

# LEHMAN BROTHERS

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**Insurance: Property &  
Casualty**

**J. Paul Newsome, CFA**  
1 212 526-6019  
*jpnewsom@lehman.com*

**Robin Albanese**  
1 212 526-6121  
*roalbane@lehman.com*

**Vincent W. Foley**  
1 212 526-4926  
*vfoley@lehman.com*

## RISK-ADJUSTED CAPITAL

### AN EMERGING POSITIVE SECULAR TREND

- Coming as no surprise to anyone who follows the insurance industry, the industry is overcapitalized, doesn't make adequate returns on its catastrophe-prone products, and is behind the banks in allocating capital using risk as a guide. But there is light at the end of the tunnel.
- Some companies are implementing a risk adjusted capital model to guide their pricing and business strategy. Below we discuss the topic of P&C RAROC (P&C risk-adjusted return on capital). Most of our insights come from our "Issues in Insurance" dinner featuring William Keogh of Risk Management Solutions and Peter Nakada of eRisks.
- Our findings suggest that implementation of risk-adjusted capital models are, in most cases, many years off; and that the early adopters will likely either have a pricing advantage, or be the early sellers of their subsidiaries that can't meet their risk-adjusted return on capital hurdles.

Increasingly, we believe that the source of the P/C insurance industry's biggest problems — overcapitalization, inadequate returns on equity, and solvency threatening price wars — is the inability and/or unwillingness of insurers to link risk with capital allocation. That is why we were so excited when William Keogh (Risk Management Solutions) and Peter Nakada (eRisks) agreed to walk us through their efforts to bring a risk-adjusted capital model called P&C RAROC to the insurance industry.

What Mr. Keogh and Mr. Nakada told us confirmed and quantified much of what we sadly suspected. The industry is overcapitalized by 20%-30%. Insurers are systematically underpricing products with major catastrophe risks. A few insurers are early adopters of risk-adjusted capital models, but most remain mired in complicated, grandiose, actuarially based models that are too complicated and often don't produce results upon which insurers can act.

Fortunately there is some reason to be optimistic. There are a number of actuaries and consultants working both within and outside P/C insurers, like Mr. Keogh and Mr. Nakada, trying to build the analytical infrastructure to allow insurers to link capital to risk. And the insurers can adapt the work done by the commercial banks instead of trail blazing into unknown analytical ground.

We also believe that the insurers that adopt risk-adjusted capital models early will have an advantage over other insurers. It is generally agreed that when the banks adopted risk-adjusted capital models they were able to run their businesses with less capital. Rating agencies became more confident in the ability of banks to manage risk after reviewing the risk-based capital attribution models used by banks, and the rating agencies allowed the banks to use less capital while maintaining their existing risk levels and their existing ratings.

Perhaps more importantly, risk-adjusted capital models give financial institutions a tool to ferret out profitable businesses. eRisks' work suggests that most lines with high-risk catastrophe exposure -- commercial multiple peril and homeowners-- are earning substandard returns. The industry would be better served, according to eRisks' model by being in lower risk lines, or by even investing in stocks and bonds, rather than being in the homeowners' insurance businesses. While all insurers can recognize, imprecisely, when a product line is losing money by examining the combined ratio, many insurers don't have the ability to compare product line and/or division returns to other product lines, divisions, or decisions to leave the business.

The implementation of risk-adjusted capital models should have a number of beneficial effects on the industry.

The first will be the exit of a number of insurers that realize they cannot make their required hurdle rates. According to RMS and eRisks the early adopters are typically European Bancassurance companies that already use risk-adjusted capital models to guide their banking operations. These companies can now compare their banking operation's returns with their insurance operation's returns. We would not be surprised if a number of these companies decided to leave the P/C business given the higher returns on equity earned by most banks. It has even been suggested that the highly-publicized sale of CGU's U.S. insurance operations may have been a result of CGU's implementation of a risk-adjusted capital model that suggested its U.S. operation's returns were sub-par.

