

General ReView®



About this Newsletter

General ReView is a publication written by Jim Bachman, Vice President, Capital Management, GR-NEAM. Each issue provides review and comment on current investment and capital management subjects impacting the insurance industry. General Re-New England Asset Management, Inc. is an SEC-registered investment advisor for insurance companies.

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Investment Risk Management Metrics: *Life and Property/Casualty Insurers*

In the 1930s, in the wake of threatening technical insolvencies due to the declining market valuations of bonds, the various state insurance regulators revised fixed income securities' accounting from market valuation to amortized cost. The industry survived what was to become a financial and economic calamity.

Recent economic and capital market tumult suggests the need for vigilant investment risk assessment and risk management, not just an accounting change. We know investment portfolio risks can be complex and diverse requiring multiple metrics for thorough understanding. In this publication, we review value-at-risk (VAR) and tail-value-at-risk (T-VAR), option-adjusted credit/duration, regulatory/rating agency capital requirements, default risk and issuer concentration for suitability as risk metrics.

For Life insurers, in particular, examining investment risk on a standalone basis is an incomplete review because their investments are a hedge to their liabilities and ought to be analyzed in that complete context. In fact, that will be the subject of our next *General ReView* publication. However, there remain good reasons to focus upon insurers' investment risk. These include current headline issues, regulatory and rating agency scrutiny, the fact that some investment risks are independent of insurers' liabilities, and the relevance to Property/Casualty (P/C) insurers.

Insurers' risk profiles are simultaneously diverse and homogenous. For example, the Life industry's asset T-VAR exceeds 100% of statutory surplus, six times greater than the P/C industry. Regulatory and rating agency asset-based capital charges are less than one-third to one-half this amount and these capital charges are less predictive of T-VAR differences among insurers than either default risk estimates or option-adjusted credit/duration. Issuer concentration differences between Life and P/C insurance companies at first blush appear to be slight, but become greatly amplified when expressed as a percent of statutory capital.

Our review focuses on all domestic Life and P/C insurance companies that were members of groups whose 2007 invested assets exceeded \$50 million. The following sections describe our methods, acknowledge our data providers, define our risk metrics and highlight key results. Our summary section focuses on the “Why”, not the “What” that precedes it, and further sets the stage for the next issue of *General ReView*, “Amending ALM: An Enterprise Solution to Insurer Risk Management.”

Overall Methods

We rely upon security level detail and financial statement data as reported in the 2007 convention blank. We include all holdings identified by valid cusips, private placements, mortgage loans and Schedule BA assets. We obtain sector classifications, durations, convexities and spreads from Merrill Lynch. Ratings are provided by the Nationally Recognized Statistical Rating Organizations (NRSROs). Derivatives are excluded. Results are shown for Life and P/C segments.

All risk metrics except option-adjusted credit/duration are expressed as both a percent of the total investment portfolio and of statutory surplus. VAR and T-VAR are calculated at the 99% level for annual periods. Option-adjusted credit/duration risk statistics are as of year-end 2007.

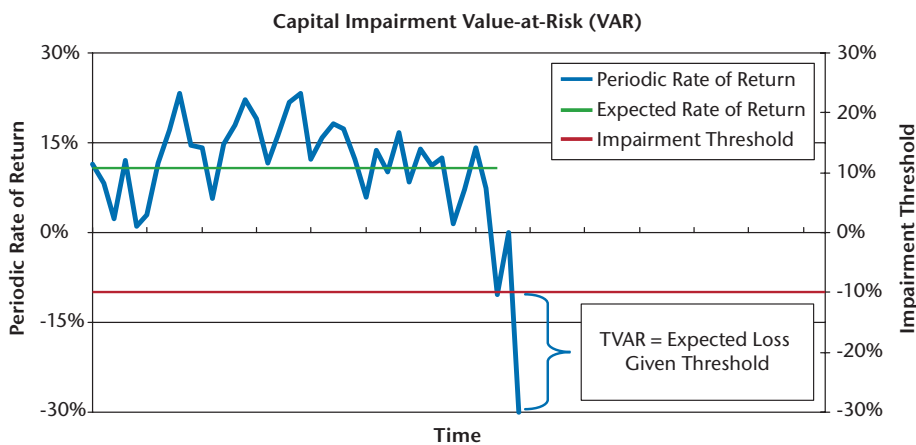
RBC, BCAR and CAR capital charges are based on recent asset risk factors from the NAIC, A.M. Best and S&P, respectively. Expected loss from default statistics are derived from Moody’s and S&P ratings studies and proprietary loss recovery estimates. Concentration statistics pertain to corporate issuers of fixed income debt.

