Economic Measurement of Insurance Liabilities: The Risk and Capital Perspective

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Insurance company financial reporting and performance measurement are going through a significant transformation. Insurers are beginning to look at their business based on what many refer to as the "economic value framework." Under this framework insurance companies determine the economic value of the capital invested in their business and the economic value of earnings to derive a risk-adjusted return on capital. Standard setters, primarily European insurance regulators through Solvency II and the International Accounting Standards Board through IFRS Phase II, propose adopting many of these concepts for solvency and performance reporting.

> **Economic View of the Insurance Business**
> The economic view of the insurance business tracks how and when values are created for owners. In its simplest form, the economic value of earnings is equal to cash flow plus the change in the economic value of the assets minus the change in the economic value of liabilities. Economic liabilities are the present value of expected cash flows plus an additional amount that would provide investors a return for placing their economic capital at risk (the "risk margin"). Typically, economic earnings equal the risk margin, and economic earnings divided by economic capital represents the return on capital. This return on capital can be used to measure the value creation from insurance underwriting activities.

Management creates economic value if return on capital equals or exceeds the cost of capital. Because the cash flows associated with insurance contracts may not confirm or demonstrate the value of these activities until, perhaps, decades after the policies are sold, companies and investors are looking to answer some basic questions: How much value is created? How was the value created and when was it created (either in sales, servicing, or risk management of the contracts)? How and in what manner can investors be convinced that reported "values" are really money and not just a magic game of numbers?

This paper examines some of the recent changes in financial reporting for insurance contracts. These changes involve a migration away from valuing liabilities and capital based on management judgment or regulatory rules to a system that incorporates market-based assumptions and risk modeling of the business. We then explore whether sufficient evidence exists to conclude whether a company has created value simply by the sale of an insurance contract (gain at issue), and we review the necessary disclosures needed to build market trust of "next-generation" financial reporting.

Specific issues related to the economic view of capital also are examined as well as some of the problems existing economic capital approaches present to the industry. Key findings include the following:

1. Economic capital—and cost of capital as contemplated and implemented today—is not sufficiently market based in order to measure whether the company will expect to earn more than its cost of capital.
2. When the unobserved occurs, a solvency system that is based solely on statistical tails and stress tests of past observations will result in inadequate levels of capital and a resultant financial crisis in the insurance industry.
3. There is market evidence of unobserved risks that are not captured in economic capital modeling, and the market would demand to be compensated for the unaddressed risks.

4. An insurance company can disclose to the market that it expects to earn more than its cost of capital without reporting a gain at issue.

This paper proposes a performance measurement approach that incorporates the market's view of risk and the level of compensation the market demands to accept that risk. The correct level of economic capital is equal to an amount needed so that a company can raise funds to cover unexpected risks at a cost that is lower than the cost of equity capital. This amount should not vary based by company. The return on capital should equal the market price for equity, and it also should not vary based on company. To the extent that the risk margin is the product of cost of capital and economic capital, then the risk margin should be a market-based number and not vary based on company.

Market-Consistent Reporting Gains Momentum

Two major aspects of next-generation insurance financial reporting can be identified: (1) the economic view of value creation (i.e., how, when, and how much value is created) and (2) market consistency (i.e., how transparent, reliable, and comparable are the financial figures that investors rely on). In the following section we will review how the industry approaches these two aspects of financial reporting.

Fair Value vs. Market-Consistent Embedded Value

One method that has been used to measure the underlying risk and value of insurance liabilities for many years, particularly in Europe and Canada, is embedded value (EV). Under this approach insurers project all of the relevant cash flows for their existing business, typically for 30 years or more, using a variety of market and nonmarket assumptions. They then determine the present value of future profits arising from the existing business using a discount rate typically based on equity returns plus an allowance for the "riskiness" of the business.

However, many in the industry have pointed out that the traditional embedded value methodology has two fundamental weaknesses, and in each case the remedy involves taking greater advantage of available market information.

The first problem with conventional EV is that, unlike the capital markets, options embedded in the underlying insurance products (e.g., GMxBs of variable annuities, guaranteed minimum interest rates) are not consistently valued.

The second shortcoming of traditional EV methodology is that investment assumptions are not market consistent. For example, in traditional EV a company could sell $100 of treasury bonds and purchase $100 of junk bonds. Nothing economic has changed; the company still has $100 of assets. However, as a result of this transaction, the company's embedded value will increase because the junk bonds' excess of credit is spread over expected defaults. The reason for the increase lies in the failure of traditional embedded value techniques to recognize the market value of the capital needed to absorb volatility in credit losses, together with associated "frictional costs." Instead, these capital costs are based only on models that use historical default experience and historical default volatility as inputs.

