White Paper on Fair Valuing Property/Casualty Insurance Liabilities

CAS Task Force on Fair Value Liabilities

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Executive Summary

This white paper was undertaken by the CAS Task Force on Fair Value Liabilities in reaction to recent developments by the Financial Accounting Standards Board (FASB) and the International Accounting Standards Committee (IASC). It is meant to be an objective discussion of the issues surrounding the fair valuing of property/casualty insurance liabilities, particularly in the United States. While the recent FASB and IASC proposals are mentioned and quoted, the white paper is meant to be applicable to the "fair value" issue in general, wherever the issue appears.

The paper begins with an introduction and background, including a definition of "fair value." In general, fair value is defined as the market value, if a sufficiently active market exists, or an estimated market value otherwise. Most definitions also include a requirement that the value reflect an "arms length" price between willing parties, so as to eliminate "fire sale" valuations. Most observers agree that a sufficiently active market does **not** exist in most cases for property/casualty insurance liabilities. Hence, estimation methods have to be used to determine their fair value.

A short history of the fair value concept then follows. In brief, the concept of "fair value" gained prominence as a result of the 1980's Savings & Loan crisis in the United States. The accounting rules for these banks at that time did not require the recording of assets at market value, hence, banks were able to manipulate their balance sheets through the selective selling of assets. Troubled banks could sell those assets with market values higher than recorded book values and inflate their reported equity, even as the quality of their balance sheet was deteriorating. The concern was raised that any time financial assets are not held at their economic value (i.e., market or fair value), financial reports can be manipulated through the selective buying and selling of assets.

Since then, the FASB has been embarked on a long-term project to incorporate "fair value" concepts in the accounting for financial assets and liabilities. In December of 1999, they released a document labeled "Reporting Financial Instruments and Certain Related Assets and Liabilities at Fair Value (Preliminary Views)." This document proposed, for the first time, that certain insurance liabilities also be reported at "fair value."

At around the same time, the IASC, in its efforts to develop consistent international accounting standards, released its "Insurance Issues" paper. This paper also proposed a fair value standard for the recording of insurance liabilities.

The paper is organized into the following sections after the introduction

A. **Background** regarding fair value concepts
B. **Fair Value in the insurance context**
C. **Alternatives to Fair Value Accounting** for p/c insurance liabilities.
D. **Methods of Estimating Risk Adjustments** - a brief discussion of possible methods for determining risk adjustments, required in the fair valuing of insurance liabilities. Pros and cons for each method are listed. Detailed discussions of these methods can be found in the technical appendix.
E. **Accounting Presentation Issues**, including alternative income statement or balance

sheet formats in a "fair value" world.

F. **Implementation Issues** surrounding the fair valuing of p/c insurance liabilities for financial accounting statements.

G. **Accounting Concepts**, or how well fair value accounting and the issues discussed in the earlier sections would be viewed in the context of general accounting concepts (such as reliability, relevance and representational faithfulness).

H. **Credit Standing and Fair Value Liabilities**, a discussion of issues related to the reflection of credit standing in determining the fair value of liabilities. This issue has given rise to vigorous discussion, both within and outside the actuarial profession. Due to the controversial nature of this issue, it has been given its own separate section, rather than including it within the earlier sections.

I. **Professional Readiness**

J. **Summary and observations**.

K. **Technical Appendices**.

These sections are meant to be conceptual discussions, with any discussion of detailed implementation procedures left to the technical appendices. The appendices also include a list of references for each section.

Key findings of the task force include:

1. New requirement

In all the accounting conventions that we were aware of, insurance liabilities have not been stated at fair value, resulting in a lack of established practice to draw on. This has implications in numerous areas, including estimation methods, implementation problems and practitioner standards. As with any new requirement, the switch to a fair value valuation standard for property/casualty insurance liabilities would probably result in many unanticipated consequences. These consequences could be mitigated if implementation is phased in. For example, one phase-in alternative would be to institute disclosure requirements at first, followed by full fair value reporting depending on the results of the disclosure period.

2. Alternatives to fair value

There are several alternatives to fair value accounting. These alternatives range from the current use of undiscounted liabilities to conservative discounting approaches to hybrid approaches that combine fair value accounting with other present value methods. Some of these alternatives may result in many of the benefits of fair value accounting, but avoid some of the disadvantages. It is also clear that all approaches have some disadvantages.

3. Expected Value versus best estimate

All the methods discussed in this paper assume that expected value estimates are the starting point in the fair value estimation process. The task force recognizes that confusion sometimes exist as to where current practice stands. While the term "best estimate" is commonly used in current accounting literature, it is not clear whether this means the best estimate of the expected value (***mean***), or the ***mode*** (i.e., most likely value), ***median*** (the value which will be too low half the time, and too high half the time) or ***midpoint*** (the average of the high and low of the range of "reasonable" estimates). While a recent U.S. actuarial standard has cleared up some of this confusion (ASB No. 36, Statement of Actuarial Opinion Regarding Property/Casualty Loss and Loss Adjustment Expense Reserves, discussion of "expected value estimates" and "risk margins"), the task force believes that clarification on this topic within the accounting standards would be beneficial, and would become even more important in a fair value context.

4. Multiple methods

There are multiple methods for estimating the fair value of property/casualty insurance liabilities. All of these methods have their own advantages and disadvantages. No one method works well in all situations. As such, those estimating fair value may need to use a variety of methods. The task force sees a need for any accounting standard to provide for flexibility in estimation methods.

5. Continuum from pricing methods

Several of the possible methods for estimating insurance liability fair values are currently used for pricing. In addition, given that the charged premium may generally be assumed to be a "market" price (in a sufficiently competitive market), that charged premium may be a reasonable initial estimate of the unexpired policy liabilities' fair value. Hence, the initial estimate of a policy's liabilities' fair value may be the result of an existing pricing model.

6. "Typical" line / "typical" company limitation of most current methods

A major issue in determining the fair value of insurance liabilities is the reflection of risk. There are several methods in the current actuarial and financial literature that can be used to calculate this risk margin, for a "typical" line in a "typical" company. Most of these methods will require further development to go beyond the typical line / typical company limitation.

7. A fair value accounting standard would lead to new research

The previous finding discussed a limitation of current fair value estimation methods. The implementation of a fair value accounting standard would lead to new research to address these and other limitations in a fair value estimation process. This would be analogous to the expansion of methods to quantify risk transfer, following the implementation in the United States of FAS 113 (reinsurance accounting).