Longer-term the industry's volatile pricing cycle should smooth out as insurers become more disciplined in their pricing. In the past, some lines of insurance have experienced pricing cycles where insurance prices rose and fell 40%, 50%, or even more over a six to 10 year period. Insurers would respond to hardening markets by implementing every dollar of

capital available, causing a steady softening of prices, which would be followed by large losses that would cause a sharp rise in prices (often 50% or larger increases) that would start the cycle all over again. Disciplined use of risk-adjusted capital models would limit the capital implemented in hardening markets up to the point of maximum returns and cause insurers to draw capital away from businesses as prices soften. In addition, the sharp increases in prices following catastrophe losses would be muted because insurers would have priced these events into their pricing models on an industrywide basis.

A world of muted pricing cycles and adequate returns on equity would be a “golden era” for insurers. Currently, eRisk estimates that the risk-adjusted return across all lines of insurance is approximately 10% — lower than their estimate for the risk-adjusted return for investments in stocks and bonds. A migration of product line returns from the current sub-par level to adequate levels would cause most insurers to enjoy higher earnings and ROEs. Publicly traded insurers would sport higher P/E ratios and higher price-to-book value multiples.

**WHAT IS P&C RAROC?**

P&C RAROC stands for property & casualty risk-adjusted return on capital. Specifically, it is the brand-name for an analytical framework developed by the consulting firm Oliver, Wyman & Company and Risk Management Solutions. eRisks is an Oliver, Wyman & Company e-venture that is providing internet delivery of risk management products and services. The P&C RAROC analytical framework is designed to “evaluate any business activity based on whether its return on capital is above or below its equity hurdle rate.” To do this P&C RAROC must determine how much capital is needed, the expected return on that capital, and the equity hurdle rate for the activity.

More broadly RAROC often refers to the general use of statistical models to measure the risk-adjusted return on capital.

The P&C RAROC is a measure of expected return on Economic Capital over the life of a policy (or block of policies).

**Figure 1:** RAROC Calculated

$$\text{RAROC} = \left[ \frac{\text{Premium} - \text{PV (Expected Claims)} - \text{PV (Expenses)} + \text{Interest on Capital}}{\text{PV (Economic Capital)}} \right] [1 - \tau]$$

*PV = Present Value*

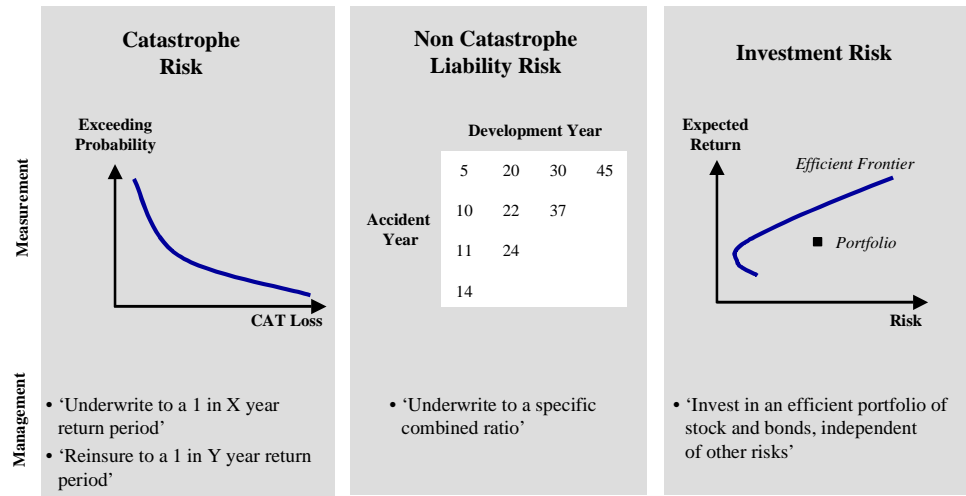
*t = tax rate*

*Source: eRisks*

In the numerator is a measure of expected profits (premium adjusted for both expected losses and the time value of money), and in the denominator is a measure of the risk-adjusted capital appropriate for the policy.

