

## Liability Proxy Service

*The pragmatic solution for calculating economic capital*

### The problem

Driven by regulators, rating agencies or just a desire to adopt modern best practice, insurers are increasingly using a 1-year VaR measure of economic capital as a tool to understand and manage their businesses. Even with the computing power available today, calculating economic capital involves multiple revaluations which, for complex insurance products, is impractical. Developing liability proxy models is therefore a pragmatic solution which, if done well, captures the risks embedded in both the product and policyholder profile.

### The solution

Barrie & Hibbert's Liability Proxy Service removes the difficulties normally associated with developing fully validated and documented liability proxy models, and offers insurers a tailored and cost effective solution to calculating economic capital.

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#### Cost effective

We start with an initial proof-of-concept phase relying on the client's existing valuation infrastructure. In this way clients can ensure that they are entirely comfortable with our approach before making significant IT investment.

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#### Easy to implement

The simple proxy can be easily coded into ERM systems, and the resulting function can be used as an integral part of a Solvency II SCR Internal Model solution.

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#### Efficient and scalable

Our research suggests that the Least Squares Monte-Carlo approach is more efficient and accurate than general curve-fitting and replicating portfolio approaches, particularly in multi-dimensional factor spaces. As computing power increases and more valuations are possible the same technique applies, giving ever more accurate proxies.

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#### Tailored

We review our client's products, their policyholder profile and any internal constraints they may have in order to provide a pragmatic solution based on the particular requirements of their organisation.

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#### Insightful

Our approach shines light into the murkiest corners of complex liability books, giving an understanding of how they behave under many different conditions and enabling risk management decisions to be taken quickly.

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#### Transparent

We work hard to ensure our clients understand all the steps we take. We use standard statistical techniques that are familiar to most actuaries and risk managers. Also the resulting function is immediately accessible to non-technical decision makers.

# Our approach

We use standard statistical regression techniques to find a function that relates a handful of risk-drivers to the liability value. Based on Least Squares Monte-Carlo, our relatively simple approach generates a large number of approximate valuations. And whilst this method acknowledges the fact that there can be a lot of uncertainty about any one valuation, looking at all valuations together does have the benefit of revealing a lot of valuable information to us.

## How it works

Three distinct projects allow clients to try the technique before committing:

### 1. Proof-of-concept

A practical cost-effective demonstration of how the methods work, providing you with an opportunity to try out the technique on your own liabilities using your own valuation machinery. You can expect:

- To gain an understanding of your liabilities and the selection of risk drivers.
- We will generate fitting and validation scenarios, fit a proxy function, compare to validation points and present findings.

### 2. Implementation

We automate the fitting and validation process and develop and deploy robust repeatable processes, which include the design and development of:

- Scenario generation process
- Valuation automation

We provide:

- Fully documented processes
- Fully documented software tools with easy-to-use installation
- Capability to run regular calibrations

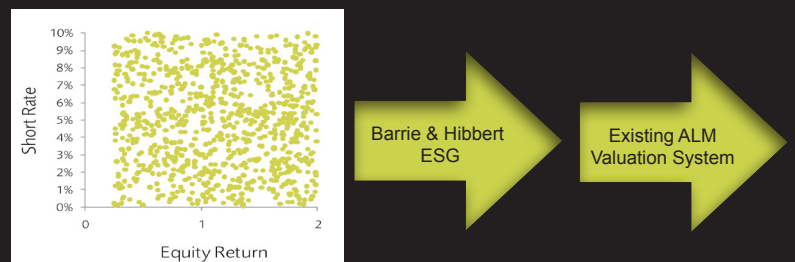
### 3. Production

We offer a regular proxy function calibration service tailored to your needs. Our service includes:

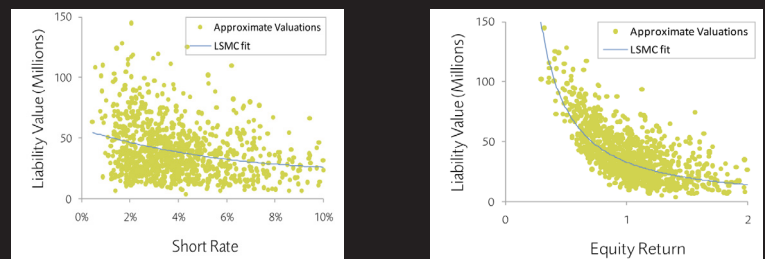
- Full documentation of method and detailed validation results.