8. When market prices and "fair value" estimates are in conflict.

The task force observed that there are at least four situations where market prices may be in conflict with the results of a fair value estimation process. In these situations, the fair value estimation process may be preferred over a market value for financial reporting. These situations include:

- *Market disequilibrium.* Given a belief in an efficient market, disequilibrium positions should be only temporary, but how long is temporary? Restrictions on insurance market exit and entry (legal, regulatory and structural) can lead to disequilibrium positions that last years. The underwriting cycle is viewed by some as a sign of temporary disequilibrium, whereby the market price at certain points in the cycle may not equal what some believe to be a fair value.
- *Market disruption.* At various points in time, new events lead to significant uncertainty and temporary disruption in the market for insurance products. Examples can include a threatening hurricane, a newly released wide-ranging court decision and new legislation (e.g., Superfund, or California Proposition 103?). At such times, market prices right after the event may be wildly speculative, or the market may even be suspended, making fair value estimation even more uncertain.
- *Information Asymmetry.* The market price for a liability traded on an active market is likely to be quite different depending on the volume of liabilities actually traded. For example, if a primary insurer cedes 1% of its liabilities, the reinsurers will quite rationally believe that this liability is not a fair cross-section of the primary's entire portfolio: i.e., the ceding insurer is selecting against the reinsurer. Consequently, the price will be rather high, compared to the case where the entire portfolio (or a pro-rata section of it) is transferred. Thus, the "actual market price" is not a better fair value representation than an internal cash flow based measurement unless most of the insurer's liabilities are actually transferred. This situation arises because the market (i.e., reinsurance market) does not have access to the insurer's private information on the liabilities. If all of the private information were public, then the actual market prices for liability transfers would better represent their fair value."
- *Significant intangibles.* Market prices for new business may be set below expected costs for such business, due to the value of expected future renewals. As such, an estimated fair value that ignores this intangible may be materially different from the market price.

Both the IASC and FASB proposals indicate a preference for the use of observed market values over estimated valuations. Given the imbalances noted above, the task force is uncertain as to how to reconcile the realities of the insurance marketplace with the IASC's and FASB's preferences for observed market value. It may be that internal estimates can sometimes be preferable to market based estimates in a fair value accounting scheme.

9. Implications of risk margin approaches without value additivity

Some risk margin methods produce risk adjustments (when expressed as a percentage adjustment) that are independent of the company holding them or the volume of business. Such risk adjustments are said to show "value additivity," i.e., the risk margin for the sum of two items

is the sum of their two risk margins.

Not all risk margin methods result in value additivity. When this is the case, reporting problems can occur. For example, if the risk margin for the sum of line A and line B is less than the sum of the two risk margins, how should this synergy be reported? As an overall adjustment, outside of the line results? Via a pro-rata allocation to the individual lines?

The issue of risk margins and value-additivity centers around discussions of whether markets compensate for diversifiable risk. Diversifiable risk is generally not additive. For example, the relative risk or uncertainty in insuring 2,000 homes across the country is generally less than twice the relative uncertainty from insuring 1,000 homes across the country.

It is not clear whether value-additivity should or should not exist for risk margins in a fair value system. A key question in the debate is the role of transaction costs, i.e., the costs of managing and/or diversifying risk, and how the market recognizes those costs in its quantification of risk margins.

The task force has not taken a final position on this issue. Instead it has flagged the issue wherever it has been a factor in the discussion.

10. Susceptibility to actuarial estimation

We have found nothing in the estimation of fair value that is beyond the abilities of the actuarial profession. We have also found existing models that can be used in the endeavor. This is not to say that the initial results of such actuarial estimation would be problem-free. Problems would undoubtedly occur during any initial implementation, and new techniques and concepts would have to be learned. In short, if fair value accounting rules were implemented for insurance liabilities, actuaries would be capable of producing such fair value estimates, with improvement to be expected over time in both the breadth of estimation methods and actuarial expertise in applying these methods.

11. Increased reliance on subjective assumptions in financial statements

The implementation of fair value accounting for insurance liabilities would increase the number of assumptions underlying reported insurance liabilities. For example, fair value estimates would require assumptions about "market" risk margins and future yields not currently part of the typical property/casualty reserving process. This increased reliance on judgment has been cited by some as a disadvantage of a fair value accounting standard. The task force suspects however that any additional uncertainty caused these additional assumptions is likely to be second order compared to differences in the various company's expected value estimates (before application of risk margins and discounting).

12. Historical comparisons - implementation issues, presentation issues

The implementation of fair value accounting would cause problems with the traditional ways of making historical comparisons, particularly for historic development triangles. One difficulty involves the possible need to restate history, to bring past values to a fair value basis. Should these restated values reflect perfect hindsight, or should some attempt be made to reflect the uncertainty (and estimation risk) that probably existed back then? (Any such restatement may have to consider restating several years of history, based on current reporting requirements.) Or should historic development data not be reported on a fair value basis, similar to current reporting requirements in the U.S. statutory statement, Schedule P, whereby undiscounted values are reported even if the held reserves are discounted?

13. Gross versus net provisions.

Under most accounting systems, both gross and net (of reinsurance) liabilities must be reported. Assuming that the net liabilities contain less risk than the gross liabilities, this would imply the cession of a risk provision. This could change the character of ceded liabilities, as they are currently reported and commonly interpreted.

14. Tax issues.

The change to fair value accounting may have tax implications, where the applicable tax laws rely on financial reporting impacted by the change. Of particular concern is the treatment of risk margins in fair value estimates, relative to tax laws. While risk margins are clearly part of market pricing realities, their acceptance by tax authorities and statutes may not be as clear. This should not be an issue for U.S. property casualty insurers, given the current U.S. tax code, but may have major implications in other jurisdictions.

15. Credit standing reflection in valuing liabilities.

The most contentious issue in the current fair value accounting proposals is whether or not the obligator's credit standing should be reflected in fair valuing its liabilities. Many feel that the existence of guaranty funds, the priority position of policyholders among other creditors in the event of insurer insolvency, and the need for insurers to be seen as solid in order to stay in business make this issue mostly immaterial. There are still strongly held concerns, for those situations where the adjustment may be material. Many feel that the impact of credit standing on liabilities should not be reflected independent on its impact on franchise value, and are concerned that some fair value proposals would fail in this regard. Rather than advocating a certain position, the task force has listed arguments on both sides of this issue.

16. Actuarial workload requirements

Fair value accounting may require reserving actuaries to monitor many more variables than they currently monitor. New items for the reserving actuary to track the impact of may include yield curves, market risk premiums, asset betas, and credit standing. The calculation of the fair value for unexpired in-force policy liabilities may noticeably increase the actuarial workload, relative to the unearned premium and premium deficiency liabilities that they replace. Fair value accounting may also require more frequent "fresh start" updates of estimates than traditional accounting, at least to reflect changing market interest rates.

17. Professional Readiness

Given no established practice in this area to-date, some education effort will probably be required. Professional readiness may also not be determinable until general understanding of the issue increases.

18. Standards versus principles

There is limited amount of practice in this area today. The task force believes that it would be appropriate to first develop general principles or a practice note, and defer development of official standards until practice has had a chance to develop.

The task force hopes this white paper will aid in the understanding of fair value accounting issues as applied to property/casualty insurance. We acknowledge that no one paper can include all that is known about a topic, especially one as new and emerging as this one. As such, we expect this to be only an initial step in the understanding of the issue.