Actuaries are typically comfortable calculating expected profits. It is what they do for a living. The key difference between what P&C RAROC does and what traditional actuarial techniques do is the linking of required capital (required by a particular line of business) to risk.

**Figure 2:** Insurers Have Traditionally Managed Risk and Return in ‘Silos’

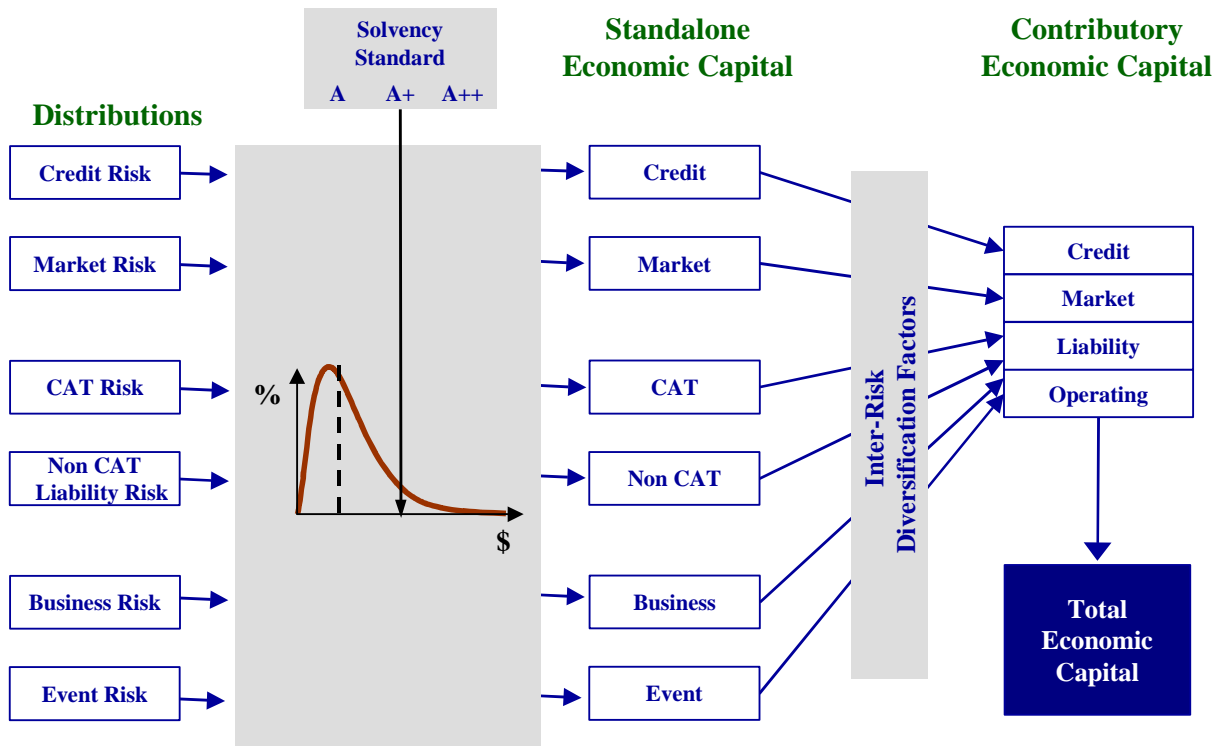


Source: eRisks

For a detailed and sophisticated description of how eRisks calculates risk-adjusted capital (some times called economic capital), we would suggest you read “P&C RAROC: A Catalyst for Improved Capital Management in the Property and Casualty Insurance Industry” by Peter Nakada, Hemant Shah, H. Ugur Koyluoglu and Olivier Collingnon.

According to Nakada, Shah, Koyluoglu, and Collingnon, “economic capital is the amount of capital required to provide a given level of safety (the “solvency standard”) to policyholders, over a specific time horizon, given the enterprise-wide risk distribution of the insurer.”