VAR and T-VAR

VAR is the amount of loss that can be exceeded *within* a specified time period at a specified probability. T-VAR is the expected amount of loss once the VAR limit is exceeded. We use VAR and T-VAR as the principal investment risk metric for several reasons: their embedded underpinnings of insurer solvency assessment, acceptance as international regulatory risk measures, broad usage within the global securities industry, and applicability in risk budgeting and the decomposition of risk.¹

Chart 1 characterizes the relationship of VAR, T-VAR and the loss threshold. The left-hand axis scales the periodic rate of return (daily, weekly, etc.). The right-hand axis scales the impairment (loss) threshold. The erratic blue line represents the periodic rate of return. The green line represents the expected rate of return. And, the red line represents the loss threshold. The threshold is set to a particular VAR (say 95% to 99.99%). T-VAR is the expected loss if VAR is, in fact, exceeded during the period under consideration.

Chart 1. VAR, T-VAR and Impairment Threshold



We compute annual VAR and T-VAR for individual companies at the 99% level. Each company's cusips are classified into one of 71 fixed income and equity indices. Additionally, commercial mortgages are classified as CMBS, Schedule BA assets are classified as equities, and private bond holdings are classified as Single A 7-10 year corporate bonds. Return and risk estimates are based on daily index returns from 12/31/2006 through 10/15/2008. Correlations span the period 12/31/1996 to 10/15/2008.

Table 1 displays the annual 99% VAR and T-VAR for the Life insurance industry. "Composite" refers to the dollar-weighted value. "Average" and "Median" refer to the numerical average and median of all insurers, respectively. Larger insurers have greater investment leverage, which amplifies their greater than average invested asset VAR/T-VAR resulting in significantly greater surplus VAR/T-VAR levels.

Table 1. 99% Confidence Level Annual VAR and T-VAR					
	Investments/ Surplus	VAR-Life		T-VAR-Life	
		% Assets	% Surplus	% Assets	% Surplus
Composite	11.1	7.9%	91.2%	8.9%	102.5%
Average	8.7	7.1%	68.0%	8.1%	76.7%
Median	7.0	7.0%	52.0%	7.9%	58.8%

Companies within the Life segment are classified as either "Annuity" or "Life" if two-thirds or more of their 2007 reserves are identified as such, respectively. Otherwise, the company is classified as "Other." **Table 2** presents the 99% T-VAR for the Annuity, Life and Other segments of the Life insurance industry. We do not show the Health segment because there are so few companies. The results are "composite" values.

Table 2. 99% Confidence Level Annual Percent of Surplus T-VAR			
	Investments/ Surplus	T-VAR-Life	
		% Assets	% Surplus
Annuity	12.1	9.1%	109.6%
Life	11.1	8.9%	98.3%
Other	10.9	9.1%	99.5%

The only discerning difference among the above sub-segments is Annuity providers' leverage. Portfolio construction appears not to be a factor (asset T-VAR among the three segments is very similar). Unfortunately, the segment composite values mask outliers. For example, the fourth largest Annuity provider has the highest surplus T-VAR at 246% and a 22.8 leverage ratio, and the second largest Life insurer has a surplus T-VAR of 266% and leverage ratio of 23.4. There are no "Large" companies at the other extreme.

P/C insurers' investment leverage is significantly less than for Life insurers. Their asset VAR and T-VAR are also less. The combination of lower leverage and lower asset VAR/T-VAR results in surplus VAR/T-VAR amounts that are scant fractions of the Life insurance industry. Once again, large companies have the greater leverage and asset VAR/T-VAR. **Table 3** displays these results.

Table 3. 99% Confidence Level Annual Percent of Surplus T-VAR					
	Investments/ Surplus	VAR-P/C		T-VAR-P/C	
		% Assets	% Surplus	% Assets	% Surplus
Composite	2.7:1	5.4%	13.7%	6.1%	15.6%
Average	2.6:1	4.8%	12.1%	5.5%	13.9%
Median	2.4:1	4.2%	10.1%	4.8%	11.6%