Casualty Actuarial Task Force on Fair Value Liabilities
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Introduction

1) Goal of the paper, and who its authors are.

The following is a discussion of fair value accounting as applied to property/casualty (p/c) insurance liabilities. It is the work product of the Casualty Actuarial Society's Task Force on Fair Value Liabilities, a task force created specifically to address fair value insurance issues raised by several recent accounting proposals (discussed in the Background section below). The issue of possible reporting of insurance liabilities at fair value existed prior to these recent accounting proposals. Hence, this paper is also meant to be a general resource for p/c insurance liability fair value discussions in general.

This paper is not meant to advocate any particular position, but is instead meant to be a "white paper," an objective discussion of the actuarial issues associated with fair value accounting.

2) Scope

The scope of this paper is limited to the issue of fair valuing of p/c insurance liabilities (and related insurance assets), with particular emphasis on insurance accounting in the United States. The analysis includes discussion of estimation issues and their application to accounting. It does not address fair valuing of life or health insurance liabilities, although we recognize the benefits of a consistent approach, where possible, across all insurance liabilities.

The scope is meant to include all material property/casualty insurance liabilities, regardless of the type of entity reporting them in their accounting statements. This would include insurance liabilities held by self-insureds, captives, reinsurers, etc. It would also include unearned premium liabilities, accrued retrospective premium assets/liabilities, material contingent commission liabilities and the like. We have not addressed all possible insurer liabilities, but we have addressed those we believe to be material at an insurance industry level.

3) Format of the paper

The paper is organized into the following sections

A. **Background**, including a definition and history of fair value in general.
B. **Fair Value in the Insurance Context**
C. **Alternatives to Fair Value Accounting** for p/c insurance liabilities.
D. **Methods of Estimating Risk Adjustments** required in the fair valuing of insurance liabilities.
E. **Accounting Presentation Issues**, including alternative income statement or balance sheet formats in a "fair value" world.
F. **Implementation Issues** surrounding the fair valuing of p/c insurance liabilities
G. **Accounting Concepts**, or how well fair value accounting and the issues discussed in the earlier sections would be viewed in the context of general accounting concepts (such as reliability, relevance and representational faithfulness).
H. **Credit Standing and Fair Value Liabilities**, a discussion of issues related to the reflection of credit standing in determining the fair value of liabilities.

I. **Professional Readiness**
J. **Summary and Observations**
K. **Technical Appendices**

These sections are meant to be conceptual discussions, with any discussion of detailed implementation procedures left to the technical appendices.

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Section A - Background

1) Definition of "fair value"

What is "fair value?" Accounting authorities do not currently have a consistent definition for this term. However, a short definition[1] could be:

a. the market value, if a sufficiently active market exists, OR
b. an estimated market value, otherwise.

If no active market exists, an estimated market value can be determined from the market price of similar assets (or liabilities). If no sufficiently similar assets (or liabilities) exist, the estimated market value is based on a present value of future cash flows. These cash flows are to be adjusted for "the effects of ... risk, market imperfections, and similar factors if market-based information is available to estimate those adjustments."[2]

In adjusting these cash flows, one of the more controversial possible adjustments is the impact of the entity's (or obligor's) own credit standing. Under some proposals, the weaker the obligor's financial situation, the lower the fair value of their liabilities would be. The assumption is that the parties to the entity is indebted to would lower their settlement demands, recognizing the risk of possibly getting much less if the entity went insolvent. This would represent a major change to the accounting paradigm for "troubled" companies. A separate section of the white paper has been devoted to this issue, due to its controversial nature and its impact on almost every facet of the fair value discussion.

Note that the fair value is an economic value, but not the only possible "economic value." Other examples of economic values include economic "value-in-use" and forced liquidation value. Economic value-in-use can be defined as the marginal contribution of an item to the overall entity's value. The forced liquidation value is the cash value achievable in a forced sale. Due to the pressures involved, the forced sale price may be materially different from the normal market price.

While fair value accounting could be applied to any asset or liability, it is most commonly an issue for financial assets or liabilities. Financial assets are generally either cash or contractual rights to receive cash or another financial asset.[3] Financial liabilities are generally obligations to

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[1] There is no universally accepted definition of "fair value" to-date, although they all follow the same general concept given by this short definition. The detailed definition that FASB is proposing can be found in FASB's Preliminary Views document titled "Reporting Financial Instruments and Certain Related Assets and Liabilities at Fair Value," dated December 14, 1999, and labeled "No. 204-B." The definition starts on paragraph 47, with discussion and clarification continuing through paragraph 83. Paragraph 47 states:

" Fair value is an estimate of the price an entity would have realized if it had sold an asset or paid if it had been relieved of a liability on the reporting date in an arm's-length exchange motivated by normal business considerations. That is, it is an estimate of an exit price determined by market interactions."

The IASC has a similar definition (found on page A181 of their Insurance Issues Paper, released November 1999). It reads:

"The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction."

[2] Paragraph 56 of the FASB Preliminary Views document mentioned above.

[3] This is a simplified definition. A more complete definition includes both options and equities in its scope. Note

provide financial assets.[4]

Lastly, a fair value accounting system focuses on the measurement of assets and liabilities, not income. The income statement in such a paradigm is just a consequence of the changing balance sheet.[5] This is in contrast to a "deferral and matching" approach, such as that used to justify prepaid expense assets (e.g., Deferred Acquisition Costs, or DAC), where the focus is to match revenues and expenses in the income statement. As a result, a fair value income statement could look very different from traditional income statements.

2) Recent history of the fair value concept - United States.

Financial assets and liabilities are accounted for in numerous ways under current U.S. accounting rules (GAAP, statutory insurance and tax). These include historical cost, amortized cost, market value, present value of future cash flows, etc. Each of the various measuring approaches has its advantages and disadvantages. Some approaches produce values that are more readily verifiable than others, but perhaps not as relevant. Others produce more relevant values, if done correctly, but they may not be feasible to use or may be too subject to manipulation.

Historically, many financial assets were accounted for at cost or amortized cost. These values were readily available and verifiable, resulting in balance sheet values that could be produced at minimal cost and that were relatively easy to audit. Likewise, many financial liabilities were at ultimate settlement value, a value that in many cases is contractually set and hence, readily available and auditable.[6]

During the U.S. banking crisis of the late 1980s, this accounting approach caused problems. Banks, which held many financial assets at historical cost, were undergoing financial strains. Many became aware that their reported balance sheet value could be improved by selling those assets with a market value greater than book value, where the book values were based on historical or amortized cost. Assets with market values less than book values were retained, as selling them would only decrease the reported book equity.[7] As a result, many banks were left with asset portfolios dominated by weak and underperforming assets, and many of these banks eventually went insolvent.

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that this is considered to be a recursive definition, not a circular definition.

[4] This is a simplified definition. A more complete definition would include options-related obligations that would negatively impact the entity if executed.

