



# Validating a Liability Model

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There are many reasons for building a model of a life insurance company's liabilities, such as valuation of blocks of in-force and new business (for embedded and appraisal values), statutory and GAAP valuations, business planning, cash-flow testing, and investment strategy testing. A great deal of time and effort often goes into building a model. However, validation, which is an important and integral part of the modeling process, is often overlooked.

Validation is the only way to determine whether the model is an adequate representation of the in-force business. Validation ensures that:

- Business has not been inadvertently omitted from the model
- Business has not been double-counted in the model
- The modeled policies (model points) are truly representative of the in-force business
- Sufficient model points have been chosen to adequately represent each homogeneous block of business
- Product features have been correctly modeled
- Projection assumptions adequately reflect experience.

Validation is the comparison of the model with actual company data. This can be done by examining the ratio (model/actual) and the difference (model-actual). There are essentially two methods: static validation and dynamic validation. Whenever possible, they should both be used.

## Static Validation

Static validation is the comparison of the in-force (balance sheet) position produced by the model at the valuation date with the actual in-force position for the modeled plans at that date. Items to be compared include:

- Numbers of policies or riders
- Units

- Face amount
- Annualized premiums
- Reserves (statutory, GAAP, tax)
- Cash values
- Account values (for universal life and deferred annuities)
- Outstanding policy loans
- Target surplus.

The actual in-force position can typically be obtained either from the company's administration system or from the valuation system. It should also be reconciled with the company's annual statement because it is common to make manual adjustments before reserves and other statistics are finalized.

There is a logical order in which to validate items. Clearly, if numbers of policies or units are incorrect, then there is little point in attempting to validate reserves or cash values. The in force should be compared with both gross and net of reinsurance. The validation should be carried out separately for each model plan (for example, universal life by death benefit option, traditional whole life, limited pay to 65, level term, and so on) and in total.

It is not always necessary to explicitly model the entire in-force business. Some small plans can be mapped into larger plans with similar characteristics. However, it is important that all the major plan types be explicitly modeled.

The proportion of the business that is explicitly modeled is subjective. To a certain degree this depends on the purpose for which the model is being built. Clearly if the results are to be published or are for statutory purposes, then a larger proportion should be explicitly modeled than if the results are for internal management information purposes only.

Similar considerations apply when determining the acceptable deviation between the model and the actual

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position. It is more important for large-plan types to validate closely than it is for small-plan types.

Each of the items to be compared should show similar degrees of validation. The ratio model/actual should be similar for each validation item. If, for example, face amount agrees closely but the number of policies does not, then perhaps the average face amount being used is incorrect.

It is also useful to validate both before and after model plan assignments. For example, consider a block of business that is 90 percent male and 10 percent female that has been modeled by using a male model point. First, determine whether the model point is a reasonable representation of the male policies before determining whether it reasonably represents the male/female mix.

## Dynamic Validation

Dynamic validation is the comparison of revenue account items produced by the model with actual revenue account items. This can be done two ways: backward or forward. For backward validation, the model is used to produce a revenue account for the year prior to the valuation date, and this is compared to the actual revenue account for that year. For forward validation, the projected revenue account is compared with budgets or forecasts and with trends over previous years. In this case, allowance needs to be made for new business written after the valuation date. The items to compare, both gross and net of reinsurance, include:

- Premiums
- Investment income
- Dividends
- Claims
- Surrender benefits, etc.
- Increase in reserves
- Expenses
- Commissions
- Taxes.

In addition, it is useful to compare cost of insurance, expense and surrender charges, as well as claim costs and interest credited, on fund-driven products.

Actual and budgeted revenue accounts are often only available at a company level or by major line of business. Rarely are they broken down into individual product groups. The level at which validation can occur depends heavily on the availability of data. Some revenue account items, for example, investment income,

may be available only at the company level, and it may be necessary to notationally allocate them between lines of business (and surplus). It is possible, however, to collect data from a variety of sources, including:

- Statutory annual statements
- Internal management accounts
- Budgets and forecasts
- Expense analyses
- Reinsurance treaty accounts
- Tax computations
- New business schedules.

## Options if Validation Is Poor

There are several options if the model does not validate closely enough.

- Review the choice of model points; for example, the number of model points can be increased to reduce heterogeneity within modeled cells.
- Check the methodology. Poor validation can indicate errors in the way the projections have been set up.
- Check the assumptions. Poor dynamic validation can indicate that the assumptions are inconsistent with experience.
- Check the actual in-force data and the actual reserve calculations. A lack of validation can be an indication of errors in this data or in the valuation.
- Ensure that the whole portfolio has been taken into account. Poor validation may be because part of the in-force has been omitted.

As an example, on universal life business, validation of reserves, cash values and surrender charges may be poor. This may be a result of modeling high and low funded plans together. A solution would be to create separate model points according to the "R-factor," the ratio of the actual fund to the guaranteed maturity fund.

Poor validation of reserves, death claims and reinsurance recoveries may be because males and females have been modeled together, or because smokers and nonsmokers have been modeled together. Poor expense validation may be because riders and stand-alone policies have been modeled together. In such circumstances it may be necessary to increase the number of model points.

## Conclusion

It is not until the validation process is successfully completed that one can be sure that a liability model is a

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reasonable representation of a block of in-force business. Validation is often an iterative process, where the cycle of running the model, validating the model, making alterations, and rerunning the model may occur sev-

eral times. In addition to checking the adequacy of the model, the process of validating the model can also offer valuable insights into the workings of a block of business.

