• Risk neutral and real world scenarios
• Built on the world’s largest capital market model library
• Easy to use with a simple workflow and fast results
• Controlled production environment reduces operational risk
• View and customize all model and calibration settings
NUMERIX ESG

Empowering our clients to meet the regulatory requirements set forth in Solvency II, IFRS, GAAP, AG43 and C3 Phase 2, Numerix ESG is a sophisticated stochastic simulation framework for producing risk neutral and real world economic scenarios.

Built on the world’s most comprehensive capital market model library, Numerix CrossAsset, Numerix ESG provides complete flexibility and transparency to view and customize all model and calibration settings, giving users full control of scenario generation.

At the same time, Numerix ESG is easy to use, with a simple workflow and fast results. And its controlled production environment reduces operational risk relative to an uncontrolled environment such as Microsoft Excel.

Numerix ESG provides insurers with the robust scenarios they need to power downstream applications such as economic and regulatory capital calculations, liability pricing, hedge projections, and statutory reserve calculations, while satisfying regulators and stakeholders within the company.
Numerix ESG enables users to:

- Generate risk neutral scenarios using a wide variety of industry-proven capital market models
- Calibrate risk neutral models using market data from any market economy and date
- Customize and import models from a comprehensive library of 40+ models across all major asset classes
- Create unified hybrid models that capture correlations among economies and asset classes
- Calibrate model parameters and risk premia to historical market data for real world scenarios
- Use real world-calibrated parameters in capital market models to generate real world scenarios
- Satisfy scenario criteria prescribed by regulators

View scenarios in a table or a graph, or export to Excel for use in other systems.
**Transparency and flexibility**
- Choose any desired model from 40+ industry-proven models
- View and customize all model and calibration settings
- Create custom indices and generate scenarios for them
- Incorporate risk premium assumptions for real world scenarios
- Integrate with any market data source

**Ease of use and quick results**
- Simple workflow to generate scenarios
- Calibrations optimized for rapid performance
- Distribute scenario generation job to a grid or cloud to achieve significantly faster performances

**Comprehensive and advanced analytics**
- Market-standard models for all major asset classes, including rates, equity, FX, credit, hybrids, inflation, commodity, volatility and life
- Industry-leading hybrid framework produces market consistent scenarios for instruments consisting of multiple underlyings

**Consistency of models across the enterprise**
- Export scenarios to other systems and different departments for use across the enterprise
- Model dynamics are consistent for both risk neutral and real world scenarios, providing consistency in a nested stochastic framework

<table>
<thead>
<tr>
<th>Instrument Type</th>
<th>Maturity Date</th>
<th>Strike</th>
<th>Market Vol (%)</th>
<th>Single Fitted Vol (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>1.57783</td>
<td>34.26</td>
<td>35.08</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>1.77566</td>
<td>23.71</td>
<td>23.48</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>1.87566</td>
<td>18.87</td>
<td>18.09</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>1.92298</td>
<td>16.34</td>
<td>15.79</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>1.97229</td>
<td>13.63</td>
<td>13.62</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>2.02169</td>
<td>10.96</td>
<td>11.48</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>2.07609</td>
<td>9.57</td>
<td>9.91</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>2.16952</td>
<td>12.95</td>
<td>11.79</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-10-30</td>
<td>2.36627</td>
<td>18.13</td>
<td>18.28</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-12-01</td>
<td>1.57783</td>
<td>28.65</td>
<td>28.0</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-12-01</td>
<td>1.77566</td>
<td>21.33</td>
<td>21.21</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-12-01</td>
<td>1.87566</td>
<td>17.66</td>
<td>17.61</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-12-01</td>
<td>1.92298</td>
<td>15.7</td>
<td>15.75</td>
</tr>
<tr>
<td>European Option</td>
<td>2014-12-01</td>
<td>1.97229</td>
<td>13.64</td>
<td>13.79</td>
</tr>
</tbody>
</table>

View calibration results for each model
• **Unique hybrid model framework**: specify component models and correlation; joint calibration process captures market dynamics of each risk factor

• **Create, customize and import models** in XML format from Leading Hedge Workbench into Numerix ESG

• **Scripting language for custom indices**: create user-defined indices (such as target volatility funds, 60/40 funds, etc.) and generate scenarios for them

• **Create scenario shocks and bumps** at a granular level, leading to greater precision in risk assessment

• **Calibrate real world model parameters and risk premia** to historical market data using Maximum Likelihood Estimation

• **Add risk premia** to a stochastic volatility model to enable real world-consistent simulations of the underlying and volatility paths

• **Project real world interest rates**: produce user-defined, future yield curves that match a forecast of interest rate behavior on average

• **Scalable high performance computing**: distribute calculations to an internal grid or cloud platform such as Microsoft Azure for large scenario sets

• **Low-discrepancy (‘quasi’) random number generator**: native variance reduction leads to fast convergence

• **Data visualization**: view 2D or 3D graphs of scenarios, Martingale tests, scenario percentiles and histograms, correlations, calibration results, volatility surfaces, and yield curves/shocks

• **Audit trail**: all scenario projections leave an audit trail in the database, recording all information needed
Discover why the world’s leading insurers and financial institutions use Numerix ESG:

Complete transparency and flexibility – not a “black box”
- Use CrossAsset workbench to select, customize and import models from a library of 40+ market-standard models into Numerix ESG, enabling maximum model control for power users

Scripting capabilities to create and generate scenarios for custom indices
- Empowers new product innovation and fast time-to-market for new product development

Unique hybrid model framework
- Most robust hybrid model in the industry, enabling accurate pricing and Greek calculations for products consisting of multiple underlyings from different asset classes

Consistency of risk neutral and real world models
- Model dynamics are consistent for both risk neutral and real world scenarios, providing model consistency in the outer and inner loops of a nested stochastic framework

Easy-to-use and powerful
- User-friendly interface is easy for non-actuarial staff to master, while actuaries and quantitative staff can “dig under the hood” to customize models, calibrations, indices, and scenarios shocks

Unique hybrid model framework allows users to select desired models based on underlyings, and use them as building blocks for the hybrid model
SERVICES

INSURANCE SERVICES

Numerix provides a highly experienced global team of financial engineers and actuaries well-versed in the complex regulatory, hedging and modeling issues that today’s insurance practitioners are currently facing. From variable annuity (VA) and fixed indexed annuity (FIA) modeling to hedge performance, economic scenario validation and regulatory reporting—our team of experts provides the deep knowledge needed to address insurers’ needs.

ESG SERVICES

Our ESG Services involve taking the Numerix Economic Scenario Generator and implementing it—using the right set of factors, the right set of data assumptions and the right set of model assumptions. The ESG validation and best practices are then tailored by our team of actuaries and financial engineers to meet the specific requirements of the customer.

Real World Calibration services are also available, to estimate model parameters and risk premia from historical market data in order to generate real world scenarios.

Copyright © 2014 Numerix LLC. All rights reserved. Numerix, the Numerix logo, and CrossAsset are either registered trademarks, or trademarks, of Numerix LLC in the United States and/or other countries.