## Three-stage approach

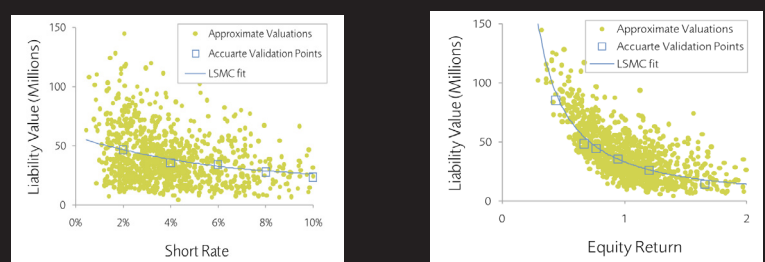
### Step 1: Develop and value fitting scenarios



### Step 2: Fit polynomial function to data



### Step 3: Validate fit



Throughout all our projects we seek to transfer knowledge, enabling clients to make good decisions and understand the limitations and strengths of the approach.

## Associated Services

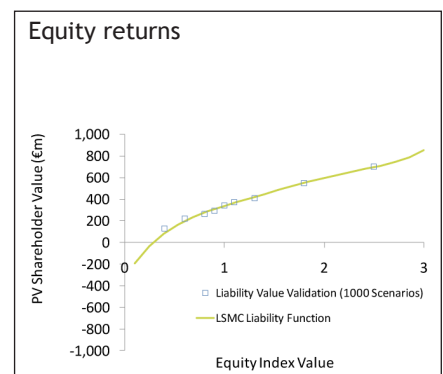
Our Proxy Service can be used in association with our Risk Aggregation Service and Real-World Scenarios to generate loss distributions needed to calculate Economic Capital.

# Case study

- Valuation method included dynamic asset allocation, book value accounting and management actions.
- Considered six market risk factors and two non-market risk factors.
- Used 20,000 fitting and 84 validation scenarios.
- We derived a multi-dimensional function that represents the liabilities (PV Shareholder Value).

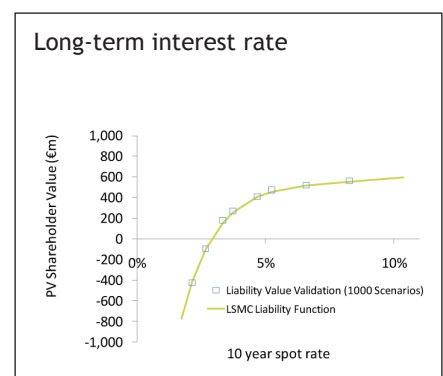
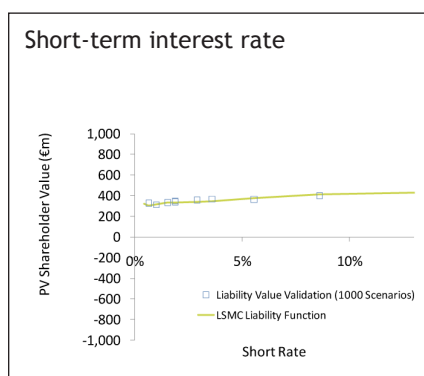
## EQUITY

- To validate we compare the proxy developed (green line) with a number of validation points (blue boxes).
- Validation points are produced by stressing risk drivers and running a full simulation with 1000 scenarios.



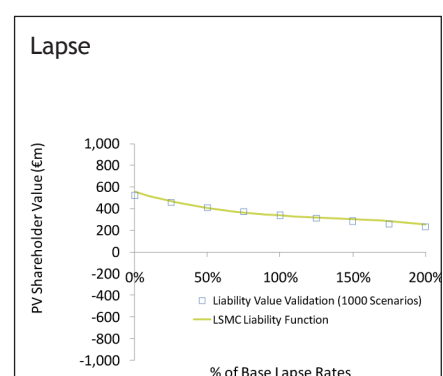
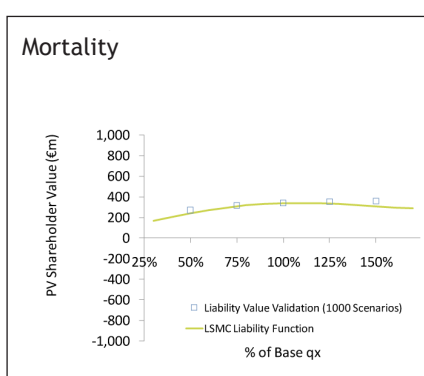
## INTEREST RATES

- We use two factors to describe the yield curve. These are shown as sensitivity to short and long-term interest rates.
- In this case yield curves and interest rate stresses include liquidity premia.
- More interest rate factors are possible.



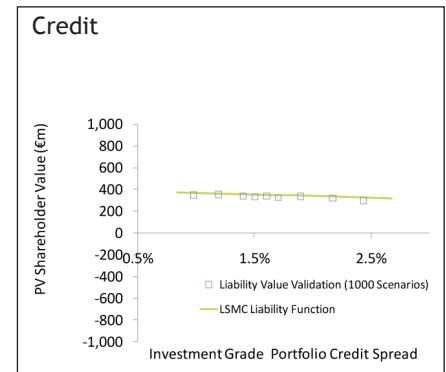
## NON-MARKET

- As well as market risk factors, non-market risks are easily included in the liability function.
- Sensitivity to both mortality and lapses included.
- Mortality is modelled as a percentage increase/decrease in base mortality rate assumptions.
- Lapses are modelled as a percentage of base assumptions.



