Turmoil in the financial markets and the resulting uncertainty has further highlighted the consumer need for secure retirement and savings vehicles that provide access to financial markets while protecting against the accompanying downside risk. Subsequently, variable annuities (VAs), which offer the transparency of a separate account (unit-linked) product together with flexible guaranteed benefits have grown in popularity with consumers and providers alike. The ability to compete successfully in this market is dependent on insurers’ ability to understand and manage the risk/reward trade-off of the VA business while meeting the customer need for long term protection.
Effectively managing the trade-offs and risk requires a sophisticated approach to modelling and risk management. In short, running a successful and sustainable VA business requires an integrated approach to product development and pricing, in-force management, asset-liability strategy and hedge execution.

ATLAS is Oliver Wyman’s software platform – specifically and explicitly designed to meet the risk and financial management challenges of a VA business.

EXHIBIT 1: THE OLIVER WYMAN SOFTWARE SUITE

The ATLAS Suite consists of the following applications, each one serving specific and distinct roles in the overall risk modelling and risk management of segregated fund/variable annuity business:

- **A Scenario Generation Framework (MoJo)** – MoJo is typically used to pre-generate market-consistent or real-world stochastic economic scenarios. It comes with a number of commonly used model forms for simulating equity returns, interest rates, bond returns, currencies and market volatilities. It is also itself modular, or plug-and-play, in that new model forms can be added easily and quickly for any of these market variables. It can model as few or as many markets as desired and the parameterization is entirely customizable.

- **Variable Annuity projection tool (ATLAS)** – ATLAS is the core segregated fund/variable annuity liability cash flow projection engine, performing the stochastic projections and, in particular, the calculation-intensive stochastic-on-stochastic valuations. As needed, it can model all the cash flows (whole contract) plus related expenses and revenue items, or only focus on the guarantee-related cash flows for enhanced speed. It can accommodate the vast majority of existing segregated fund/variable annuity product designs in North America, Europe and Asia, and is continually updated to keep up with product evolution. It also allows user-defined variables/functions and code scripting, providing the user with additional customization options, without the drag on run-time normally associated with such “customized code”. ATLAS is used in all applications for segregated funds/variable annuities, whether product development and pricing, financial reporting (Canadian GAAP, US GAAP, US statutory, IFRS, Solvency II, MCEV, etc.), hedge strategy development, hedge execution, internal economic capital models, etc.
• **Hedge Strategy Projection tool (HedgePro)** – HedgePro is used to simulate a hedging strategy through time. The most common application is to assess the performance of a particular hedging strategy over time, as in a hedge feasibility or effectiveness study. Using liability model output and the economic scenarios, as well as user-specified parameters pertaining to the hedging strategy (including the current hedge positions, the universe of available hedging instruments, hedge mismatch tolerances, etc.), HedgePro rolls-forward the hedge portfolio, simulating hedge rebalancing transactions to maintain the hedge portfolio within desired mismatch tolerances.

• **Balance sheet projection tool (NPATH)** – NPATH is an invaluable time-saving tool to approximate stochastic-on-stochastic valuations. Using a single stochastic projection set, it projects future balance sheet provisions that are based on stochastic valuations (e.g. CTE measures) without the need for full stochastic-on-stochastic valuations. This is particularly useful when the future valuations are based on tail-VaR or CTE measures using real-world stochastic projections, for which many variance-reduction techniques commonly used for market-consistent models cannot be employed.

• **Tools and utilities** – We have developed many tools over the years, including tools to assist with inforce compression/grouping, scenario stratification, ESG calibration/parameterization, testing/debugging, stochastic output analysis, financial statement presentation for various accounting regimes, etc. Most of these are very flexible and we routinely tailor these to our clients’ needs during implementation.

