Business Risk Measures and Analyses

Business Risk

Business Risk can broadly be defined to be insurance business risk other than financial, asset-liability management risk. As such, this risk category would address areas of uncertainty that threaten the viability of the insurance organization including product features such as mortality or persistency; internal organization features such as expenses or staff retention; external influences such as regulatory or legal actions. The components of business risk then are the adverse experience of known contingencies (lapse, mortality, expenses) and adverse deviation in business expectations such as in production/sales, and business growth. Our intent is not to attempt to include and define the many business risks facing insurance organizations but simply to provide an approach for measuring the impact that adverse variation would have on the finances of the organization, thereby allowing better risk understanding and management.

Insurance is a long-term business contract in which forecasts are used to price and value the business products. Included in the forecasts are expectations and measures of contingencies and business processes. Since few can predict the future, there is a considerable risk of unfavorable financial results as actual results develop differently from these expectations. Hence business risk analysis is important for the ultimate decision-makers to quantify both the impact of their decisions and the impact of variations that occur.

Analyses Concepts

Similar to the concept of Duration with regard to interest rate risk, an approach can be used to identify the effect of variability in the results of insurance business risks by analysis of sensitivities.

The basic approach is to use a value measure for the business, e.g. Profit Margin or Embedded Value ("EV") or Return on Equity ("ROE"), and to determine its change if an underlying component of the business risk were to shift incrementally.

Implementation

To measure the financial impact of an insurance business risk, there must be a projection tool, or model, that can generate time line cash flow projections using best estimate assumptions for the underlying business and product components.

Define a measure in the model that is dependent on the values of the underlying components and determine the value of that measure using the best estimate assumptions. Vary the assumptions of the underlying components and determine the "new" value of the measure. This can be done by defining a "unit" of change for a component, such as a 10% increase/decrease in the component.

Determine the sensitivity of the measure to a change in the underlying component by dividing the percentage change in the measure by the percentage unit change of the component.

Example

For all policies issued prior to the examination date suppose a financial model is readily available.

Limit the discussion to simple categories for revenues and expenditures; namely premium for revenue, and insurance benefits and general expenses for expenditures.

Define a simple profit margin measure, PM, without reference to the reserving method or amounts:

PM = [PV(Premiums) – PV(Insurance benefits) – PV(Expenses)]

(where PV represents the present value of future cash flows using a given interest scenario)

This measure is easy to calculate and may be easier to understand by non-financial managers.

Now the sensitivity can be calculated by reference to the following values:
Let PM_{BE} be the simple profit margin using best estimate assumptions.
Let PM_{XLAPSE} be the simple profit margin if the lapse assumption is increased for each duration and age by some percent x.
Let PM_{YMORT} be the simple profit margin if the mortality assumption is increased for each duration and age by some percent y.
Let $PM_{ZEXPENSE}$ be the simple profit margin if the expense factors are increased by some percent z.

Hence, the sensitivity measures can be defined as:
Profit Margin Lapse sensitivity = $[(PM_{XLAPSE} - PM_{BE}) \div PM_{BE}] \div x\%$
Profit Margin Mortality sensitivity = $[(PM_{YMORT} - PM_{BE}) \div PM_{BE}] \div y\%$
Profit Margin Expense sensitivity = $[(PM_{ZEXPENSE} - PM_{BE}) \div PM_{BE}] \div z\%$
Such measures quantify for the financial officer the potential impact to the value measure (in this instance a simple profit margin) of mis-estimation inherent in the business.

Best Estimate		Year	Year	Year	Year	Year
	PV(i=0)	1	2	3	4	5
Premium		1000	800	680	612	563
Benefits		500	440	408	398	394
Expense		500	160	136	122	113
Profit	484	0	200	136	92	56
Lapse		0.2	0.15	0.1	0.08	0.08
Mortality		0.5	0.55	0.6	0.65	0.7
Expense %		0.5	0.2	0.2	0.2	0.2

For lapse sensitivity, increase the lapse in each duration by 10%:

Lapse Increase		Year	Year	Year	Year	Year
	PV(i=0)	1	2	3	4	5
Premium		1000	780	651	580	529
Benefits		500	429	391	377	370
Expense		500	156	130	116	106
Profit	465	0	195	130	87	53
Lapse		0.22	0.165	0.11	0.088	0.088
Mortality		0.5	0.55	0.6	0.65	0.7
Expense %		0.5	0.2	0.2	0.2	0.2

Then $PM_{XLAPSE} = [(465 - 484) \div 484] \div 10 = -0.00393$ or -.4%

With this simple example the Profit Margin sensitivities can be determined as:

PM(lapse)	-0.4%
PM(mortality)	-4.4%
PM(expense)	-2.1%

Let's suppose a company is considering a change in its approach to distribution/service on all products, this will have an impact on future persistency. The sensitivity measure can be used within reasonable range to quantify the financial limits within which cost-benefit analysis work well. In this simple model with all other factors unchanged, an increase of 1% in lapses would reduce forecast profits 0.4%. Similar examples might be quantifying changes in underwriting standards or claim assessment, the cost of the change compared to the benefit of increased profit due to better mortality. Likewise, expense analysis could indicate where synergies can improve the business model.

Clearly more sophisticated models would be needed in order to reflect the correlation of items as one might expect in the simple example that expenses would be reduced offsetting some of the profit reduction from additional lapses.

Pros & Cons

Just working through this simple example, one begins to understand some of the favorable and unfavorable characteristics of sensitivity testing:

Pros

- The relative impact of underlying components can be compared with each other
- Once developed, a wide variety of value measures can be consistently determined from one model
- The model can be used to understand the impact of actual results as well as to project the potential results of decisions that change underlying components

Cons

- The sensitivity testing is only as good as the model and clear disclosure of the assumptions, correlations (or lack thereof) and limitations should be provided
- Development, testing and verification of an appropriate business model is resource consuming particularly since components are inter-related
- Even a robust model will have a degree of model variance