[5] Accounting systems that focus on the balance sheet are labeled "asset-and-liability-measurement" approaches by the IASC Insurance Issues paper (e.g., paragraph 159). Fair value is an example of, but does not exclusively define, such approaches.

[6] This is clearly not the case for the property/casualty industry, where the amount of the loss is not set by contract, but instead determined via a settlement process.

[7] This process of selling those assets with market-over-book, while retaining those with book-over-market, is referred to as the "cherry-picking" of assets.

The FASB,[8] and many others, felt that a balance sheet based on market values would have provided earlier warning of a bank's financial weakness. They proposed that all bank financial assets be reported at market value, at least for U.S. GAAP financial statements. These concerns resulted in FAS[9] 115, which requires market value accounting for those assets held in a "trading portfolio." These discussions also led to the discussion of fair value accounting for financial assets and liabilities.

New problems arose when determining the scope of FAS 115. Recognizing the fact that many financial institutions compete against one another, whether in the same narrowly defined industry or not, FASB proposed that all U.S. financial institutions be subject to their new asset reporting rules. This would include securities firms, life insurers and p/c insurers (although it is less obvious how p/c insurers compete directly with the others on this list). The FASB's concern was that to not treat all competitors equally in these rules would result in an uneven playing field.

Several parties raised concerns with requiring assets to be held at market value, when the liabilities were not reported at market. They believed that this would cause reported equity to become very volatile and not meaningful. Given the desire for consistency between asset and liability valuation, and the belief by many that market value (or even fair value) accounting for insurance liabilities was not possible, they proposed that the standard's scope exclude the insurance industry. The FASB was not swayed by this argument. They decided to include the insurance industry in the scope of FAS 115, and possibly address the balance sheet inconsistency at a later date.

Since then, the FASB has had a stated vision of having all financial assets and liabilities reported at fair value, pending resolution of any remaining implementation issues.[10]

3) FASB Fair Value project

In 1986, FASB added a broad-based project concerning the appropriate accounting for financial assets and liabilities (i.e., financial instruments) to its agenda. As of a result of the influences mentioned above (and others), it has evolved into the FASB Fair Value project.

The FASB has held discussions on this project during much of 1999. In December of 1999, they issued a "Preliminary Views" document on this project, which was intended to communicate their initial decisions and to "solicit comments on the Board's views about issues involved in reporting financial instruments at fair value." The preliminary views document had a comment

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[8] Financial Accounting Standards Board, the principal setter of GAAP accounting standards in the U.S. The FASB's standards are superceded only by the Securities and Exchange Commission (SEC). The FASB also must approve AICPA standards of practice before they can become effective.

[9] Financial Accounting Standard. Financial Accounting Standards, or FASs, are issued by the FASB.

[10] In paragraph 3 of the previously mentioned FASB Preliminary View document is a quote from FAS 133, that states as follows. "The Board is committed to work diligently toward resolving, in a timely manner, the conceptual and practical issues related to determining the fair values of financial instruments and portfolios of financial instruments. Techniques for refining the measurement of the fair values of all financial instruments continue to develop at a rapid pace, and the Board believes that all financial instruments should be carried in the statement of financial position at fair value when the conceptual and measurement issues are resolved. [paragraph 334]"

deadline of May 31, 2000.

This FASB document states that insurance obligations settled in cash (which represents nearly all insurance liabilities) are financial instruments, hence, the goal should be to have them reported at fair value. This includes reinsurance obligations. In addition, paragraph 46 of this FASB document "would prohibit capitalization of policy acquisition costs of insurance enterprises." Presumably, the effect of prepaying these expenses would be picked up in the fair valuing of unearned premium liabilities.

As to how to estimate the fair value of these, the preliminary views document references the new FASB Concepts Statement of Present Value-Based Measurements, released February 11, 2000, 2000.

4) IASC - fair value developments and Insurance Issues paper

Concurrent with the FASB developments discussed above, the International Accounting Standards Committee (IASC)[11] has been working to develop standards for financial instruments and for insurance accounting.

Efforts in the area of financial instruments in general include International Accounting Standard (IAS) 39, issued in 1998, and the Joint Working Group on Financial Instruments, currently working to develop a standard by the end of 2000. IAS 39 is very similar to FAS 115, in that it requires investments in a "trading portfolio" to be held at fair value. Unlike, FAS 115, it creates an exception to fair value accounting for any "financial asset ... that does not have a quoted market price in an active market and whose fair value cannot otherwise be reliably measured."[12]

During December 1999, the IASC released an "Issues Paper" focused solely on insurance accounting, with a comment deadline of May 31, 2000.

Among other findings, the IASC paper stated that

- Insurance liabilities should be discounted, and
- If a new international standard is released that requires fair value accounting for financial instruments, then "portfolios of insurance contracts should also be measured at fair value."[13]

(Note that neither the IASC nor the FASB documents, nor their GAAP consequences impact statutory accounting unless the NAIC takes explicit action.)

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[11] Per the IASC web site as of January 18, 2000 (http://www.iasc.org.uk/frame/cen1.htm), "The International Accounting Standards Committee (IASC) is an independent private-sector body working to achieve uniformity in the accounting principles that are used by businesses and other organisations for financial reporting around the world."

[12] Chapter 30, paragraph 21 of "The IASC-U.S. Comparison Project: A Report on the Similarities and Differences between IASC Standards and U.S. GAAP," Second Edition, published by the FASB in 1999.

[13] These two bullets come from the IASC Issues Paper on Insurance, pages iv-v, bullets (d) and (k).

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Section B - Fair Value in the Insurance Context

1) General statement

In general, the fair value projects of both the FASB and IASC propose that any asset or liability that ultimately settles in cash should ideally be valued at its "fair value." This would include (but not be exclusively limited to):

- Loss reserves (i.e., claim liabilities)
- Loss adjustment expense liabilities
- Policy reserves, including unearned premium or unexpired policy liabilities
- Accrued retrospective premium assets
- Return retrospective premium liabilities
- Contingent commissions
- Reinsurance recoverable amounts
- Deductible recoverable amounts
- Salvage and subrogation recoverable amounts.

In addition, a fair value accounting approach (at least according to the FASB) would not recognize prepaid acquisition costs as an asset. Hence, these assets would disappear under fair value accounting.

Premium deficiency reserves would also disappear under fair value accounting, as any expected price inadequacy on in-force policies would be directly reflected in the unearned premium reserve valuation.

Given the absence of an active market for most (maybe all) of these items, their fair value would have to be based on an estimate. The estimate would involve discounted cash flows.