**KEY BENEFITS**

1. **A SINGLE VA PLATFORM IMPROVES THE QUALITY OF MANAGEMENT INFORMATION**

   ATLAS provides a common platform for all VA applications – from product development/pricing and financial reporting to business planning and risk management. ATLAS is not just a hedging tool; it was designed to serve all VA applications from a global perspective. This improves the applicability and usefulness of management information along a number of dimensions:

   • Ability to rapidly assess the risk/reward profile of new product designs (pre- and post-hedging) and effectiveness of hedging operations from a number of measurement lenses and accounting/capital filters
   • “Plug and play” approach to scenario generation allows for alternative models and flexibility
   • Consistency of inputs, outputs and calculations promotes comparability and instills confidence in the results across businesses
   • Easy maintenance and sharing of models across users in different locations
   • Rapid model building due to flexible yet intuitive structure

   At Oliver Wyman we believe that the integrated approach of one ATLAS across the business makes it the right choice for the successful risk management of variable annuities.
2. EXCEPTIONAL SPEED AND FUNCTIONALITY GIVES TIMELY ACCESS TO THE RIGHT INFORMATION

ATLAS is consistently praised by clients for its speed, stability, scalability and superior functionality. This allows for greater accuracy and the rapid provision of results to support better and faster decision making. Clients can be confident that the platform will remain relevant and robust as the business grows in size and evolves in complexity due to internal (e.g. product features) and external (e.g. financial reporting demands) requirements. We have clients running models with hundreds of thousands of records for business issued across the globe without the need for highly specialized hardware, software or network setup (entirely within the user’s control).

The superior functionality means ATLAS can serve all VA applications, including solvency and reporting requirements (including CGAAP, Solvency II, IFRS, US GAAP and US Statutory), thereby improving the applicability and usefulness of management information for decision making.

3. A DELIBERATE PARTNERED APPROACH PROMOTES CLIENT OWNERSHIP OF THE FRAMEWORK

Our project management style is disciplined, yet flexible and responsive to the needs of our clients; depending upon the situation, our role ranges from oversight of client resources to actual hands-on implementation.

Our Software is designed specifically to be brought “in house” and “owned” by the client. We do not offer outsourcing services – only consulting and software solutions. We believe risk management and hedging are too important to be outsourced for the long-term success of the VA business.

To this end, we customarily work on-site in a true partnership style. Our goal is to quickly and effectively transfer our intellectual capital and “embed” the knowledge within the organization. We believe the transfer of knowledge (and acceptance thereof) is so important that we insist on a clear and quantified commitment from the client as a partner in achieving the agreed-upon project objectives:

4. OUR SOFTWARE LICENSING AND ANNUAL SOFTWARE SUPPORT AGREEMENTS ARE SIMPLE

We license the entire suite of tools (including ATLAS, MoJo, NPATh, HedgePro and associated analysis templates) by Licensed Region (Americas, Europe-Middle East-Africa, Asia-Pacific). A Software license grants the Client an unrestricted, perpetual license to use the Software within a Licensed Region for a single, one-time fee. Within a Licensed Region, we do not restrict or track usage in any way (i.e. the Client may install on any number of machines/cores and there is no limit on the number of users).

Software support is provided on an annually renewable basis. Support/maintenance entitles the Client to unlimited Software support and access to all new Software releases/version upgrades within the 12-month period covered by the support/maintenance fees.
TECHNOLOGY REQUIREMENTS AND CONSIDERATIONS

• Currently compiled as a 32-bit Windows® application
  − Compatible with Windows Consumer Platforms including XP, Windows 7
• Minimal system requirements:
  − Microsoft.NET Framework (v 3.51)
  − Microsoft Visual C++ runtime library
  − 4GB RAM, 100GB HD
• Multi-threaded to leverage all CPU cores
• Scalable to larger server farms and Cloud environments for distributed execution
  − Calculation-intensive runs are able to take full advantage of a large number of 16+ Core Server machines with Hyper-threading enabled, all working in collaboration
  − Simple integration with Windows HPC for Compute Cluster Distribution and Management
  − Simple integration with Amazon Elastic Compute Cloud for on-demand added compute capacity
• Support for off-loading execution on leading General Purpose Graphical Processing Units (GPGPUs) for further performance execution gains:
  − Support for most NVIDIA Compute 2.0 or 3.0 CUDA-compatible GPGPU devices
• Tight integration with standard spreadsheet and database tools
• Compact and highly portable output

ATLAS combines versatility and modest technology requirements with a powerful multi-threaded, multi-processor calculation engine making it suitable for use on the road, at the desktop or on a compute cluster.

