

MG-ALFA MegaBytes

Update from the Product Manager

I have used this space on several occasions to discuss our efforts to deliver a system capable of supporting the proposed global changes in risk metrics and reserve and capital requirements. Our development efforts for the past three years have been focused on creating a platform that can handle whatever the regulators, rating agencies, standards boards, and boardrooms request. We have delivered powerful stochastic and nested stochastic utilities in the base system. We have delivered a system that is capable of running seriatim liability valuations of any size, as well as ALM projections with more than 200,000 liability model points and seriatim assets in a 32-bit environment. We have delivered a system that runs more than two times faster than it did three years ago, and we have delivered a number of optimization options allowing for further reductions in runtime. We have delivered out-of-the-box integrations with three grid vendors, have provided built-in distributed computing capabilities for small clusters, and threading options to take advantage of multi-core architecture. And we have implemented additional controls and tools to facilitate auditing and verifying data consistency. With the architecture and calculation logic now in place, we are focusing on designing and building utilities to facilitate the reporting and analysis of the results.

It is now time to challenge you. A few weeks ago I was discussing the effort required to move to a stochastic valuation platform. The person I was speaking with indicated that they expect it will be relatively straight-forward since they have been doing asset adequacy testing for years - just a matter of adding in a few more scenarios.

While that is clearly an understatement, I encourage you to think about exactly what will be involved in moving your MG-ALFA models into a production environment for financial reporting.

How long does it take to refresh your models for asset adequacy testing? My observation is that most companies take a few months to update their models and produce results. Not only will that time period need to be shortened dramatically for valuation, but the models will need to be much more precise as the function moves from a pass-fail analysis to *setting* reserves and capital.

How efficient are your models? Good intentions aside, the models at most companies tend to get a bit sloppy over time. Deadlines and time pressures often give way to best practices, and plans to review at a later date tend to be a low priority. Strict adherence to best practices in model structure, formula syntax, and data management will be critical for fast refresh and runtime, as well as for auditability.

How complete are your models? Most company models have been built based on assumed model points. For many of the proposed regulations it

will be necessary to calculate a floor reserve that will be a policy level valuation. While the calculation will be straightforward and supported in the MG-ALFA system, your data models will need to be updated to support a seriatim analysis. Tabular data that is currently defined for specified model points will need to be expanded or the source of the information changed. Plans

Welcome New Clients!

M Financial Group

Homesteaders Life
Company

Presidential Life
Insurance Company

Western & Southern
Financial Group

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From the Product Manager

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that were deemed immaterial will need to be fully defined. Items that were ignored, such as riders or substandard ratings, will need to be considered and included in the models. Again, the level of precision required will be much higher than is typical in models used for asset adequacy, business plan, or asset liability management.

While we put quite a bit of thought and energy into developing the tools necessary to support you in meeting the new global requirements, we have also been thinking about the implementation. This is leading to creating additional tools to support the integration of MG-ALFA into the IT infrastructure of your organization, reporting tools to assist in explaining the results of a stochastic valuation, and audit tools, controls, and processes to insure SOX compliance. Sai Man has authored an article, which can be found on Page 3, discussing the challenges of implementation of PBA. In future editions, we will provide a series of additional articles expanding on the six challenges Sai identifies. In addition, the MG-ALFA Users' Group Meeting on September 24th in Washington, DC will be focused on these issues. I encourage you to attend and participate in the discussion.

Pat Renzi

Beta test Microsoft's



Windows[®] HPC Server 2008

Built on Windows Server 2008 64-bit technology, Windows HPC Server 2008 can efficiently scale to thousands of processing cores and provides enterprise-class tools for a highly productive HPC environment. And now you can see for yourself when you join the beta program. To sign up, visit www.Microsoft.com/HPC.

Technician's Corner: Casualty Database

by Michael Witt

Milliman is nearing completion of a new Casualty Insurance formula database that will allow users to stochastically model claims costs and other cash flows for non-life products within MG-ALFA. This new functionality will be particularly useful for multi-line insurers interested in ERM, Economic Capital, or other model applications where distributions of claims under stochastic scenarios must be analyzed and quantified.