To address these weaknesses, many companies now use market-consistent embedded value (MCEV) methodologies. In MCEV guarantees and options are explicitly valued using methods that are the same or similar to those used for valuing other financial assets that are sold in the marketplace, and a risk-neutral approach is adopted for setting investment assumptions and discount rates. Specifically, guarantees and options are either valued stochastically or using closed-form approaches such as the Black-Scholes formula. For example, a guaranteed minimum death benefit (GMDB) on a variable annuity is the same as a traditional put option—the difference is the option is exercised at the death of the owner.

Given these adjustments, should MCEV be considered a fair value of insurance company liabilities, and how does it differ from current fair value accounting proposals?

MCEV differs from current fair value accounting proposals (IFRS Phase II, FAS 157) in three key areas:
1. The definition of nonmarket assumptions
2. The calculation and calibration of risk margins and
3. The use of internal models for determining capital in lieu of the market value of costs.

We will see that, like the improvements of MCEV over traditional EV, fair value proposals consistently drive toward using observable market data.

The first item, nonmarket assumptions (e.g., mortality, lapse, expenses, and morbidity), is not the focus of this paper. Nonmarket assumptions are required for both fair value and MCEV calculations, and it will be interesting to study how the industry evaluates these assumptions as it considers the practicalities of implementing fair value accounting.

This paper focuses on the second and third differences: the calculation and calibration of risk margins and the use of internal models. MCEV does not explicitly refer to risk margins, although it does include a cost of capital provision, which is implicitly a risk margin. However, as we discuss later, this risk margin may not be directly related to the market view of the risks associated with writing the product, nor is there typically a direct relation between this margin and the risk premium that shareholders or investors may demand for accepting the underlying risks. We can draw a parallel here with credit risk, where the 99th percentile of statistical distribution of losses for a credit instrument may not be consistent with what the market demands (spread over the risk-neutral rate) for assuming the risk of default by owning the credit instrument.

Under MCEV the compensation to the investor for assuming risk is typically calculated using a capital rate applied to the appropriate level of capital. This compensation is a cost no different from any other expense. In determining the appropriate level of capital, many companies still rely on external rating agency models targeting a desired credit rating (e.g., 150 percent of S&P capital) or regulatory capital requirements rather than internal economic capital estimates. Although these capital models are grounded in assessing the underlying risk of the products, they generally employ "average" factors that do not vary by product and

may not reflect the unique risks of the business being valued. Additionally, the cost of capital rate is typically based on company-specific targets and a company's own capital structure. The degree of consistency with external investor expectations varies. Instead of using an economic capital rate that is the market's view of the specific risk, MCEV typically employs the insurer's view of risk based on average factors.

Although still under debate, MCEV has gained momentum. Over the last few years, more major European companies have calculated their EV using the MCEV approach, and European investment analysts also have demonstrated positive reactions toward MCEV. The move to market-consistent reporting has increased transparency and comparability—which has reduced the information risks investors are taking—but the move also has further implications.

Issues of "Next-Generation" Reporting

Some key issues have been extensively discussed and debated in the area of economic valuations of insurance business. The major focuses are the following:
1. How risk margins are calibrated and
2. Recognition of gains at issue or no gains at issue.

Both issues can be traced back to the original purpose of various kinds of valuations: to accurately reflect change in shareholders' value.

Risk Margin Calibration

The difficulty of identifying which approach to take when determining risk margins is compounded because the term "risk margin" can be interpreted differently by different parties. In its Phase II discussion paper, for example, the IASB suggested that risk margins should be determined such that they compensate entities for bearing risk. For life insurance companies, that would include compensation for the guarantees and options provided to policyholders as well as any frictional costs and residual cash flow uncertainty.

This might be easy to determine if we lived in a world with no regulators, no transaction costs or liquidity concerns, and perfect, readily available information. In such a world the risk margin would be reflected in the equilibrium price of insurance contracts. Specifically, investors in insurance enterprises, like any other investors, would want to receive the highest possible return for bearing risk. Insurance seekers, on the other side of the transaction, would look to pay the lowest return. The market-clearing price in which a transaction occurred between these two groups, considering the acquisition costs, would implicitly include the market price of the risk, that is, the risk margin.

This would be similar to the millions of transactions that occur in the various investment markets around the globe. If we consider a corporate bond, for example, the risk margin would be implied in the purchase price. If we calculated the expected cash flows incorporating the expected default and recovery rates, we could determine an expected return and compare it to the return on a similar risk-free bond. Ignoring friction costs and issues such as liquidity premiums, the risk margin would then be the excess of the expected corporate bond return over the expected return on the risk-free investment. This market-clearing premium, in conjunction with market expectations

on defaults, would be the only necessary input to determine the appropriate risk margin.

But as traffic jams and train delays remind us on our commutes to work, we do not live in a perfect world. Regulatory restrictions vary greatly, and myriad actual and perceived competitive advantages exist. We also find significant disparities in information and a variety of frictional costs.