For now, the focus from the FASB and the IASC is on contractual cash flows. Non-contractual cash flows, such as future renewals, would be precluded from the cash flows used to estimate fair value, even when the renewals are largely unavoidable due to existing legal or regulatory rules. The only renewal business flows to be included in these cash flows are those that are contractually guaranteed.[14]

[14] The treatment of renewal business is still an open issue. The quandary these accounting organizations face is that renewal business IS considered currently by those valuing the overall net worth of insurance enterprises. Therefore, a "market value" of the enterprise would include these intangibles. If a market price would include them, then why should a cash flow estimation procedure, generally meant to estimate a hypothetical market value, exclude them? So far, they have leaned against including them, despite a risk of being inconsistent with real-life market valuations, due to problems with reliably estimating the renewal flows.
While both the FASB and IASC proposals include contractually guaranteed renewals in these projected cash flows, the IASC definition further requires that the insurer's pricing flexibility for these renewals be restricted in some fashion.

These discounted cash flows may need to be adjusted for:

- **Risk or uncertainty in the flows (with the size of the adjustment based on market compensation for such risk)**
- Credit standing of the obligor
- "Market imperfections," including possibly illiquidity.

2) Risk or uncertainty adjustments.

A summary of the October 27, 1999 FASB Board meeting[15] included the following statement, regarding the board's conclusion concerning present value-based measurements.

> "A risk premium is necessary if the risk is identifiable, measurable, and significant. In cases where the risk does not meet those characteristics, risk should not be incorporated into a measurement."

We expect little disagreement that the risk in insurance liabilities is "identifiable" and "significant." We expect the principal discussion to be on the measurability of this risk, in an accounting context.

3) Credit standing of the obligor

As mentioned above, the FASB views the credit standing of the obligor as an integral part of a liability's fair value. After numerous discussions on this topic, they clarified their original statements to say that such credit standing reflection "includes the effect of associated deposit insurance, state guaranty funds, purchased credit insurance, or similar enhancements."[16]

4) Market imperfections, including illiquidity

It is generally recognized that there is no active market for most or all p/c insurance liabilities. Hence, such liabilities will be illiquid to some degree in a fair value context. It is less obvious how a fair value estimate should adjust for such liquidity problems.

5) Alternatives to fair value

Both the FASB and IASC documents recognize outstanding issues regarding the implementation of fair value accounting for insurance liabilities. It is possible they may not be resolved or resolvable in the foreseeable future. Therefore, it is possible that the accounting standards bodies would propose an alternative to fair value accounting, reflecting some of the economics but possible not all that might impact a "fair value."

6) Potential advantages and disadvantages of fair value accounting in the insurance context

Below are some of the advantages and disadvantages to fair value accounting, as it might be applied to insurance liabilities, that have been discussed in prior literature. This partial list is intended to aid in comparing fair value accounting to the various alternatives, discussed in the next section. More detailed discussion of these and other advantages/disadvantages can be found

[15] From the FASB Action Alert No 99-35, dated November 3, 1999.
[16] FASB Action Alert, No 99-34, Dated October 27, 1999.

throughout the later sections of this paper.

Potential advantages - Fair Value

- Consistency with assets. If insurance company investments are to be reported at fair value, then its insurance liabilities should be too. This consistent treatment across the entire balance sheet would prevent false volatility in reported earnings and equity.
- Eliminate accounting arbitrage. Valuation of insurance liabilities at other than what they are worth in the market creates incentives to manage earnings through sales of these liabilities, even when done at non-economic prices.
- Consistency with other financial instruments. To the extent that non-insurance financial liabilities are similar to insurance liabilities, they should be accounted for similarly. Otherwise, the inconsistent accounting rules could create competitive advantages based strictly on the accounting, not the economics.
- Relevance. As the value at which such liabilities could be extinguished or traded, fair value should be the most relevant measure for investors.

Potential disadvantages - Fair Value

- Difficulty in measuring. The calculation of reliable fair value adjustments may be a difficult task, and may not always be possible.
- Greater estimation reliance. Fair value accounting systems increase the number of estimates underlying the reported financials. This raises questions as to potential estimation error, and even manipulation of estimates.
- Volatility in earnings. Liabilities held at fair value may show much greater volatility, due to changing yield curves and risk adjustments, versus undiscounted or conservatively discounted liabilities.[17] This additional volatility may provide more noise than information to capital providers and other users of financial statements.
- Cost. Implementation and maintenance of a fair value accounting system will cost time and resources. There may be other alternatives that cost less, and do not have all the disadvantages mentioned above, while still maintaining many of the advantages of fair value accounting.
- Uncertainty. Fair value accounting has never been implemented for insurance liabilities, or other liabilities for which there are no active markets. There will inevitably be some unintended or unexpected consequences from its implementation.

[17] Assuming that the conservative discount rate is not readjusted each reporting period.

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Section C - Alternatives to Fair Value Accounting

Introduction

For many, the proposals by FASB and IASC present some radically new ways to value balance sheet items and to measure income for insurers. Most of the proposed changes have a reasonable theoretical basis, but a practical implementation of the new methodology will undoubtedly present significant challenges to the actuarial and accounting professions.

For example, as discussed in the *Methods for Estimating Fair Value* section, all of the methods currently available to measure the risk margin suffer from various disadvantages. None of these methods is presently in widespread use for actual valuation of balance sheet liabilities (however, some are commonly used for ratemaking). Although it is likely that more research will evolve given an accounting standard that requires a risk margin, it is difficult to see a route that will arrive at a widely adopted standard approach. Lacking a standard approach (with appropriate guidelines for the magnitude of risk margins by lines of business), it may be difficult to enforce a reliable comparison across insurers.

It is also not clear that all the proposed changes will benefit the industry, its customers or investors. An example is the inclusion of the effect of credit risk in the fair value of liabilities. This requirement implies that an insurer experiencing a lowered credit standing will see its earnings improve. This creates an incentive for companies to increase operational risk and thereby increase the insolvency cost to customers. (For a more detailed discussion of credit risk, see the separate section of this paper on this topic.)

For these reasons, it is prudent to consider some alternatives to the full implementation of the FASB and IASC proposals. The following are alternatives that we have considered or that have been presented in the accounting literature. We do not necessarily endorse any of them, but we list them here in order to enhance the discussion of this topic.

The Alternatives to Fair Value

1. Undiscounted expected value

Use the *undiscounted expected value of the estimated liability payments* as its accounting value. This alternative is essentially the *status quo* for property-liability insurers, although some may have historically used estimates of amounts other than the mean (such as the median or mode). It implicitly assumes that the risk margin equals the discount on the liability. Note that current statutory and GAAP accounting standards allow discounting for some losses (e.g., workers' compensation life pensions). However, the vast majority of liabilities are not explicitly discounted.

The FASB and IASC proposals indicate that the proper way to view the estimation of uncertain cash flows is that the *expected value* of the cash flows is the relevant measurement. Note that the

proposals do not directly address this issue with respect to the intended accounting treatment. However, the examples in the documents clearly show the preference for expected value.

The actuarial profession has also recently adopted the expected value criterion. The new Actuarial Standard of Practice No. 36, "Statements of Opinion Regarding Property/Casualty Loss and Loss Adjustment Expense Reserves," specifically requires that the preferred basis for reserve valuation be expected value.