The new database provides for the stochastic modeling of expenses, premiums, claims inflation, grouped claims (generally smaller in size), individual claims (larger claims), and catastrophic claims (grouped claims on a large scale due to individual events). In addition, the new database will allow for the calculation of claim reserves and various types of reinsurance contracts. Investment income, taxes and profit distribution will utilize the existing MG-ALFA logic.

To model claims stochastically, the user specifies a distribution and the necessary parameters, and MG-ALFA generates random claim incurral values for each month of a projection. The user can select from several different discrete and continuous distributions for each of the stochastically-generated variables, including Normal, LogNormal, Poisson, Beta, Gamma, Discrete, and Ogive. While the functionality to support these distributions was added to the core system primarily with Casualty business in mind, these new distribution functions are available for use with other lines of business as well.

The new database will also include new standard reports for non-life businesses and audit reports to facilitate validation.

The Casualty database will be available on request following the release of MG-ALFA Version 7.0. Please contact the helpline at 888-600-8188, or mg-alfa@milliman.com for more information.

Michael Witt is a consultant specializing in Latin America in the Seattle office of Milliman.

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Principles-Based Reserves and Capital - Understanding the Implementation Challenges

by Sai Man

Over the past several years, regulators have been moving from using a formulaic methodology to a principles-based approach (PBA) for determining reserves and capital. The primary drivers of this change in approach are to capture the risks embedded in more recent product designs and to eliminate redundant reserves. With formulaic reserves, the mortality table, interest rate, and method used in calculating reserves are all conservative and prescribed, whereas PBA uses a stochastic approach to fully evaluate the product risks.

Many companies have been holding off on investing resources in preparation for these new requirements until details are finalized. However, determining reserves and capital requirements on a monthly or quarterly basis will be a significant task, and doing this in a timely manner will require careful planning and significant changes to the current modeling processes at most companies.

While the details of PBA may not yet be finalized, the fundamental concepts are well-defined. There are at least six significant challenges deserving of attention:

- Expand models to support the seriatim deterministic scenario.
- Develop the process to demonstrate the validity of the stochastic grouped model.
- Implement an efficient process to refresh the models to meet reporting timelines.
- Implement controls and processes to satisfy internal and external audit requirements.
- Develop a high level of comfort that the assumptions are appropriate to determine the amount of reserves and capital to hold.
- Build the knowledge and processes to provide a layman's description of the key drivers related to the changes in reserves and capital from one period to the next.

The Deterministic Reserve: The deterministic reserve is a relatively straightforward calculation. However, given that the reserve will need to be determined at the policy level, policy values and assumption data will need to be defined for all plans, ages, risk classes, bands, and other differentiating factors. Expanding models to this level of granularity will require planning to insure that the models are efficient and easy to maintain. Building automated feeds to the administrative system or data warehouse is the ideal solution, and implementing such a process now will make the model refresh process going

forward more efficient and controlled.

Model Validation: Model compression is something that most actuaries are comfortable with, but a process will need to be established to demonstrate the validity of the grouped model relative to the seriatim model. To aid in this process, we are currently creating automated grouping utilities and new reporting functionality that will analyze model fit by comparing the results of the deterministic scenario using both the seriatim inforce and the grouped inforce.

Process and Control: As stated above, models will need to be refreshed and validated quickly and with a high level of control to satisfy the auditors. This is certainly achievable, but it requires significant planning and development. It will not be acceptable from either a time or control perspective to be refreshing models manually. Both the asset and liability models will need to be updated through automated processes with the necessary checks and balances in place. With the changes to the MG-ALFA data model that will be delivered in Version 7.0, data files will be more accessible for automated update processes and security features to track changes will be significantly improved.

Defining Assumptions: The assumptions used in PBA are prudent estimate assumptions that are appropriate for the block of business. Prudent estimate assumptions are set for mortality, interest, expenses, lapse, premium levels, and policy-holder behavior, all of which reflect the company's experience. Statistical methods are used to quantify the credibility of this experience. While these items are all included in Cash Flow Testing models, there will be a significantly higher degree of scrutiny given to the development of the assumptions used for PBA since the results will be used to *set* the reserves and capital, rather than simply deciding if there is *enough* capital. While many companies have experience studies in place, implementing the processes to determine the credibility factors, ascertain what pads should be used, and document the analysis and decisions is not an insignificant task.