Further, beyond typical frictional costs, insurance contracts are complicated because individuals may value them very differently. The purchase and persistency of insurance contracts are sometimes driven as much by emotions as they are by thoughtful consideration, and it is not difficult to understand why policyholders regularly make judgments when making decisions during the lives of their contracts that seem contrary to what would be expected if they simply analyzed prospective cash flows. The concept of an efficient market seems to conflict with the behaviors exhibited by policyholders after they purchase contracts.

If we can't rely on policyholders making decisions solely based on efficiency, why would we assume insurance companies would not take advantage of policyholders' inefficiency? It would be a fair presumption that insurers leverage these inefficiencies by making every effort to capture economic rents (i.e., returns that exceed the minimum return demanded by investors). With this in mind, it is not clear that the market-clearing price for insurance contracts accurately captures the risk margin. These inefficiencies in the market could represent an opportunity to the insurance enterprise and enable the investor to actually achieve more than the compensation they would normally demand for the level of risk they accept.

Those who account for market inefficiencies generally take one of two positions: either there is a gain at issue (GAI) or there is no gain at issue (NGAI). The GAI proponents contend that an insurance enterprise should be able to recognize an immediate gain for any premiums expected to be received during the life of a contract that are over and above those implicitly required by the risk margin associated with the business being written. NGAI supporters view the premium received as the primary or only indication of the appropriate risk margin required by the market.

Both views have merit from a disclosure perspective, and these arguments and the related market evidence will be examined in the following sections.

Arguments for Gain at Issue

Those who believe a GAI is possible can quickly point to the inefficiencies in purchasing insurance. An argument can be made that insurers have more information than individuals seeking insurance, and that not being able to fully value all the options and guarantees in their insurance contracts helps ensure that policyholders overpay for these options. Companies also may have comparative advantages over their competitors through, for example, proprietary investment strategies, more efficient distribution networks, or regulatory advantages.

Insurers, on the other hand, can use the wealth of their experience and observable market information to determine the minimum price they would accept for bearing the

risk in the insurance contract. This price would be based on the insurer's knowledge of the risk and the appropriate risk margin to compensate it.

Provided the insurer can receive more than this minimum price from the insured, it would capture the economic rent (amounts that are greater than compensation for bearing risk) represented by the present value of the difference between what they expect to receive from the policyholder and the minimum amount their investors would require to enter a new transaction with the policyholder based on the expected cash flows. The ability to capture this economic rent is an important disclosure item for investors because it demonstrates the skill of management.

Additionally, although the maturity of an insurance contract represents one aspect of the economic transaction, it is not the only aspect. The act of selling an insurance contract also represents an economic activity. A significant amount of capital is invested by the insurance company in the development of the product distribution system, and, as an economic activity supported by capital, the sales process itself should reflect a return on the capital invested in distribution.

Even though the insurer, or presumably another insurer, would accept a lower price determined by the risk margin, the insured accepts a higher price either because of lack of complete information or by being convinced of the value of the transaction by the sales process. This higher price generates an economic rent and, therefore, a gain at issue for the insurer.

Arguments for No Gain at Issue

Those who believe a GAI is not appropriate often point to the models used to determine the explicit risk margin. These models are highly complex and often include thousands of potential economic scenarios. They also may include a variety of demographic scenarios. The models then process countless path-dependent calculations attempting to replicate policyholders' behaviors based on those scenarios. More importantly these scenarios reflect the insurers' view of the risk and not the market view of risk.

While many critics of GAI accept that economic rents exist, they question whether a reliable and credible method can be developed to measure them. Absent a reliable and credible method, any GAI is suspect and results in a loss of comparability between the reported results of different insurance enterprises.

Critics also are concerned about the accounting concept of revenue recognition. A GAI can occur only when the present value of future amounts expected to be received by the insurer from the policyholder exceeds the costs of providing benefits and services to the policyholder. However, the policyholder typically does not have a legal obligation to pay these amounts. Should an insurance company recognize income when there is no binding legal obligation for the policyholder to actually pay the insurance company? If the answer is "no," recognizing this type of income appears to lack a sound, theoretical rationale.

Even if we assume the economic and demographic scenarios were appropriate based on demographic trends and market prices, it is extremely difficult to externally confirm that the path-dependent calculations are appropriate. Either the projected scenario has never happened before or the product projected did not exist in the past, or both. Therefore, these assumptions are founded upon unobserved information. This may lead to the GAI being subjective and, perhaps, misstated.

The observable information components in our possession are the market-clearing premium and the acquisition costs. Using this observable information, we can determine the risk margin such that there is no gain at issue. Although it may not be a theoretically exact measurement, it is at least objective. More importantly, for those who believe NGAI is appropriate, under a fair value system the rebuttable presumption should be that the market is efficient. In an efficient market, economic rents do not exist.

The clash between proponents of gain at issue and no gain at issue shows no signs of abating, as seen in the divergent reactions to the IASB's discussion paper of IFRS phase II. However, to truly answer this question, we need to look at why we initially started the financial reporting journey: to facilitate investors' decision making to be on the right track.