Figure 3: RMS and eRisks Now Bring Economic Capital and RAROC to the P&C Industry



Source: eRisks

Essentially, insurers would use statistical models for the various risks borne by insurers (credit risk, market risk, non-catastrophe insurance risk, catastrophe risk, and operating risk) to calculate the amount of capital needed to stay in business at some statistical level of confidence. In imprecise, layman’s terms, an insurer would be asking how much capital do I need behind this business so that I can say I am 99.5% (or some other confidence level) sure that I will not go bankrupt.

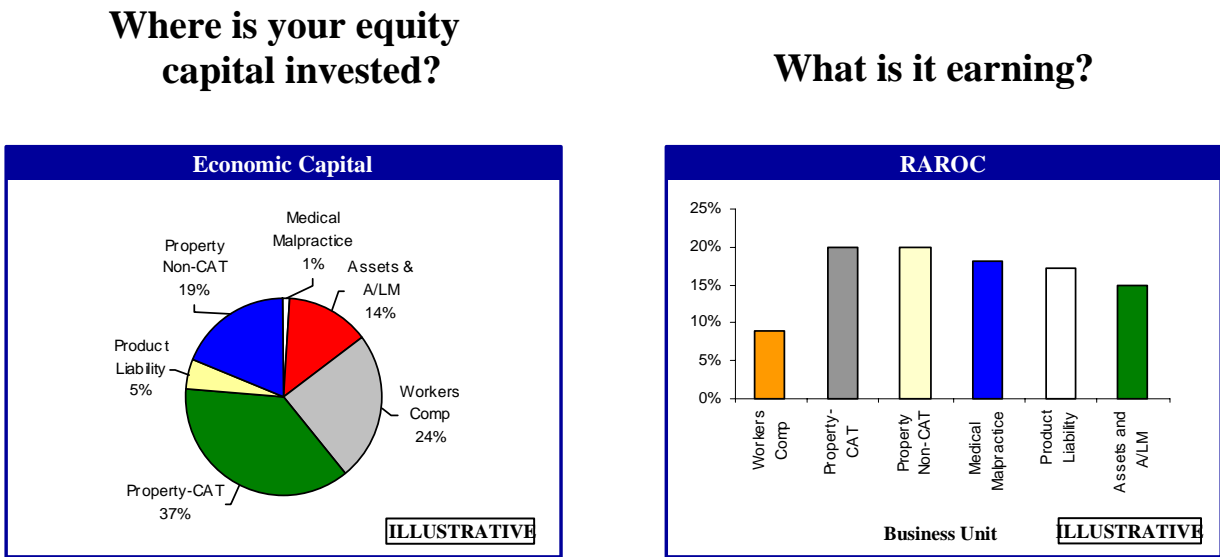
**WHY DO INVESTORS CARE?**

Clearly, P&C RAROC or systems like it could be used to evaluate an insurer’s stock’s investment potential.

First, P&C RAROC can tell investors how much value is being created by a company and where that value is being created. Essentially the process can deliver return-on-equity calculations by line of business that are comparable across industries.

Companies could ultimately develop tables like those illustrated below that would show investors where their money is being invested and what returns those investments are getting.