Analysis and Interpretation: Finally, the most significant, and arguably most interesting, component will be developing the intuition and understanding to communicate the results. Having the information necessary to explain the reserve and capital changes from one period to the next will be a critical component - and a

PBA uses a stochastic approach to fully evaluate the product risks.

Expanding the granularity of models to this level will require planning to insure that the models are efficient and easy to maintain.

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Version 6.6 Enhancement Summary

MG-ALFA Version 6.6 was released in April and includes a number of significant enhancements, summarized below:

Completion of System Restructure: For the past several years, we have been focusing on restructuring the system to minimize runtimes, maximize capacity, and expand functionality. While we will always be looking for opportunities to improve system efficiency, this release represents the culmination of the planned core system restructure. Focusing first on runtime, the following table demonstrates the improvements achieved since January, 2006.

	Traditional Life ILP Mode	Variable Annuity ILP Mode	SGUL DLP Mode
Monthly	62%	67%	25%
Annual	39%	57%	37%

The traditional life model is a 1,000,000 record, 20-year projection. This is a good demonstration of the significant improvements related to capacity. Because MG-ALFA was developed as an ALM system from the start, our proprietary memory management techniques provided the ability to run fairly large models in a dynamic ALM mode (DLP) within the constraints of a 32-bit operating system. However, this structure was not ideal for processing very large, liability-only models quickly and efficiently. Consequently, we introduced the Independent Liability Projection (ILP) run option to support processing large, seriatim projections where the liability calculations are not dependent on the asset results. Over the past several releases we have optimized the system such that it is now possible to run many millions of cells extremely fast in ILP mode, and we have done this without compromising our core ALM capabilities. In fact, we have improved both the performance and the capacity in DLP mode as well. It is possible to run ALM projections with 200,000+ model points in Version 6.6 in a 32-bit environment. This is a tremendous competitive advantage for us, and for our clients.

In addition to the speed and capacity gains, Version 6.6 also includes some new features as a result of re-architecting the core system. These include the ability to write forward-referencing formulas as well as changes in the profit solve feature to allow for solving for items that impact reserves rather than just cash items.

Hierarchical Liability Plan Input Option: This new option provides a cleaner, more intuitive process for viewing and managing plan data. The benefits of this new structure include:

- Manage liability input by plan to reduce complex varies-by structures.
- Hierarchical structure provides an intuitive and efficient way to add a new plan.
- Plan input coding can be done by different users and easily integrated later.
- Peer review, validation and documentation of plan input are simplified.

Guaranteed Minimum Benefit Stochastic Pricing Solve: This stochastic pricing solve analyzer has been enhanced to allow for the option to solve for the charges necessary to hit a specified profit target across economic scenarios. The user has complete flexibility in the level at which the solve is performed – solve for charges at the product level, the benefit level, or the cell level. The analysis tools provide the detail necessary to understand the risks and how to mitigate them. ●

Principles-Based Reserves and Capital

Continued from Page 3

challenging one given the amount of information that will be generated. We are developing analysis-of-movement reports that can be linked to the administrative system to track actual-to-expected differences due to lapses, deaths, premium deposits and other tractable information. This report will, of course, also include the impact of the economic environment changes and the change in the stochastic scenarios.

PBA has been a moving target for several years, making it difficult for companies to implement these new regulatory reserving requirements. Our objectives are (1) to design an interface that facilitates the integration of MG-ALFA into the IT infrastructure such that refreshing and running the monthly valuation will be an automated and controlled process, and (2) to generate the information necessary to audit, understand, and explain the reserves and capital and the changes from one period to the next. ●

It is possible to run ALM projections with 200,000+ model points in version 6.6 in a 32-bit environment.

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From the Support Line

Q

I received the following message: "This database file format is not compatible with this version of MG-ALFA". What does this mean and how can I correct it?

A

This message indicates that you are trying to open a file that was either created in a newer version of the system or was previously converted to a newer version. If the file was created in the newer version, you will need to open that version to use or edit the file. If the file was converted, it is possible to restore the older version. When an MG-ALFA file is opened in a more recent version of the system, a back-up version of the file is created. It will be in the same subdirectory as the original file, and will have the same file name, but with a BkUp## extension appended. To use this file, using Windows Explorer, navigate to the subdirectory containing the MG-ALFA file that has been converted. Rename the converted to file to a distinct name, and delete the BkUp## extension from the original file. This file will now be compatible in the prior version of the system.