Investor Benefits

The purpose of any reporting basis is to provide investors with comparable company information. How do the GAI and NGAI methods achieve that goal?

While those recording a GAI will directly demonstrate these additional gains through income, those who calibrate the risk margin to the market-clearing premium will show only this value as the business and risk unwind. Under both methods the company will need to provide significant additional disclosure to investors.

With a GAI calculation investors require information on how the company determines its risk margins and economic capital, what the key assumptions are, how they are determined, and how experience has evolved relative to those assumptions. The successful company will tell investors it earned more than its cost of capital to the extent it has a gain at issue. Investors could then compare the company's estimates of risk and capital to those of other insurance enterprises.

Companies operating in an NGAI environment also would need to provide additional disclosures to investors, specifically their implied risk margins based on the company's economic capital and market-clearing premium. Similar to the GAI environment, disclosures in the underlying assumptions and how experience has evolved relative to those assumptions likely would be needed. The successful company will tell investors it earned more than its cost of capital to the extent its implied risk margin is greater than its cost of raising capital. Again, investors could compare the company's implied risk margins to those of other insurance enterprises. Without such disclosures investors in an NGAI environment will be left with the same question they currently face under U.S. GAAP: what are future free cash flows that imply a higher or lower risk compensation versus investors' cost of capital?

It is important to note that, regardless of which method companies employ, similar information will need to be disclosed to validate companies' internal capital estimates. To the extent these disclosures are stable or changes are reasonable, an insurance enterprise will gain credibility and investors will be willing to accept the valuation. If the disclosures are suspect, investors are likely to find the company's valuation less credible. NGAI advocates contend that their results are more transparent, credible, and auditable and are calibrated to market. The challenge for GAI advocates is to bridge these gaps so readers of financial statements don't come to the conclusion that insurance liabilities are "marked to myth" rather than "marked to market."

Interpreting "Market-Consistent Economic Capital"

Quantifying economic levels of capital is another key component of the economic valuation or reporting framework. Although a market-consistent approach has not been widely accepted, further development, including disclosure of insurers' economic capital methods, may be another component for insurers to demonstrate their risk and capital management abilities in the marketplace.

Industry and Economic Levels of Capital

In the past the capital adequacy framework relied on regulatory or rating agency measures; today the framework is calibrated based on company-specific risks. Although a number of different approaches model economic capital, current practice focuses on "fat-tailed events" to set up capital hedging against "low-probability, extreme-loss events."[1] Normally some stochastic economic scenarios will be provided from the corporate level, and risks could be modeled either bottom-up or top-down. Diversification will be taken into consideration at the corporate level to measure the overall risk exposure.

Under Solvency II economic capital is defined as the amount determined such that an insurance enterprise can absorb all losses within a year with a 99.5 percent probability. Although this is an improvement over the average factor approaches traditionally used in determining capital requirements, it is still unlikely to represent a true "economic" capital level. Specifically, under this definition, the capital level is based on internal company models and is only focused on a fixed default term. It also assumes that a company can recapitalize at the end of a year even if it had a loss event that potentially made it insolvent.

Is it valid to assume bond investors would knowingly take the risk of a successful recapitalization after a loss event? If investors do take that type of risk, shouldn't we expect the slope of the credit curve to be flat because the risk in all subsequent years would be equal to the risk in year 1? If investors choose not to take this type of risk, then, under the Solvency II definition, any relationship to the market's perspective of economic capital requirements would be only coincidental.

We have observed that companies can demonstrate they have a gain at issue based on market-observed inputs if the risk margin is a market-based number. If the risk margin equals economic capital times cost of capital, then determining economic

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[1] SOA, "Economic Capital Specialty Guide," 2004.

capital and the cost of capital should be market-based calculations. We propose the following definition of market-based economic capital: Market-based economic capital is the level of capital needed to absorb the first losses of an insurance portfolio such that an insurance company can raise the next dollar to pay for additional losses in the capital markets without paying an additional equity risk premium. One example could be how much capital a company needs to hold before an investor is willing to buy its surplus notes that pay an investment-grade credit spread. The following discussion offers similar proposed variations of this definition.
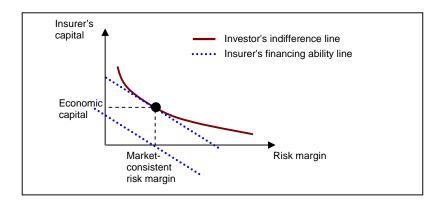
At a recent SOA conference, John D. Johns, chairman, president and CEO of Protective Life Insurance Company, presented a proposal in which he suggested insurance companies be required to sell surplus notes equal to 10 percent of peak economic reserves. In order to sell these notes, an insurance company would need to get an investment-grade rating on the notes. A consequence of this proposal would be that, in order to be successful, a company would need to demonstrate to the market's satisfaction (or at least to a rating agency's satisfaction) that the level of capital held was economic.