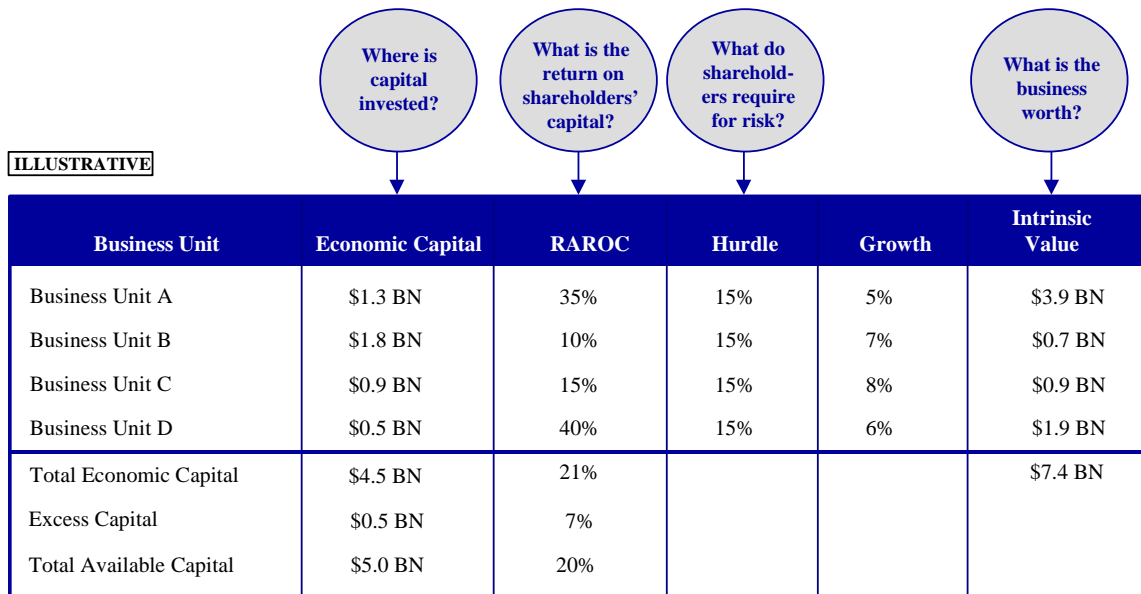
**Figure 4:** Economic Capital and RAROC Allow Insurers to Answer Key Strategic Questions



Source: eRisks

Secondly, the tool could be use for valuation purposes. Below is a table provided by eRisks and RMS that illustrates how an equity analyst might develop an “economic” or “intrinsic” value for a company.

**Figure 5:** How Can P&C RAROC Help Equity Analysts?



- Improved transparency
- Peer group analysis
- Valuation analysis (DCF, EVA, SVA)