When an MG-ALFA file is opened in a more recent version of the system, a back-up version of the file is created.

Q

If I have 100 scenarios and I want to report the IRR by scenario, what is the most efficient option to produce a single report with the 100 IRRs?

A

You can use a *ScenProjCycle* report to get the scenarios as rows and the IRR in a column corresponding to each row.

```
#header SUMMARY OF IRR
#line 5
#constants
#column
IRR(srAdjProfit, 0, 20) 12.2 Scenario ~d
```

You can replace *srAdjProfit* with whatever stream you would like to calculate the IRR on. Please note that this solution makes use of the ~d report command. Within scenario summary reports, the ~d and ~s commands can be used to include the scenario description or scenario number on the report.

Q

I would like to calculate average tabular interest on reserves. Is this possible?

A

Here is a suggestion for coding average tabular interest:

1. Create a variable named *ivalIF(t,s)* in the mRV module with a formula-type of expi. In this variable, you will reference the explicit basis for ival, such as *stat.ival*.
2. On the Liab tab of your database, create *NewVariable* that is in the mLiab module, an inventory (inv) type and (t,s) index. Define the formula for this variable to be:
TabRes * ivalIF(t,s)
3. On the OthMod tab of your database, create another new variable. You could start this one by copying *AveCommRate*. The new variable should be in the mProj module, an inventory type and (p) index. Define the formula for this variable to be:
0 if (TabRes(p) = 0)
NewVariable(p) / TabRes(p) otherwise

Within scenario summary reports, the ~d and ~s commands can be used to include the scenario description or scenario number on the report.

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From the Support Line continued from page 5

Q

I would like to modify the Bond asset class to have the ability to model fixed, floating and scheduled coupon bonds. What is the best method for doing this?

A

Adding this functionality requires a few simple database changes.

1. Add an option list, *CouponType*, with the choices of Fixed, Float, and Schedule.
2. Add an mAsset input variable for Bonds called *CouponType*.
3. Modify *ParRate* (mAsset and mNA) to include the Bond class. Set it to na for the mNA version. For the mAsset version, the formula needs to be set to something like the following:

<i>CouponRate</i>	<i>if (y < 1 or CurrMon = 0)</i>
<i>ParRate(y, m - 1)</i>	<i>if (CouponType = Fixed)</i>
<i>SchedRate</i>	<i>if (CouponType = Schedule)</i>
<i>ParRate(y, m - 1)</i>	<i>if (CouponResetTerm = 0)</i>
<i>Reset</i>	<i>if (CurrMon mod CouponResetTerm = 0)</i>
<i>ParRate(y, m - 1)</i>	<i>otherwise</i>

where

<i>SchedRate =</i>	<i>ParRate(y, m - 1)</i>	<i>if (CouponRateAdj(y, m) = 0)</i>
	<i>CouponRateAdj(y, m)</i>	<i>otherwise,</i>
<i>CurrMon =</i>	<i>date(y, m) - AcqDate,</i>	

Reset = EffToNom(gesYieldCurve(Currency, y, m, CouponResetMat) + CouponSpread)

4. Add a new variable, *CouponRate*, in mAsset and in mNA. Copying both the mNA and mAsset versions of *ParRateSink* is a good starting point. Since the formula for the mNA version will be the same as SinkBond, you can just copy the SinkBond category definition line and change the category to Bond. In a similar fashion, since *CouponRate* will already be defined as an input item for the SinkBond asset class, all that needs to be done is copy the category definition line for SinkBond and change the category to Bond.
5. Add the inputs to support the scheduled and floating types. These include:
 - a. *CouponRateAdj*
 - b. *CouponResetMat*
 - c. *CouponSpread*
 - d. *CouponResetTerm*
 Note that *CouponResetTerm* must be an integer.