In 1999 the Shadow Financial Regulatory Committee of the American Enterprise Institute advocated requiring banks to issue a mandatory minimum level of subordinated debt to serve as a market mechanism for bank regulation. This proposal was further developed in a paper, "Subordinated Debt: A Capital Markets Approach to Bank Regulation,"[2] by Mark E. Van Der Weide and Satish M. Kini, and a comprehensive study by staff of the board of governors of the Federal Reserve system was somewhat supportive of subordinated debt requirements to enlist the bond market into efforts to supervise banking institutions.[3]

Questions remain regarding how much economic capital insurers need to hold and what amounts are needed to cover losses for an insurance business before investors would give up the requirement of an additional risk premium. It is obvious that the cost of financing is a function of the economic capital cushion. Investors try to maximize this "cushion" given the "regular," or market-consistent, cost of financing, while insurers try to minimize the cushion in order to maximize returns to equity investors. Equilibrium is reached (as shown in the figure below) when the economic capital level and risk margin result in insurers paying a "market-consistent" cost to raise the next dollar from the capital market.

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[2] See Mark E. Van Der Weide & Satish M. Kini, Subordinated Debt: A Capital Markets Approach to Bank Regulation, 41 B.C.L. Rev., 2000.

[3] See Kwast, Myron L., Daniel M. Covitz, Diana Hancock, James V. Houpt, David P. Adkins, Norah Barger, Barbara Bouchard, John F. Connolly, Thomas F. Brady, William B. English, Douglas D. Evanoff, and Larry D. Wall, "Using subordinated debt as an instrument of market discipline", report of a study group on subordinated notes and debentures, Board of Governors of the Federal Reserve System, M. Kwast (chair), staff study, No. 172, December, 1999.

In other words, given the level of risk and return, investors would be indifferent between this and alternative investments. Returning to the corporate bond example, the economic capital level would determine the bond rating. The rating, in turn, would drive the risk margin, or credit spread.

In addition to economic capital being market based, the cost of capital also is a market-based number. According to Rich Carbone, chief financial officer of Prudential Financial, "Economic capital should enable an enterprise to properly size the company's equity."[4] One implication of this view is that a company determining its risk margin using a cost of capital approach—where the risk margin equals economic capital times weighted average cost of capital—may significantly underestimate its risk margin. This is because the weighted average cost of capital includes the cost of debt and hybrids in addition to the cost of equity. However, if economic capital measures the size of equity, then only the cost of capital should solely be the cost of equity.

To illustrate this point, suppose a company's economic capital is equal to $100. Also assume that, because of either rating agency or regulator concerns, the total capital held is $150. Now assume that the company's capital structure consists of 70 percent equity with a cost of 500 basis points over the London interbank offered rate (LIBOR) and 30 percent debt with a cost of 50 basis points over LIBOR. The company's weighted average cost of capital is LIBOR plus 3.65 percent ($0.7 \times 5\%$ + $0.3 \times 0.50\%$), and the risk charge is equal to $3.65 ($100 $\times$ 3.65%).

However, if economic capital is the amount needed to properly size equity, then the cost of capital should be based on the price of equity times economic capital plus the price of debt times excess capital. This results in a risk charge of $5.25 ($100 $\times$ [100% x 5%] + [$50 $\times$ 0.5%]). It might be more appropriate to consider the cost of the nonequity component as an expense because of the particular regulatory structure rather than as a component of the risk charges. In this example a company using a weighted average cost of capital rather than looking at costs by component would significantly underestimate the market value risk charge.

Economic capital, as defined by many industry consultants and insurance companies, reflects management's view of the risk of the business. However, similar to the move from EV to MCEV, where the market's view of returns replaced management's view, economic capital should be based on the market's view of the

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[4] This comment was made during an informal interview.

risk. The market's view of the risk can be defined as the point at which the market would provide additional capital at an investment-grade cost. In today's market a rating agency willing to validate a company's economic capital should be willing to provide an investment-grade rating on any debt issued above this capital level. Theoretically, every company should have the same economic capital for a given level of insurance risk.

To the extent economic capital is established to fund losses, the cost of capital should equal the market cost of equity. Although this would be independent of a company's capital structure or regulatory structure, the cost of any capital in excess of this economic capital should be equal to the company's cost of debt.

Given that economic capital and the cost of capital are "market numbers," the risk margin required to accept insurance risks should then be identical between insurance companies and other market participants wishing to get paid for taking the same insurance risk. We can use this economic capital model and cost of capital to determine the required return on the liabilities, which indicates the appropriate risk margin demanded by the market.

Any differences between companies would be due to differences that arise in attempting to measure either economic capital or the cost of capital. The following sections explore some of the causes of these differences in practice:
1. Information risk
2. Friction and operation risk and
3. Unknown unknowns.