Section 3.6.3 of the ASOP states "In evaluating the reasonableness of reserves, the actuary should consider one or more expected value estimates of the reserves, except when such estimates cannot be made based on available data and reasonable assumptions. Other statistical values such as the mode (most likely value) or the median (50th percentile) may not be appropriate measures for evaluating loss and loss adjustment expense reserves, such as when the expected value estimates can be significantly greater than these other measures." For some, this may be viewed as a change to the previous status quo, while for others, this is merely putting in writing the current practice.

The U.S. regulators' point of view, as expressed in the NAIC Issue Paper No. 55, proposes that the reserves to be booked be "management's best estimate," although the term "best estimate" is not currently defined.

When discussing "expected value" in this paper, we define the term to be without a risk margin, unless stated otherwise.

Advantages

- This is easiest to accomplish. There is no change to current accounting procedures.
- The risk margin equals the amount of the discount, so a risk margin is implicitly included in the liability value.
- The risk margin is directly correlated with the amount of the discount. This is intuitively appealing, since many believe that the amount of risk is positively related to the length of the loss payment tail.
- It is easy to measure the runoff of the liability.

Disadvantages

- It fails to overcome the many problems associated with current accounting, including
  a) Incentive for accounting arbitrage, or transactions undertaken strictly for a favorable accounting result, despite no economic benefit.
  b) Misleading information for decision making, in that transactions that have a poor economic result may look better than those creating a favorable economic result.
  c) Items with significant long-term uncertainty may appear inestimable on an undiscounted basis, even when estimable on a present-value basis.
  d) Companies writing different types of insurance would not be comparable.

- It is a poor calculation of either the risk margin or the present value of the liability. Hence, this alternative results in an accounting value for equity that may not adequately represent the value to investors, policyholders or other parties.

2. Present value at a risk-free interest rate

Use the *present value of the estimated liability payments* as the accounting value. This alternative is equivalent to the fair value, except for the risk margin and adjustment for credit standing. Some would view this as the best practical alternative to fair value, given the difficulties in estimating the risk margin and credit risk adjustment. For some lines of business, such as workers compensation, actuaries routinely calculate present values of the liabilities (although typically using a conservative discount rate). For other lines, the loss and LAE payments patterns needed for present values are usually a by-product of normal loss reserving or ratemaking practices.

This approach is equivalent to *effective-settlement measurement*, discussed on page 22 of the FASB document "Using Cash Flow Information and Present Value in Accounting Measurements" (3-31-99). The effective-settlement method gives the liability value as the amount of assets, which when invested at a specified interest rate, will produce cash flows that match the expected liability cash outflows.

Advantages

- This method is feasible with current actuarial skills and practices. Many insurers currently discount loss reserves for some lines of business. Also, the requisite cash flow patterns are commonly produced in estimating the undiscounted reserves.
- Discounting has widespread acceptance and is fundamental to the life/health industry.
- There is no dispute over how the risk margin should be calculated and applied to individual companies.
- Measuring and displaying the runoff of the liability is not difficult.

Disadvantages

- It will require more work and therefore, expense compared to not discounting.
- A risk margin is not calculated, so the fair value of the liabilities will be underestimated.
- The transition to discounted reserves will expose insurers who have carried inadequate undiscounted reserves that are implicitly discounted (an example is environmental liability). When they are forced to explicitly discount all reserves, some insurers will further discount an already implicitly discounted reserve, rather than admit that the original reserve was inadequate.

- Earnings will emerge closer to the time when the policy is written. (i.e., they are front-ended). This may provide incentives to writing risky long-tail business for companies that have weak earnings.

3. Present value using an industry-standard risk-adjustment

This alternative is similar to #2 above. It uses the present value of expected liability payments as its accounting value, but the present value is taken using a *risk-adjusted* interest rate. Here, *risk-adjusted rate* is defined as a rate that produces a present value *higher* than the present value obtained using the appropriate risk-free interest rate (as in #2 above). To accomplish this, the risk-adjusted rate must be *lower* than the risk-free interest rate. The difference between the two interest rates is called the risk adjustment. For some short-tail liabilities such as catastrophe loss exposure (embedded in unexpired contracts) an adjustment to the interest rate may not be appropriate. In these instances, a *risk margin*, as a percentage of the present value of expected loss, can be added to the present value.

This method is conceptually equivalent to the fair value (with no credit risk adjustment), except that the risk adjustment is determined on an industry-wide basis. Thus, in many cases, the circumstances of the individual insurer would be ignored in favor of accounting simplicity.

There are several approaches that could be applied to determine the industry-standard risk adjustment. A standard-setting organization (such as the AAA or NAIC) could promulgate risk adjustments by line of business or for all lines taken together. The organization might apply some of the methods discussed in Section D and then use judgment to weigh the results in producing the risk adjustment(s). The adjustment could also be set to be the same for all lines, or to vary by line.

Advantages

- It is as nearly as easy as #2 above and it has all of the same advantages plus others.
- It produces a fair value for a typical company's liabilities, since (an) appropriate industry-wide risk margin(s) are (is) provided.
- Comparability between companies may be enhanced, since the risk margins (per unit of like liability) would be the same for each insurer.
- Given the difficulties in accurately estimating risk margins at the industry level in this alternative, it remains questionable whether company-specific fair value estimates would be reliable enough for accounting purposes. Hence, this may be the most practical approach to implementing something akin to fair value.

Disadvantages

- It has the same disadvantages as #2 above except for the omission of a risk margin.
- It may not be a very accurate or reliable calculation of the risk margin for an insurer with atypical liabilities. If risk margins vary by line of business and a single risk margin is

applied to all lines, then insurers writing different types of insurance would not be comparable.
- In the case where line-by-line standards are set, new lines may develop for which no standards yet exist. The standard setters may forever be trying to catch up to market developments.
- There is no formal process to determine the standard-setting body.

4. Mixture of fair value and alternatives

Use *fair value for some liabilities* and one or more of the alternatives for other liabilities. Categories that possibly may require this treatment include unexpired risk (loss embedded in the unearned premium reserve, or UPR), catastrophe losses, environmental losses, ceded losses and loss adjustment expense.

For example, estimating the fair value of UPR runoff can be very difficult when the valuation date occurs as a storm or major catastrophe is threatening, but the public release or reporting of that value is after the event, when the storm either did or did not hit. In this case, an accurate fair value as of the balance sheet date has little relevance at the time losses are reported. Note that retaining the current UPR calculation, and not reflecting fair value until the loss is incurred, would be a "mixture" that retains the current "deferral and matching" paradigm of GAAP accounting.

Under this alternative, either the accounting standard-setting body would establish which categories get which treatment, or the insurer would decide on the basis of a materiality criterion.

Advantages

- This may be the most practical solution to the problems associated with full implementation of the fair value concept.
- This alternative is flexible. It could be amended as actuaries, accountants and other professionals became more adept at measuring the proposed fair value components.