6. Change the book value calculation (BookVal) for the Bond class to account for the floating and scheduled coupons.

<i>MoSingle (</i>	<i>yieldBOND,</i>	<i>{ Discount rate }</i>
	<i>y, m,</i>	<i>{ Year and month to calculate mo }</i>
	<i>OavNcf,</i>	<i>{ Cash flow variable name }</i>
	<i>PaymentTime,</i>	<i>{ Payment timing in month }</i>
	<i>NumMonths)</i>	<i>{ Cash flow num months }</i>
		<i>if (0 = m mod MonthsinCycle(CashMode))</i>

<i>BookVal(y, m - 1)</i>	<i>otherwise</i>
--------------------------	------------------

where

<i>NumMonths =</i>	<i>PaymentDate - date(y, m),</i>
<i>yieldBOND =</i>	<i>2 * [(1 + yield / PaymentFreq)^(PaymentFreq / 2)) - 1]</i>

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From the Support Line

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Q

Is it possible to model policy lapses moving to RPU status?

A

The support staff has an Adx available with the code required for modeling conversion to RPU status. Please contact the MG-ALFA support team at 888-600-8188 or at MG-ALFA@milliman.com if you are interested in obtaining this Adx.

RPU Code Implementation Overview:

1. Surrenders to RPU are modeled using the conversion decrement. An alternate implementation would have been to specify a portion of lapses that would go to RPU.
2. All RPU is assumed to be for a flat \$1000 per unit.
3. RPU units in-force is the number in-force the prior month, less RPU deaths, plus new RPU units. New RPU units are calculated using the number of conversions, the cash value, and a monthly interpolated non-forfeiture basis $NSP / 1000$.

Q

I am reviewing the reserves for my VUL product line. Would you explain what the *VarSExcess* item represents?

A

When calculating model regulation reserves for a VUL contract, the reserve is calculated for the entire contract using a specified guaranteed interest rate to determine the GMF, GMP, and the current period reserves. Because the separate account liability is set equal to the separate account fund balances for reporting, an additional liability equal to the difference between the separate account liability and the model regulation reserve attributable to the separate account funds is held in the general account. To illustrate, assume a total account value of \$2500 consisting of \$500 of general account funds and \$2000 of separate account assets. If the statutory reserve for this policy were determined to be \$2250, the statutory balance sheet would reflect \$2000 of separate account liabilities and \$250 of general account liabilities. ●

When calculating model regulation reserves for a VUL contract, the reserve is calculated for the entire contract using a specified guaranteed interest rate to determine the GMF, GMP, and the current period reserves.

Save the Date

September 24
Users' Group Meeting at
the SOA VAS
Milliman's PBA Solution
Washington, D.C.

2008 Upcoming Events

June 17, Quebec City, Canada

Life Spring Meeting

Hospitality Suite
Quebec City Hilton

June 19, Quebec City, Canada

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

July 16, Chicago

Building Efficient MG-ALFA Models
Marriott Chicago Suites O'Hare

September 24, Washington, D.C.

**Users' Group Meeting
Milliman's PBA Solution**
Embassy Suites Hotel

September 25, Washington, D.C.

**Valuation Actuaries' Symposium
Hospitality Suite**
Renaissance Hotel

October 9-10, Denver

New User Training
Marriott at Gateway Park

October 19-22, Orlando, FL

SOA Annual Meeting & Exhibit
Orlando World Center Marriott

Sneak Peek at “Building Efficient MG-ALFA Models”

On July 16th, the MG-ALFA team will be hosting a modeling seminar focused on building efficient MG-ALFA models. An efficient MG-ALFA model is a model that is easy to understand and update. And it of course runs fast! The following is a sneak peek at a couple of the modeling techniques that will be discussed, and their impact on run times.

A client contacted the MG-ALFA team for assistance with improving their model runtime. By using three relatively simple model setup changes, the runtime was more than cut in half.