EXHIBIT 2: VERSATILITY

ON THE ROAD... AT THE DESKTOP... ON A COMPUTER CLUSTER

Local model databases (MS Access) and files

“Small” or ad-hoc runs, model development, testing, analysis

Use VPN and remote desktop to access cluster or more powerful desktop

Local or network model databases and files (MS Access, SQL Server)

Sufficient for almost all “non-SOS” or production runs

Access computing cluster for longer runs

Scheduled and user-submitted runs

“Out of the box” distributed processing capabilities have allowed ATLAS to be run in many different distributed computing environments:

- Standard corporate networks
- Windows HPC
- Condor
- Control M
- UC4
- Amazon Cloud

All components in the process can be readily automated to simplify daily and other scheduled runs
Multi-threaded execution means ATLAS will utilize all available CPU cores. Multi-processor runs are usually only necessary for stochastic-on-stochastic (SOS) projections or to run hedging operations. Additionally, support for multiple database types via ODBC means users can still be productive while “disconnected”, but still allows control to be maintained in the production environment. Distributed runs can be connected or disconnected with respect to the database – whichever option best suits the user or environment.

OUR EXPERIENCE

We have executed over 60 assignments with North American, European and Asian clients in the areas of market entry, product development, pricing, risk appetite, capital management, hedging strategy review/design, hedging implementation/optimization, reinsurance, mergers and acquisitions, divestitures, etc.

We have been using our ATLAS software for Oliver Wyman’s VA risk consulting activities for almost 15 years and licensing/supporting the software commercially since 2004. We now have 10 ATLAS software clients globally (head-quartered in Canada, the US and Europe).

Our proven track record and extensive global client list mean that our expert consultants are able to draw on best practices and years of experience to:

• Facilitate the successful implementation of ATLAS across the business
• Ensure the system goes operational and that there is a complete transfer of knowledge to your staff to ensure the ownership of ATLAS is brought in-house
• Deal with any queries or issues that may arise, and create any bespoke functionality you may require, in a timely manner

Given the compute-intensive nature of ATLAS, our team has also gained a vast amount of experience in the financial computing space. In particular, the team has built a wealth of knowledge and intellectual capital in distributed grid computing, cloud computing, accelerator card offloading (GPGPU, MIC architectures) and on several other leading computing topics.
ABOUT OLIVER WYMAN

With more than 3,000 professionals in over 50 cities around the globe, Oliver Wyman is an international management consulting firm that combines deep industry knowledge with specialized expertise in strategy, operations, risk management, organizational transformation, and leadership development. The firm helps clients optimize their businesses, improve their operations and risk profile, and accelerate their organizational performance to seize the most attractive opportunities. Oliver Wyman is part of Marsh & McLennan Companies [NYSE: MMC]. For more information, visit www.oliverwyman.com.

ABOUT ATLAS

ATLAS is Oliver Wyman’s world class platform for modeling and managing the risk of variable annuities, expressly engineered to meet the full range of business needs of VA providers. ATLAS is a robust, complete platform that offers superior functionality and unparalleled speed without compromising on flexibility. With a proven track record and an extensive global client list, Oliver Wyman’s is able to draw on best practices and years of experience to facilitate the successful implementation of ATLAS across business applications, ensuring a complete transfer of knowledge and professional, timely ongoing software support. For more information, contact atlas.support@oliverwyman.com or:

Geoffrey Hancock, FSA, FCIA, CERA, MAAA
Partner
+1 416 868 2509 Office
+1 416 505 8908 Mobile
geoffrey.hancock@oliverwyman.com