Disadvantages

- It may be difficult to decide which items should get the full fair-value treatment and which items should continue to be valued as they are now.
- It could lead to inconsistent accounting of like items.
- There would be a possibility for accounting arbitrage, or "gaming" the system.
- This alternative could lead to "cliff" changes in liabilities, if a given liability could change valuation standards over its life (such as when the loss component of the UPR becomes incurred).

5. Entity-specific measurement

Use *value-in-use* or *entity-specific measurement.* These measurements substitute the insurer's assumptions for those that the marketplace would make. This measurement would be similar to fair value, but would use an insurer's assumptions regarding interest rate and risk margin. It could also reflect the entity's taxes, servicing cost, affiliate structure and financing costs. Assuming that credit risk were contemplated in the accounting standard, this measure could also incorporate the entity's estimate of the value of its expected default on its obligations. This type of measurement is equivalent to assessing the value at which the entity would be indifferent between running off the liability and settling the liability in a current cash transaction. This value is not necessarily the same as the value that the market would accept for settling the transaction.

In assessing market value of a liability exchange, an important economic effect, called *information asymmetry*, is relevant here. In financial markets, the values of many transactions depend on the amount and quality of information regarding the transaction. Both parties to a market exchange do not always have access to the same information. An example is mortgage lending, where the originator of the loan may have more detailed data on the credit-worthiness of the homeowner than an institution that has purchased the loan. If offered a small portfolio of loans, the loan purchaser will discount the price to guard against anti-selection. However, if the original lender offers its entire portfolio for sale, there is less risk of anti-selection. Therefore, the market value of a single loan chosen at random will depend on how many loans are sold. The same phenomenon will be present for insurance liabilities. In this case, we view the market transaction as an exchange to a reinsurer.

Therefore, in order to satisfy value-additivity in estimating fair value of an insurance liability (where an active market does not exist), one must assume that either the hypothetical market transaction occurs under *symmetric information,* or that the insurer's entire portfolio of liabilities is traded in a market large enough to absorb it. Otherwise, the entity-specific measurement will most likely give a better market value than one obtained by an actual market transaction having a limited size in relation to the entire portfolio.

Advantages

- The insurer would have the most control with this approach.
- An insurer with unique liabilities would be able to use the proper risk margin.
- The method recognizes the current lack of a market for many insurance liabilities, including the large information asymmetry that impedes the existence of an active market. Given this information imbalance, the "market" price is either not transferable to similar liabilities (due to individual portfolio differences), or is a naive price.
- It focuses on the marginal contribution of the item to the total value of the firm, not the exit price for an item for which exit is not a viable alternative. Hence, it may be a more relevant measure to the firm.

Disadvantages

- It might place an additional burden on individual insurers, who would need to derive their specific risk margins.
- It would tend to produce liability values that are not comparable between companies. This would partially defeat the purpose of fair value.
- The method would likely be subject to manipulation by the reporting entity to a greater extent than other alternatives.

6. Cost-accumulation measurement

This approach is discussed on page 22 of the FASB document "Using Cash Flow Information and Present Value in Accounting Measurements" (3-31-99). This method attempts to capture the incremental cost that the insurer anticipates it will incur in satisfying the liability over its expected term. This method typically excludes the markup and risk premium that third parties would incorporate in the price they would charge to assume the liability.

For insurers, these items are the reinsurer's expenses and profit load associated with reinsuring the liabilities. In practice, measurement should be similar to that of the present value alternative (#2) above. Insurers would estimate the liability cash flows and discount them using a prescribed interest rate.

Advantages

- Same as #2.

Disadvantages

- Same as #2.
- It can be dependent on the current corporate structure. For example, it may assume that existing affiliates providing services at marginal cost (to the affiliate) will always be around. This could result in substantial changes in value if the corporate structure changes (e.g., breakup of the parent conglomerate).
- It may not adequately represent what the market would require to transfer the liability.

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Section D - Methods of Estimating Risk Adjustments

Section introduction and scope

The previous sections discussed general conceptual issues relative to fair value accounting and the principle alternatives to fair value for insurance liabilities. No detail was given as to how the fair value would actually be calculated. This section takes the next step, discussing specific methods that may be used in calculating the fair value of insurance liabilities.

Risk adjustments

Fair value estimates reflect expected cash flows, the time value of money and an adjustment for risk. This section focuses on the last of these components, the risk adjustment. The methods discussed here assume that expected cash flows and risk-free discount rates are already available. For the purpose of all subsequent discussion the starting point for the discount rate before risk adjustment is the risk-free rate.

Risk to the insurer

All the methods discussed here focus on the riskiness of the insured liabilities to the insurer, not the risk that the insurer will default on the liabilities. This latter risk, called credit risk, is very controversial as to its role in estimating the fair value of liabilities. As such, it is being addressed separately, in Section H. Therefore, while some of the methods discussed below may implicitly reflect this credit risk, quantifying that risk is not the intent of this section.

Risk to loss (and loss expense) liabilities

The risk adjustments discussed here generally apply to two major liability categories on the balance sheet: 1) liabilities already incurred (for example, loss reserves) and 2) liabilities not yet incurred for policies already written. The latter liabilities are called the unearned premium (or "unexpired policy") liabilities Although all the other methods we describe for liabilities already incurred could be used for, the unearned premium liabilities, we provide a separate discussion at the end of this section on methods for computing their risk margins.

Other balance sheet insurance items, such as contingent commissions and deductible recoverable amounts may also be subject to a risk adjustment in estimating their fair value. The risk adjustment for these items is not addressed in this section, although some of the methods discussed here may also be feasible for estimating their fair value.

This section begins with a conceptual discussion of risk margins, including a discussion of diversifiable versus nondiversifiable risk. Next, the methods listed below are presented. These presentations are meant to give the reader a brief conceptual overview of the methods (a more involved discussion is included in the appendices). At the end of this section, a chart comparing the listed methods is provided.

(Note: Neither the inclusion of a method, exclusion of a method, nor the order of the methods listed is meant to imply any preference or priority by the task force. Methods were listed if members of the task force felt it deserved consideration, whether or not consensus was achieved.)

1) Capital Asset Pricing Model (CAPM) based methods, where the liability beta is calculated from insurers' asset and equity betas.

2) Internal Rate of Return (IRR) method, where the risk adjustment is derived from cash flow and rate of return on equity (ROE) estimates.

3) Single Period Risk-Adjusted Discount method, where the calendar year ROE is used to find a risk adjusted interest rate.

4) Methods that use historical underwriting results to derive a risk adjustment.

5) Methods using probability distributions of aggregate losses.

6) Determining fair value estimates from reinsurance transactions.

7) Direct estimation of liability market values based on share prices of property-liability insurance companies.

8) Transformed distribution methods, where the probability distribution of liability outcomes is altered to produce a higher expected value.

9) Naive methods using rules of thumb.