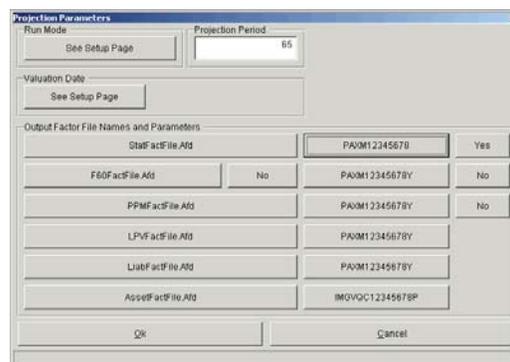
Table 1 summarizes the cumulative improvement associated with these changes:

	Cells Per Hour	Improve %
A. As is	99,000	0%
B. Use AFD optimize	117,000	15%
C. Use speed optimize	132,000	25%
D. Formula changes	234,000	58%

The following changes were made to the model:

Change One (Line B of the Table) - Use the Afd Optimize Feature. Available under the Projection Parameters on the Proj tab, the Afd Optimize feature allows the user to customize the cell-key used for the generation of reserve values. For this model, we changed the *StatFactFile.Afd* varies-by to exclude issue year and the Optimize Parameter to *Yes* as shown in Figure 1. This feature, first introduced in Version 6.5, allows for the user to specify the components of the cell-key that drive differences in reserve factors. If there are multiple records with common values for the specified components, the reserves are calculated once and reused for subsequent model points.

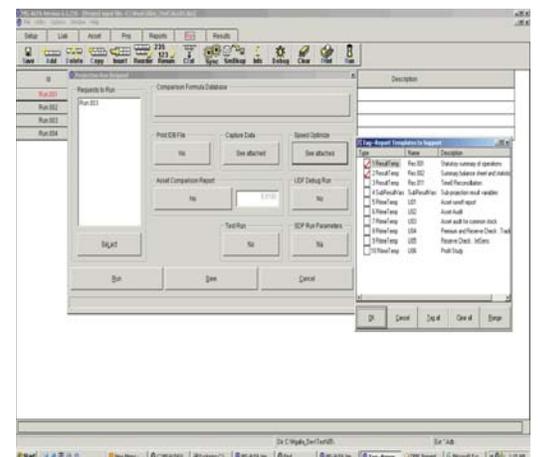
Figure 1



Change Two (Line C of the Table) - Use of The Speed Optimize Function. For the second change, we turned on the *Speed Optimize*

Parameter to calculate only the variables necessary to support result templates Res.001 and Res.002, which were the two primary reports being used. The *Speed* optimize feature was first introduced in the database several releases ago. The database version of the Speed feature creates a new database which includes only the variables necessary to support the selected reports. The Speed feature was expanded in Version 6.5, by allowing it to be set “on-the-fly” for a given run. When initially implemented in 6.5, the runtime optimization feature was only applicable in Independent Liability Projection (ILP) mode. Version 6.6 expanded this feature to Dynamic Liability Projection (DLP) mode. The on-the-fly approach does not require creation of a new database. Rather, the runtime switch simply bypasses the items that are not required to support the selected reports. The database Speed option will be somewhat faster than the optimize option since the variables are completely removed rather than just bypassed. There will still be some overhead associated with their being there, but the convenience may be worth the small overhead.

Figure 2



Change Three - (Line D of the Table) - Database Formula Modifications. There are certain database formula structures that can add significantly to runtime. It is often possible to get a big gain for little effort by searching for these and restructuring the formulas to be more efficient. In this particular project, we searched for uses of the sum function. There were a number of database formulas summing prior period data. Since these variables get called each cycle it is much more efficient to define accumulation formulas rather than summing from policy issue to the current date every time the formula is executed. In this example, the benefits were huge due to the large number of variables that were using the sum function and could easily be modified.

We hope that this article gave you a flavor of the modeling tips and techniques that will be discussed at the Chicago seminar. We hope that you can join us on July 16th.

By using three relatively simple model setup changes, the runtime was more than cut in half.

May Puzzler

MG-ALFA tracks policy year and month with the (t) and (h) indices. It also tracks projection year and month with the (y) and (m) indices. How would I write a formula that calculates a variable on a calendar year basis? Note there may be more than one possible solution to this problem. We are looking for your MG-ALFA creativity!

Email your answer to Valea Coyne at valea.coyne@milliman.com



Answer to the January Puzzler

Congratulations to the following clients that got the answer to the puzzler correct:

Jill Klibanov - Bankers Life

Vinicius Mori - SulAmerica

To correctly code the variable, an else statement needs to be added into the first "if" clause as follows:

```

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

  else if (Cond 2)
    Form 2

  else
    Form 3
  
```



Without the **else**, it is interpreted as:

```

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
  
```