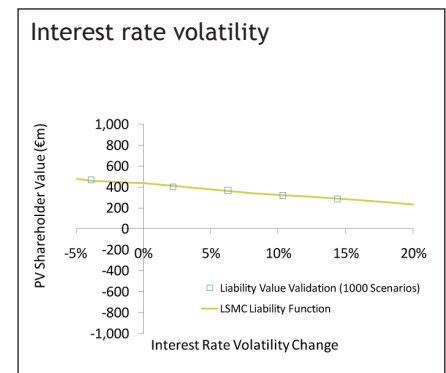
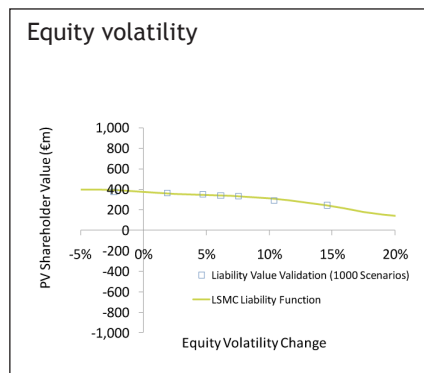
## CREDIT

- Credit exposure is represented as universal stress to spreads.
- This example shows little exposure to credit spreads due to relatively high quality assets and asset allocation rules that react strongly to increases in spreads.



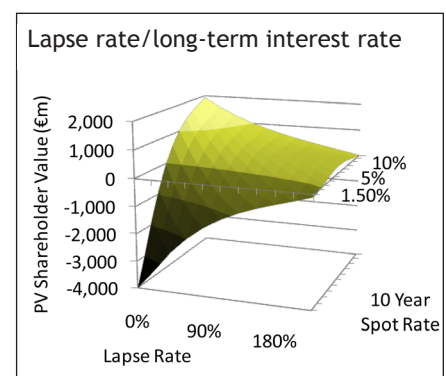
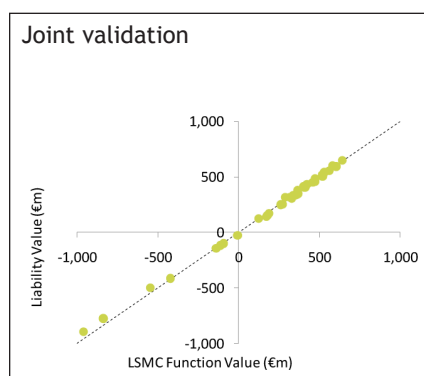
## VOLATILITY

- As well as exposures to equities and interest rates, the liability function gives sensitivity to implied volatilities for interest rates and equities.



## MULTIPLE DIMENSIONS

- The liability function includes sensitivity to simultaneous changes in multiple risk drivers.
- Predicted values are compared to joint validation tests.
- Joint interest rate—lapse rate function shows how sensitivity to interest rate risk reduces as lapse rate increases.



## Why Barrie & Hibbert?

We believe that it is our people who make us unique and it is they who enable us to offer a different consultancy proposition. We employ a mix of actuaries, quantitative analysts, software engineers and economists who bring with them a wealth of expertise and experience. We use this combination of talent together with our models, methods, tools and client experiences to provide innovative and cost-effective solutions to client problems.

### Rely on our knowledge and experience

Barrie & Hibbert was established in 1995 by John Hibbert and Andrew Barrie. We provide a range of software modelling tools, research and consulting services to a wide range of financial institutions and strategic partners.

Our primary focus is the identification, quantification and management of financial risk in savings and investment products, institutional portfolios and life and pensions balance sheets. We have developed a powerful library of financial models that can be used to understand the complicated joint financial relationships that drive uncertainty in long-term financial plans.

As well as those who build, develop, deliver and support our models, we employ experienced market practitioners who know how to integrate and align our products to specific clients' needs. This close engagement with our clients helps us to stay ahead in our ever-evolving marketplace and ensures that our clients reap maximum benefit from our products and services.

### We never stand still

Because the needs of our clients are constantly changing, we never stand still. Our dedicated research team is always at the leading edge, constantly working to enhance our products. This future-proofing, which is the cornerstone of our business, is also supported by strong links to practitioners, regulators and academia.

### Learn more about our expertise

At our website, you will find numerous research notes and articles on our work in this and other areas.

Go to: [http://www.barrhibb.com/research\\_and\\_insights](http://www.barrhibb.com/research_and_insights)

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