BEECHER CARLSON

Beyond Expected Value – Considering Volatility

May 2018

This is the first of three white papers offered by the Beecher Carlson Alternative Risk team on the fundamental tools companies use to estimate and review their corporate risk profiles.

White paper 1: Beyond Expected Value – Considering Volatility
White paper 2: Loss Dependence – A Portfolio Level View of Retained Exposure
White paper 3: Corporate Risk Appetite and Program Structuring

MARKET PRICING

As the insurance market becomes more capital efficient, many risk managers are looking into innovative structures for financing risk. Prior to assessing the organizational value that can be added by any new program structure, Beecher Carlson recommends a brief review of volatility in the context of uncertain loss outcomes to refresh one's familiarity with the quantitative tools used to evaluate the relative merits of competing risk financing strategies.

A few simplifying assumptions made as we review volatility are as follows:

1. Risk managers will look to finance losses in the most capital efficient manner available.
2. Risk managers, for the purposes of this review, consider risk on a line by line basis without regard for risk interconnectivity.
3. A credible stochastic model has been estimated for each source of risk, and actual losses will be known and paid at the end of the year.
4. Risk transfer counterparties hold capital to support each assumed risk at the 90% confidence level, and they back surplus with cash.

We understand that the assumptions are somewhat academic, but they are necessary for us to illustrate these ideas both simply and succinctly.

Volatility is defined as a quantitative measure of the potential for losses to differ from their expected value for a specific underwriting year, based on all information known about the corporation's exposure to loss at the outset of that year.

A simplified risk transfer market pricing mechanism can be described by the following equation:

Market premium = E(loss + LAE) + Administrative charge + Capital charge*

**computed using a market derived carrier WACC value and a risk-specific marginal economic capital requirement estimate*

In the following example, we will look at two sources of risk for Company A. Both risks have an expected annual loss pick of $1,000,000. Risk X is less volatile than Risk Y.

Volatility aversion dictates that the market premium for Risk Y be larger than for Risk X. In practice, market participants charge for volatility; this is the case whether the participant is a (re)insurance company underwriter or an institutional investor providing P&C risk capital through an alternative financing mechanism. Merely knowing the expected value of loss associated with a risk is not sufficient to assess its value in the risk transfer market.

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Risk X	Risk Y
Expected value – $1,000,000	Expected value – $1,000,000
Range of Possible Outcomes	Range of Possible Outcomes
$775,000 – 10% chance	$0 – 90% chance
$825,000 – 10% chance	$10,000,000 – 10% chance
…	
$1,225,000 – 10% chance	

These two risks have equal expected values, but each must be treated differently in terms of financing and capital considerations. Risk X has a 10% chance of reaching $1,225,000. Thus in considering a risk margin to be maintained for possible adverse outcomes, only a $225,000 cushion need be contemplated at the 90% confidence level. Risk Y, however, has a 10% chance of costing $10,000,000. Therefore, a $9,000,000 margin for potential adverse deviation must be considered at the 90% confidence level.

For these scenarios, we assume that the pure premium is set at $1,000,000. Administration and capital charges are then added to derive a market premium on the program, where we assume that the WACC for a risk transfer counterparty is 10%. We can see that within this framework the market does indeed penalize Risk Y for its high level of volatility.

Risk X	Risk Y
Expected value = Pure premium: $1,000,000	Expected value = Pure premium: $1,000,000
Administrative expenses (20%): $200,000	Administrative expenses (20%): $200,000
Risk charge at 10%: $22,500	Risk charge at 10%: $900,000
Market premium: $1,222,500	Market premium: $2,100,000

RETENTION ANALYSIS

When reviewing these two risks, it becomes apparent that a key driver of market premium is the capital charge, which is a function of volatility. Now suppose that Company A retained risk, and assume that from a regulatory standpoint they do not need to hold capital in excess of expected losses to support retained exposures. Does this mean that when evaluating self-funding options Company A should ignore volatility and optimize their selections based on expected costs alone? No. Excessive volatility in corporate cash flows and GAAP earnings can lead to undesirable outcomes including liquidity problems, increased costs of debt and equity capital, strained stakeholder relations, and in some cases even bankruptcy. To ensure that the unpalatability of retained uncertainty is incorporated into program structuring decisions, we recommend the addition of a volatility charge when estimating self-funding costs. Volatility charges can be defined in many ways, but it is desirable that they increase as the "distance" (in a probabilistic sense) between expected losses and extremely adverse losses increases. A volatility charge should also increase as a company's corporate cost of capital increases, since funds to pay for unexpected self-insured losses will need to be sourced. For the purposes of our example, we assume that Company A has a corporate WACC of 25% and estimates its Self-funding costs as follows.

Self-funding cost = E(loss + LAE) + Administrative charge* + Volatility charge**

**including captive expenses, if applicable*
***computed as (Company A WACC)*(downside semi-deviation of losses)*

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Risk X	Risk Y
Expected value = Pure premium: $1,000,000	Expected value = Pure premium: $1,000,000
Administrative expenses (20%): $200,000	Administrative expenses (20%): $200,000
Volatility charge: $25,388	Volatility charge: $711,512
Self-funding cost: $1,225,388 > Market premium	Self-funding cost: $1,911,512 < Market premium
Financing decision: Transfer Risk X	Financing decision: Retain Risk Y

In this simplified model, where expected losses are equal and capital and administration costs are constant, volatility drives optimal program selection. If Risks X and Y are considered in tandem, their probabilistic dependence structure will affect the volatility of aggregate losses resulting from the portfolio X + Y. That concept will be discussed in the second paper from this series.

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