Source: eRisks

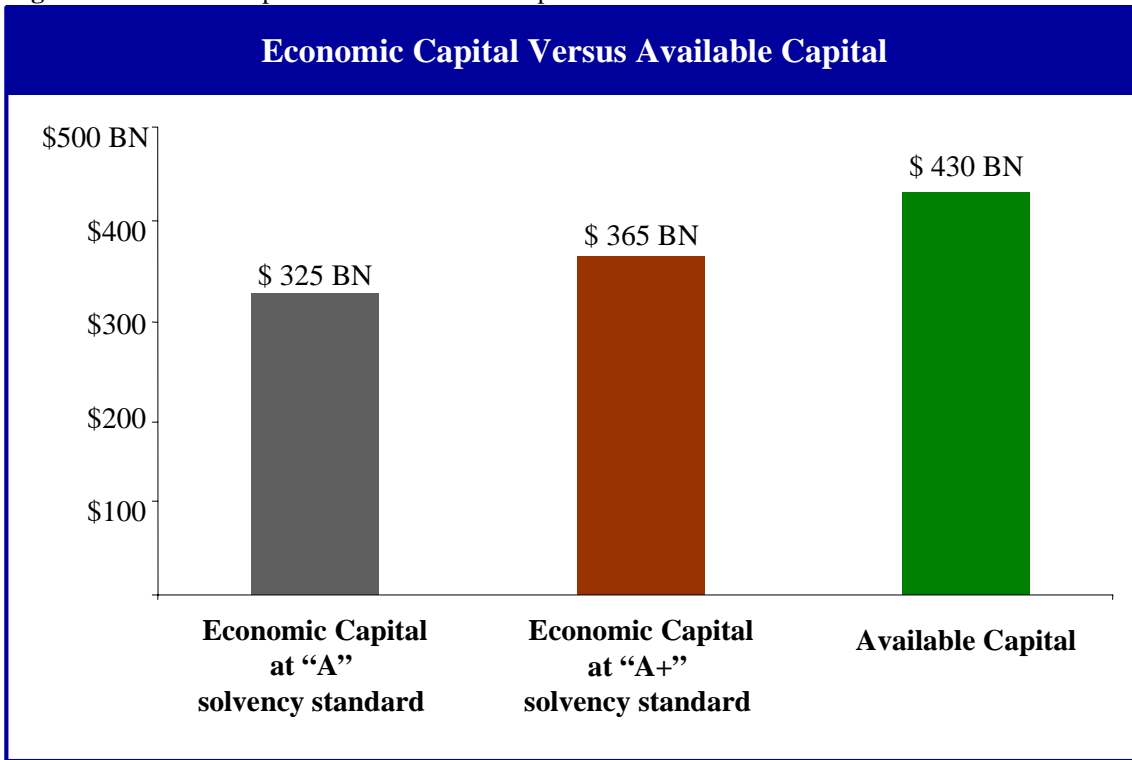
**WHAT DOES IT TELL US?**

The use of risk-adjusted models can tell us a lot about the P/C industry in general.

The results below come from a property – casualty insurance industry study conducted by eRisks and RMS. The results confirm and quantify many things we already knew about the industry.

First, the models show that the industry is overcapitalized by 20%-30%. Below is eRisks’ and RMS’ estimates for the required capital for the industry if the average desired claims-paying ability rating is either a “A” or “A+” as defined by A.M. Best.

**Figure 6:** Economic Capital Versus Available Capital



Source: eRisks

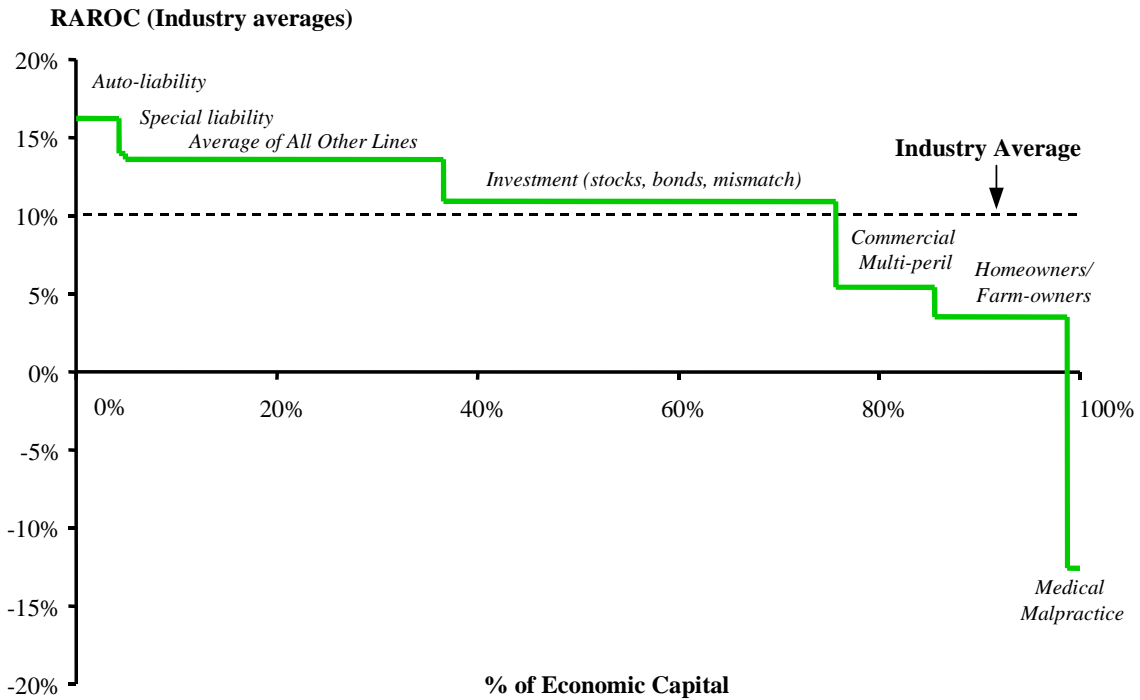
Second, insurers are systematically underpricing products with major catastrophe risks. A few insurers are early adopters of risk-adjusted capital models, but most remain mired in complicated, grandiose, actuarially-based models that are too complicated and often don’t produce results upon which insurers can act.