Information Risk

In the practical world investors have to deal with the details. Specifically they need to understand how to correctly measure the potential risks that threaten their investments. In other words, investors should be convinced that the economic capital modeling established by insurers accurately captures all major threats to shareholder value.

Building this market confidence in an insurance company's economic capital modeling might be the most challenging task it will face. The insurance business is not totally transparent to investors or policyholders for two major reasons:
1. The complex nature of the insurance business and
2. Insurers' unwillingness to fully disclose the information they have in order to protect their competitive advantages.

The insurance industry rarely gives investors a full picture of the past, present, and future states of their business; this can also create problems for insurers themselves. In targeting other companies for acquisition, a major challenge CEOs must meet, regardless of the level of due diligence they perform, is trying to identify significant issues within a target's balance sheet. This information gap, all other things being equal, results in insurers requiring a higher risk margin for acquired business than for business they write themselves.

If insurers require higher risk margins for insurance companies they invest in, why wouldn't they assume other investors would require those same higher margins?

It appears that carriers' internal economic capital modeling might underestimate what the market actually expects. In other words, internal economic capital implemented in the industry is lower than the true "mark-to-market" economic capital requirements. This is due, in part, to information risk.

As an example, although many insiders have claimed that their companies or even the industry is overcapitalized, only one of the top 20 public insurers is rated as AAA by S&P or Fitch. As Steve Dreyer, practice leader of North America Insurance Ratings for S&P, pointed out during an interview in 2006: "If a company came to us today and said, 'Here's our economic model; raise our rating or lower our capital requirement,' we're not going to accept that." He also noted that S&P's new enterprise risk management criteria are intended, in part, to sort out "which ones [companies] are really telling the truth and which ones are really based on more hope than actual science."[5] Presuming insurers' models are appropriate, significant impact from this information risk appears to exist.

Another indication of this information margin can be found in insurance securitizations. In these deals direct carriers or reinsurers transfer underwriting risks to the capital market by transforming underwriting cash flows into tradable securities. Although several companies are actively implementing internal economic capital modeling, the execution of securitization transactions currently taking place in the industry may imply that internal models underestimate "real" economic capital. Carriers have to put up much more extensive capital to execute a XXX/AXXX deal in the United States compared with deals of similar size in other industries. S&P, for example, verifies that economic reserves plus an amount of economic capital are sufficient to fund future benefits under conservative stress scenarios. They request a third-party actuarial firm to run deterministic stress scenarios based on large adverse deviations, which are then used to determine the adequacy of the economic reserves and economic capital covering tail-risk events. In its rating criteria for XXX transactions, published in December 2004, S&P tests the redundancy of XXX reserves by looking at both a 25 percent increase in mortality throughout the period as well as a one-time 350 percent shock to mortality. Both of these scenarios lie greater than three standard deviations away from a mean event in one year's mortality expectation.[6] In other words, S&P uses the models created by the insurers, but requires them to survive an event that is expected to happen only less than once every 750 years. Either S&P is not fully comfortable with the models because of the information risk, or S&P is uncomfortable with the models because it does not believe they fully capture all risks.

Friction and Operational Risks

If we return again to the corporate bond example, another aspect of risk margins is illuminated. Recall that, in a perfect world, the risk in any purchase price would compensate the investor only for the uncertainty of the amount and timing of the interest and principal payments. However, Delianedis and Geske noted that cash flow uncertainty explains only a part of the risk margin in corporate credit spreads[7] and that

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[5] Susanne Sclafane, "S&P: A Vision of the Future," *National Underwriter* (August 2006).
[6] S&P, "Life Insurance Criteria: Regulation XXX Structured Solutions," 2004.
[7] Gordon Delianedis and Robert Geske, " The Components of Corporate Credit Spreads: Default, Recovery, Tax, Jumps, Liquidity, and Market Factors," May 1999.

market frictions play a significant role as well. For example, they noted that increased liquidity reduced the credit spread, but it had no impact on the actual default spreads. The market includes frictional costs in risk margins of traded and listed securities such as corporate bonds. There is no obvious reason that these same frictional costs would not also be relevant in valuing insurance liabilities.

Additionally, companies' risks are not confined to what can be modeled. One of the most difficult items to quantify is the amount of capital needed for operational risk. What is the potential loss due to fraud, market conduct, rogue traders, failure of operating systems, physical disruptions, and other operational risks? If the market includes a margin for operational risk, it seems appropriate that companies should also include an allowance for this risk. It could be argued that operational risk is specific to a company rather than to a financial instrument and should not be part of the risk margin of the liability. Such a risk must, however, be supported by the products sold and may be considered as part of the overhead risk margin.

