:

```
If (Cond 1)
Form1A if (Cond1A)
Form 1B if (Cond1B)
Form 1C otherwise
```

```
else if (Cond 2)
Form 2
```

```
else
Form 3
```

The user correctly recognized the change would need to be different because of the forward syntax, so he wrote this:

```
If (Cond 4)
0
If (Cond 1)
Form1A if (Cond1A)
Form 1B if (Cond1B)
Form 1C otherwise
```

```
else if (Cond 2)
Form 2
```

```
else
Form 3
```

This returned entirely the wrong answer.

Question 1: What is wrong with the change?

Email your answer to Valea Coyne at [valea.coyne@milliman.com](mailto:valea.coyne@milliman.com)



### July Answer:

A (t,h) variable can not directly reference a (t,s) variable. However, all (t,s) variables have a (c) version, so the (c) version can be referenced in the formula.