Note that the model also shows that some other non-catastrophe laden products are being underpriced by the industry. For example, medical malpractice insurance is the biggest money loser for the industry.

The chart below also illustrates just how bad a job most insurers are doing for their equity owners. The average return of about 10% is below the risk-adjusted return for the insurer’s investment portfolio. (Remember insurers are big investors in stocks and alternative investments like venture capital that have been big earners in recent years.)

Figure 7: Profitability by Line

... and profitability by line

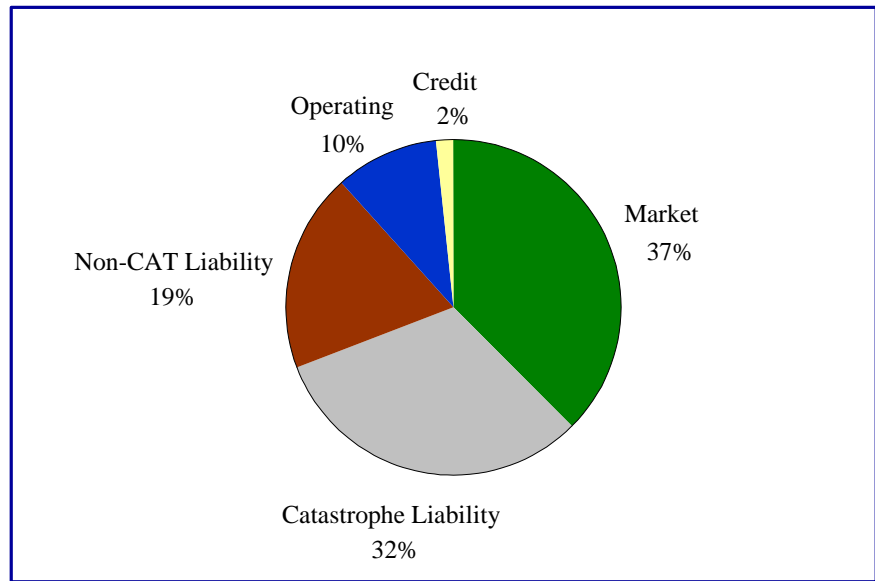


Source: eRisks

The models can also show an insurer its capital requirements by type of risk. Below is a risk-adjusted breakdown of where the industry’s capital is invested by risk. Interestingly enough the biggest risk/capital allocation is investments — something that insurance analysts often given only slight study. Because most insurance company’s investment portfolios seem very much alike equity analysts tend to concentrate on the insurance risk where investors perceive to be the source of the most earnings volatility. It turns out that non-catastrophic insurance liability is number three on the list of risk for insurers. Catastrophe risks — considered a “black box” for insurance analysts is the second biggest risk.

**Figure 8:** Capital Requirements By Risk Type

**... capital requirements by risk type ...**



Source: eRisks

**WHO IS USING IT?**

There are currently seven client companies using eRisks’ P&C RAROC product. Half of these insurers are bancassurance companies (companies with both banking and insurance operations) that already use RAROC type tools to manage their banking operations. The other half include U.S. based primary insurers and Bermuda-based reinsurers.

We suspect there are a couple more insurers using risk adjusted capital models similar to P&C RAROC. eRisks has a couple of competitors like SS&C and Tillinghast who have also developed risk-adjusted capital allocation models. We also suspect that most major insurers have large statistical modeling projects that could easily provide inputs required for a model such as P&C RAROC.