Unknown Unknowns

Economic capital modeling has become more sophisticated over the past decade and has focused on the fat tails discussed above. However, these models still do not capture all the risk. In addition to frictions and operational and information risks, most models do not address two additional types of risks: paradigm shifts and "black swans," as Nassim Taleb classifies them.[8] These are the large-impact, hard-to-predict and rare events that are beyond the realm of normal expectations based on current probabilistic "curves" or historical trend analyses. For most practitioners, "black swans" are unknown unknowns, and they are one of the most challenging elements to model. However, these unknown unknowns are the major drivers behind many business failures. Like Taleb pointed out, "Almost all consequential events in history come from the unexpected."

It appears, to some degree, that the market also has included these unknown unknowns in its risk margins. This can be observed in one aspect of the market from the presence of "volatility smiles," or skews, in option pricing.

For example, using a Black-Scholes formula and observed market information (including the price of an option), the implied stock volatility in the market price can be determined. Equity options traded in American markets prior to the crash of 1987 showed this implied volatility to be relatively constant regardless of the relationship between the stock price and strike price of the option. However, after the crash a "volatility smile" began to appear.[9]

These data showed that the implied volatility increased as the strike price moved away from the current stock price. Since the difference between the stock and strike prices would not affect the volatility of the underlying security, the market apparently realized that the Black-Scholes model was not capturing all the risk. Considering that, according to the same model, the market drop in October 1987 was statistically less likely than a once-in-10,000-years event, questioning it seems prudent.

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[8] Nassim Nicholas Taleb, "The Black Swan: The Impact of the Highly Improbable," *New York Times*.
[9] Emanuel Derman, "The Volatility Smile and Its Implied Tree," *RISK* (Feb.1994).

Although our economic capital models are much more sophisticated than the simple Black-Scholes option pricing formula, it would be impossible to say with certainty that we have sufficiently captured these unknown unknowns. If they cannot be modeled, then it appears reasonable that some of the difference between the economic capital as determined by an internal capital model and the market-implied economic capital can be attributed to the market's demand to be compensated for these unknown unknowns.

Also, we do not need to look past recent headlines for indications of model failures. As the subprime market has shown, companies' internal models frequently rely on a historical dataset. However, this historical dataset comes from the world as it existed before, not as it exists today. Over time, the world changes, and the historical data that feed the models may no longer be appropriate. Mortgage default data based on one underwriting standard may not be appropriate for a different underwriting standard.

These unexpected subprime losses in the United States also have made analysts more skeptical of internal modeling. Flawed or inadequate models, bad assumptions, and poor judgments have contributed to this crisis. More importantly, internal models that were based on historical default rates failed to capture the change in underwriting standards that occurred when banks were no longer required to keep risks on their balance sheets. Recently David Viniar, CFO of Goldman Sachs, said, "We are seeing things that were 25-standard deviation moves, several days in a row."[10] In the summer of 2007, Fitch revised its rating process for structured finance collateralized debt obligations by "increasing the default probability by 25 percent for US subprime RMBS bonds issued since 2005."[11] One recent article published in *Institutional Investor* also described the subprime crisis as "20-standard-deviation moves and events that happen once every 100 years." The article continued: "From the 1987 crash to the subprime meltdown of 2007, we see the same sort of thing happening. Our not very helpful reprise is to shake our heads as if we are looking over a fender bender and point the finger at statistical anomalies like fat tails—bigger, more frequent moves than would be predicted by a normal distribution of returns—and 100-year events."[12] Since a 20- or 25-standard deviation move is statistically almost impossible, this can only be an indictment of the models themselves. This would naturally lead to skepticism with regard to capital modeling.
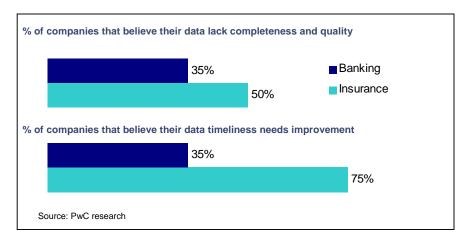
Transparency and Comparability

Economic capital has been a revolutionary improvement for the insurance industry to actively manage its complex business. However, while economic capital modeling effectively portrays carriers' risk, it is uniquely calibrated and, therefore, is not transparent to investors, policyholders, and other stakeholders. As discussed above, the reasons include the information gap, the complex nature of the economic modeling process, the complex nature of the products, the longevity of the products, and additional risks that are difficult or impossible to include in the cash-flow models.

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[10] Peter Thal Larsen, "Goldman pays the price of being big", Financial Times (August 2007).

[11] Fitch Ratings, " U.S. Subprime RMBS/HEL Upgrade/Downgrade Criteria", June 2007.

[12] Richard Bookstaber, "Investing—The Myth of Noncorrelation," *Institutional Investor* (September 2007).

Recent PricewaterhouseCoopers research shows that 50 percent of surveyed companies believe their economic capital data lacks completeness and quality, while 75 percent of surveyed companies believe their data timeliness needs improvement.