Regulatory/Rating Agency Capital Charges

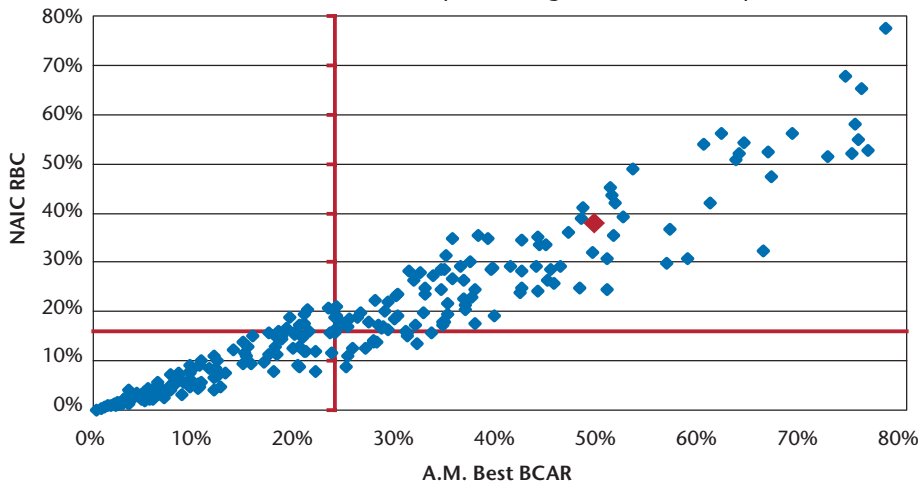
We apply the RBC, BCAR and CAR asset risk factors of the NAIC, A.M. Best and S&P, respectively, to compute the asset risk capital charges for each company. **Table 4** summarizes the results for Life and P/C insurers. It is clear that Life insurance industry charges are much greater than for the P/C insurance industry and that NAIC and S&P asset risk capital charges are very similar. Also, it appears that larger companies have the higher risk charges and the differential between Life and P/C asset risk using these risk metrics is less than the differential when using VAR/T-VAR metrics resulting in fewer identified outliers.

Table 4. Regulatory/Rating Agency Asset Risk Capital Charge as Percent of Surplus

	NAIC	A.M. Best	S&P
Life			
Composite	38.3%	49.5%	35.4%
Average	19.4%	27.6%	20.2%
P/C			
Composite	9.5%	10.6%	10.5%
Average	5.0%	6.2%	5.9%

In **Chart 2** we display the NAIC vs A.M. Best asset risk capital charges for all the groups within the Life insurance industry. Each **blue dot** represents an individual group. The **red dot** is the industry composite. The **red lines** intersect at the median value of all groups. For all groups the A.M. Best capital charge for asset risk, as a percent of surplus, exceeds that of the NAIC, reflecting by asset category, consistently higher risk charges.

Chart 2. NAIC vs A.M. Best Asset Risk Capital Charges as Percent Surplus



Option-Adjusted Credit/Duration and Estimated Loss Given Default

We have described option-adjusted credit/duration in a previous publication. Simply, two portfolios of four-year duration, AA quality are not of equal risk when the first is 50%/50% 2-yr/6-yr AAA/A, and the second is 100% 4-yr AA. The former clearly has greater “Risk” (long weaker credit). We factor into credit/duration the cusip’s optionality to provide an accurate point-in-time estimate of fixed income portfolio risk. This metric reflects the cusip aggregated impact of the three primary components of fixed income investment risk. As shown in **Table 5**, Life insurers’ option-adjusted credit/duration is greater than for P/C insurers, and for both segments the larger groups have the greater portfolio risk.

	Life	P/C
Composite	4.9	3.9
Average	4.3	3.4
Median	4.3	3.3

Our estimates of risk due to expected loss given default (ELGD) are based on Moody's and S&P ratings transition studies and proprietary loss recovery estimates applied to each of the fixed income indices into which insurers' holdings are classified. These estimates differ from regulatory/rating agency capital charges for asset risk because they account for duration. **Table 6** provides an example of the differences in these estimates for BBB rated corporate bonds.

Corporate Bonds BBB Rated	ELGD Charge	P/C Charge			Life Charge		
		NAIC RBC	A.M. BEST BCAR	S&P CAR	NAIC RBC	A.M. BEST BCAR	S&P CAR
3–5 Yr Maturity	1.8%	1.0%	1.0%	3.9%	1.3%	3.8%	3.9%
10–15 Yr Maturity	6.0%	1.0%	1.0%	3.9%	1.3%	3.8%	3.9%

The regulatory/rating agency charges differ among one another and RBC and BCAR charges vary depending upon the type of entity owning the bond. However, none of the organizations' charges vary by maturity. The ELGD risk metric increases as the maturity increases, and does so regardless of the entity type, which owns it.

Table 7 displays the correlations of asset T-VAR, option-adjusted credit/duration, expected loss given default and the regulatory/rating agencies' capital charges for Life insurers. Option-adjusted credit/duration has a .77 correlation with T-VAR. Regulatory/rating agencies capital charges, though having high correlations to one another, have low correlation to T-VAR. And, although not shown, all correlations are less for P/C insurers (for which there is less VAR/T-VAR risk) than for Life insurers.