A hot topic in the actuarial world has been the implementation of what is known as DFA or dynamic financial analysis models. While sharing similar analytical foundations with risk-adjusted capital models (they are, in theory, the same thing), most DFA initiatives have extremely broad goals. Essentially these projects turn out to be multi-year initiatives to stochastically model the statutory and GAAP, income statement, balance sheet, and cash flow statements of an insurer. Just running these models can take days instead of minutes.

But the most important users will be the rating agencies. Most insurance rating agencies like A.M. Best, Moody’s, and Standard & Poor’s have their own risk-adjusted capital models that they use to determine if an insurer has adequate amounts of capital. The next step for the rating agencies will be to add risk-adjusted profitability requirements to their ratings. Currently, the rating agencies are moving in that direction. It will be the rating agencies, above all that will drive the insurers to begin using risk-adjusted capital models.

**WHAT WILL IT DO TO THE INDUSTRY?**

The implementation of risk-adjusted capital models should have a number of beneficial effects on the industry.

The first will be the exit of a number of insurers that realize they cannot make their required hurdle rates. According to RMS and eRisks the earliest adopters are typically bancassurers

that are familiar with the use of risk-adjusted capital models to guide their banking operations. These companies can now compare their banking operation's returns with their insurance operation's returns. We would not be surprised if a number of these companies decided to leave the P/C business given the higher returns on equity earned by most banks. This is somewhat offset by the fact that bancassurers get substantial diversification benefits by adding risks such as P/C insurance risks that are uncorrelated to the global financial markets. It has even been suggested that the highly publicized sale of CGU's U.S. insurance operations may have been a result of CGU's implementation of a risk-adjusted capital model that suggested its U.S. operation's returns were sub-par.

Longer-term the industry's volatile pricing cycle should smooth out as insurers become more disciplined in their pricing. In the past, some lines of insurance have experienced pricing cycles where insurance prices rose and fell 40%, 50%, or even more over a six to 10 year period. Insurers would respond to hardening markets by implementing every dollar of capital available, causing a steady softening of prices, which would be followed by large losses that would cause a sharp rise in prices (often 50% or larger increases) that would start the cycle all over again. Disciplined use of risk-adjusted capital models would limit the capital implemented in hardening markets up to the point of maximum returns and cause insurers to draw capital away from businesses as prices soften. In addition, the sharp increases in prices following catastrophe losses would be muted because insurers would have priced these events into their pricing models on an industrywide basis.

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### ***How Long Will It Take For The Industry To Start Using Risk-Adjusted Return On Equity Measures?***

If a company is highly motivated and the CEO is a strong champion of the initiative, a corporation can typically fully implement RAROC or a similar program in about five years. At least it took the typical, motivated bank about five years. It actually takes eRisks only about two months to build the model, but interweaving the model's results into the business decisions on the front line take a long time. The firm must essentially change its culture.

The insurance industry will probably take far longer to implement risk-adjusted capital models. The joke in the industry is that the insurance industry was an early implementer of computers in the 1960s, but have not purchased any new computers since. Unfortunately the joke is still not far from the true. Despite being an actuarial/mathematical business the insurance industry is very slow to try new innovations that are outside of their domains of knowledge. In the case of P&C RAROC, the innovation is the blending of actuarial science, corporate finance, and financial engineering.

Since eRisks and its competitors are generally about a year old, we expect the industry will probably be actively using these models in about eight to 10 years (three to five years if the banking world is a precedent).

The good news for investors is that there will likely be some "early adopters" that put risk-based capital models to use in the next couple of years. These companies, in our opinion, will have an advantage over their slower peers. The use of risk-based capital models should

allow some companies to better ferret-out markets that are currently underpriced and avoid insurance markets with obsessive competition.

The key for investors will be to add the following questions to their list of questions they routinely ask insurance managements:

- Do you use risk adjusted capital attribution models?
- Where is the shareholders' capital invested, by activity?
- What do you expect to earn on this capital?
- How do you link risk to capital?

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New York (1) 212 526-7323

London (44) 171 260-2241

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