% of companies that believe their data lack completeness and quality

Banking	35%
Insurance	50%

% of companies that believe their data timeliness needs improvement

Banking	35%
Insurance	75%

Source: PwC research

If insurers believe that their models are incomplete, it is difficult to expect others to give those models much credibility. Analysts' distrust stems from the lack of transparency and the inability to compare insurance operations, which is partly because they have no ability to calibrate to market-observed numbers. MCEV gained credibility over traditional methods by including more market inputs. Additionally, as European companies disclose the methods they employ to calculate their embedded value, we have seen unification in those methods. The ability to determine relative performance of insurance companies appears to be just as important as quality of earnings for analysts.

Generally U.S. analysts think that the internal models lack comparability and auditability and are too theoretical and subject to management manipulation. For these analysts comparability and consistency may be more important than theoretical correctness. Our perspective is that any further modifications of the value measurement should aim to increase transparency and reduce analyst distrust. Although the IASB stated in its discussion paper that it prefers recognition of GAI, this will likely create more distrust unless a method can be found to calibrate the results of the economic capital model. This calibration could be similar to the John D. Johns proposal mentioned earlier. Absent such a calibration that would refute the presumption of an efficient market, a fair value framework should presume market efficiency. This could include no gain at issue or, perhaps, a gain at issue that is limited to a return on the amount of capital that is invested in the distribution system.

Rethinking the Performance Measurement Approach

In defining a performance measurement approach that would quantify returns in the measurement period, we must first develop an approach to determine the appropriate level of economic capital. The approach should maximize the use of market information and be as transparent as possible, and we must also recognize that all internally created models will not be able to explicitly or objectively capture all risks. Using these points as a guide, we can identify several sources to provide an indication of the appropriate level of economic capital.

Most directly, the minimum capital to satisfy a target debt rating may serve as a source. The capital set aside in securitization deals or in financial reinsurance transactions also may provide some direct evidence of the appropriate level of capital. Additionally the economic capital created from an internal projection of cash flows can be adjusted for risk premiums observed in more liquid markets. For example, the level of corporate credit spreads above default levels could be translated into an equivalent additional capital requirement appropriate for insurance liabilities.

Although we recognize the difficulties in calibrating to what is a far-from-liquid market, we anticipate that, through disclosure of methods and assumptions employed, the market will ultimately reach a consensus on these values and a resultant market view on the exit value risk margin.

Finally, any changes in these values from one period to the next need to be transparent. Depending on the underlying products, companies will need to develop stable and understandable analytics to enable this work. For example, these analytics could split the market and nonmarket information or could attempt to address each of the relevant risk margins individually.

Measuring the performance or change in capital adequacy of an insurance company is dependent on the type, amount, and transparency of information that is provided to investors, regulators, and the public. Similar to the movement from EV to MCEV, where the market view replaces management views, economic capital based on a market view of risk would seem to be more transparent and comparable across entities. Theoretically every company should have the same economic capital requirement for a given type and level of insurance risk assumed. Differences might exist, but should not be definitional. Instead, the differences in approaches to assuming risk and assumptions in estimating the theoretical value would create market differences. This market view of risk can be determined based on where the market is comfortable providing funding at investment-grade cost.

Economic capital modeling is a valuable and powerful tool for helping managers and investors understand the risks and rewards of an insurance enterprise. However, it is important to remember it is a tool to help understand the risk: it cannot capture all risks or replace business judgment. In looking at how the market prices risk, it appears that the market understands this. Using economic capital based on statistical tails of distribution and stress tests of past observations appears to conflict with how the market looks at and prices risk, and it seems contrary to valuing business on an economic value framework.

Establishing a solvency framework in which capital is based on internal models may result in insurers experiencing difficulty recapitalizing at the expected capital market rates after a severe shock. Specifically any recapitalization is likely to demand higher credit spreads than those implicitly used to calibrate the internal models. While we don't know what the paradigm shifts and black swan events will be or how large they will be, we do know that they will happen. To the extent these are rare events—and the market is convinced they are rare events—contingent capital (debt, hybrids, etc.) can be raised efficiently to fund these events. However, competitive cost pressures would make it difficult for a company to raise capital to

protect it against a problem that affects the entire industry. It may be difficult for management to explain to investors that they underperformed relative to their peers because of the cost of contingent capital. Based on this view, we conclude that, perhaps accidentally, Regulation XXX in the United States may be a more economic-based regulation than the proposed Solvency II. While they introduce their own frictions and inefficiencies, securitizations and other financial engineering developed in response to regulation XXX force companies to convince the market of the proper level of economic capital and raise contingent capital to fund a mortality epidemic if losses are above this level.

The insurance industry has many tools available to assist it in providing clearer, cleaner, and more useful information to interested parties. Whether the approach is GAI or NGAI, more information and disclosure around capital needs and risk returns are necessary. With this information the move to market-based performance measurement is under way.