Life Industry					
Metric	T-VAR	OACD	ELGD	NAIC	A.M. Best
OACD	0.77				
ELGD	0.75	0.90			
NAIC	0.50	0.46	0.37		
A.M. Best	0.56	0.72	0.69	0.86	
S&P	0.56	0.70	0.68	0.87	0.99

Issuer Concentration

We addressed P/C insurer corporate issuer concentration in October 2003.² Recent defaults and default rate trends spawn a review of both segments. **Table 8** displays a corporate issuer concentration profile for Life and P/C insurers owning at least \$100 million corporate bonds at year-end 2007. We express issuer concentration in relation to surplus rather than assets to highlight the exposure to the loss of capital from a failed investment.

% Reported/ % Owned	<1% of surplus	1 -< 2% of surplus	2 -< 3% of surplus	3 -< 5% of surplus	5 -< 10% of surplus	>= 10% of surplus
Life						
% Surplus	5.8%	6.0%	20.3%	28.8%	33.0%	6.1%
% Corp Bonds	1.1%	1.8%	15.1%	21.3%	47.5%	13.2%
P/C						
% Surplus	70.8%	17.1%	6.9%	4.0%	1.1%	0.1%
% Corp Bonds	41.3%	29.1%	13.1%	10.4%	4.5%	1.6%

Life insurers appear more willing to commit far greater surplus to individual corporate issuers than P/C insurers. The largest single corporate issuer of Life insurers, representing 33% of industry surplus and owning over 47% of industry corporate bonds, is in the range of 5% to less than 10% of surplus. In contrast, the largest single corporate issuer of P/C insurers, representing nearly 71% of industry surplus and owning over 41% of the industry's corporate bonds, is less than 1% of surplus.

Even these breakouts mask wide inter-company variations and do not completely detail issuer risk. For example, the greatest issuer concentration is with a P/C insurer having 107% of its \$260 million surplus in three money center financial institution issuers. Also, and not shown, is the fact that neither the credit quality nor duration of insurers' largest holdings vary from the average of their entire corporate holdings.

Summary

Fundamentally, we believe that investment risk cannot be viewed independently of product risk, but rather that an enterprise-wide approach must be taken. That point notwithstanding, there are good reasons to assess standalone investment risk, and that assessment is best served by using multiple metrics to measure and better manage the risk. As is the usual case, the devil is in the details. Even with multiple metrics, "averages" can easily mask outliers.

We began this piece by noting VAR/T-VAR asset-side risk capital charges can be multiples of regulatory/rating agency requirements. We now offer several reasons. First, VAR/T-VAR estimates are very sensitive to their underlying return and volatility assumptions. We structured these inputs to reflect the most recent time periods characterized with economic return and high volatility. Perhaps we assumed our conclusion. On the other hand, it is in such economic regimes that the greatest care must be given to assessing capital adequacy.

Second, VAR/T-VAR capital charges are predicated upon a 99% confidence interval. We could lessen the threshold, perhaps to 95%, recognizing that a one in a one-hundred year event might seem too remote. On the other hand, the institutions for whose capital adequacy we are trying to assess have multi-generation obligations and perhaps the requirement ought to be even still more stringent, say the 99.5% level, the standard for Solvency II.

Third, VAR/T-VAR calculations account for correlation of assets' returns (or their lack of returns). Asset correlations are not incorporated into regulatory/rating agency asset risk capital charges. However, they exist—most often they are significant and, in periods of stress, they approach unity. Ignoring correlation of asset returns underestimates asset risk at the time it is most critical to assess its consequences. The lack of correlation measurement is consistent with the historic evolution of asset/liability matching or management (ALM).

We reviewed several other investment risk management metrics in this article; namely option-adjusted credit/duration, expected loss given default, and issuer concentration. These are relatively straightforward and complementary to the VAR/T-VAR metrics. The first two can be easily calculated and monitored over time or used to make point-in-time risk assessments among portfolios without having to specify the return/risk regime or solvency thresholds associated with VAR/T-VAR.

We believe that issuer concentration is one very important risk management factor. However, to fully operationalize it, there is a need to expand the scope of the analysis from fixed income assets to all other assets and to look across the balance sheet to determine whether there are other dependencies, such as similar product offerings/geography or counter-party/reinsurance.

We believe that investment risk management is a journey, not a destination on which we seek to guide our clients. Please call or email with your comments, questions or suggestions. Individual company results and peer comparisons are available.

Endnotes

¹ See Holden, Gayle. *Value-at-Risk: Theory and Practice*. Academic Press. 2003; Marrison, Chris. *The Fundamentals of Risk Measurement*. McGraw Hill. 2002; Gup, Benton E.. *The New Basel Capital Accord*. Thomson Press. 2004.

² See, *General ReView*, Issue 24



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