10) Other methods.

Conceptual overview - risk margins

The IASC (paragraph 243) and FASB (Concept statement 5 paragraphs 62 – 71) documents require the use of a risk margin when measuring the fair value of an uncertain liabilities (such as an insurer's liabilities) by discounting the expected liability cash flows. The finance and actuarial literature generally support this approach. (Butsic, Cummins, D'Arcy, and Myers-Cohn.)

The economic rationale for a risk margin is that a third party would not accept compensation for a transfer of liabilities if such payment reflected only the present value of the cash flows at a risk-free interest rate. The acquiring entity would get an expected risk-free return while bearing

risk. A market exchange of the liability would therefore require a premium or risk margin over and above the present value of the liability discounted at the risk-free rate.

In this section we discuss various possible feasible methods for estimating a risk margin. All of these methods have been used for estimating risk margins, either for direct application to balance sheet liabilities or in ratemaking. Financial theory indicates that the same principles for estimating the risk margin in pricing would also apply to a fair valuation of outstanding liabilities. For certain kinds of short tail liabilities, such as claim liabilities associated with catastrophes, the risk margins for pricing may be much larger than the risk margins for liabilities, however. This is because, once a catastrophe has occurred the uncertainty regarding future payments may be relatively modest, compared to the quite large level of uncertainty before the event has occurred.

There are two major paradigms used to compute risk loads that are represented in this paper: the finance perspective and the actuarial perspective. These two paradigms differ in their treatment of diversifiable versus nondiversifiable risk. In the context of liability fair value, diversifiable risk is defined as risk that can be reduced, per unit of liability volume, as more volume is added. For example, if two statistically independent risks are combined, their joint risk will be reduced due to the tendency of bad outcomes from one being offset by good outcomes in the other. In contrast, nondiversifiable (or systematic) risk is defined as risk that cannot be reduced, per unit of liability volume, as more volume is added. Here, bad or good outcomes in one risk are matched with the same result in the other.

The amount of diversification depends on the correlation between the units being added. This

$$\sigma(x+y)=\sqrt{(\sigma_x^2+\sigma_y^2+2\rho\sigma_x\sigma_y}$$

effect is evident in the square root rule for summing standard deviations:
Where ρ is the correlation between x and y, σ_x is the standard deviation of x and σ_y is the standard deviation of y.

Adding more units to a portfolio may or may not reduce its risk. If the correlation between the units is one, then there is no reduction in risk per unit volume from adding more of the units. In this case the standard deviation of the sum will equal the sum of the standard deviations, and when this is normalized by dividing by the mean of the portfolio, the risk per unit is unchanged. In investing, for instance, adding more shares of a given company's stock to one's portfolio will not reduce the portfolio's risk, since the shares added will be perfectly correlated with the shares the investor already owns.

If the correlation between the units is less than one, then there is a reduction in risk per unit volume from adding the units. Thus, if an investor adds to the portfolio shares of a company not already in it, the risk should decline since the correlation of the new stock with stocks in the

portfolio should be less than one. If the correlation is negative then there can be a significant reduction in risk.

An example of diversifiable risk from insurance is the random occurrence of losses — where the fortuitous amount of one claim does not influence the amount of another claim. An example of nondiversifiable risk from insurance is medical inflation, where a change in the cost of medical care will simultaneously effect the value of general liability and workers compensation reserves. Another example is parameter risk, where the mean (or other parameter) of a loss distribution is unknown. Here the uncertainty in the mean affects all losses included in the distribution.

The finance perspective:
The classical finance perspective, as reflected in such methods as CAPM and internal rate of return, posits that an investor is compensated only for that risk that is not diversifiable. Diversifiable risk is not rewarded in the financial markets, because an investor can eliminate this risk by holding a diversified portfolio of securities. The finance perspective quantifies nondiversifiable risk, which is also called systematic risk, by measuring the correlation of a security's return with the market's return. From the finance perspective, if an investor owns a sufficiently diversified portfolio of securities, the only portion of the securities' return that cannot be diversified away is due to its co-movement with the market. Thus, much of the finance literature tends to treat systematic risk and covariance with the stock market as synonymous, and ignores other possible approaches to defining and quantifying diversifiable risk.[18] For determining risk loads in insurance, this may translate into measuring the correlation between insurance companies' returns from underwriting and market returns on its shareholder's equity.

The actuarial perspective:
In determining risk loads, what has come to be known as the actuarial perspective, in general, looks at the contribution of a policy to the total risk of the enterprise. (Risk loads based on aggregate probability distribution reflect the actuarial perspective.) The contribution to total risk will have a component that is diversifiable (process risk) and a component that is nondiversifiable (parameter risk). For many lines, especially in large insurers, the component due to process risk will be small, however, due to the law of large numbers. The actuarial perspective views the nondiversifiable or parameter risk component as that portion of total uncertainty due to the enterprise's inability to accurately measure its true liability and expense costs. While parameter risk may sound analogous to systematic risk, as both are viewed by their users are nondiversifiable, they are different concepts. Systematic risk is measured by calculating correlations with market returns. Parameter risk, where quantified, is measured through the use of Bayesian statistics.

[18] Certain approaches, such as Arbitrage Pricing Theory allow factors other than beta to be used in the quantification of risk. Except for some very recent research work, these approaches have not influenced the finance-based methods used to compute risk loads in property and casualty insurance.

The characterization of the finance approach as quantifying only nondiversifiable risk and the actuarial approach as including both diversifiable and nondiversifiable risk is an oversimplification. Stulz[19] points out that in the real world, total risk often matters, and costs incurred by companies to control total risk are rewarded in the financial markets and the failure to do so may be punished. For some kinds of insurance, such as catastrophe insurance, it could be difficult to find a market unless some kinds of "diversifiable" risk were rewarded. Property catastrophe risk is diversifiable in a perfect market, but the mechanisms for doing so are so costly that in practice it is only partially diversifiable. As in the case of formally nondiversifiable risk, the whole industry is in the same boat, so the market treats the risk as systematic and policyholders in catastrophe-exposed areas pay a risk premium for insurance coverage. If an efficient means of diversification were to arise, then that situation would change.

While the actuarial based methods often explicitly incorporate process (diversifiable) and parameter (nondiversifiable) risk components into the risk load formulas, some of the finance-based methods, such as internal rate of return, may implicitly incorporate this risk as part of the total return on equity required by an insurance company.

The discussion surrounding diversifiable versus nondiversifiable risk is still evolving. The reader should be aware that differing views exist as to whether only diversifiable, or both diversifiable and nondiversifiable risk should be included in risk adjustments. The reader should also be aware that there are also very different approaches to measuring the nondiversifiable component.

[19] Stulz, Rene, "Whats wrong with modern capital budgeting?", Address to the Eastern Finance Association, April, 1999

Method 1. The CAPM Approach

(Note: references to specific authors mentioned below and in the discussion of subsequent methods can be found in the Appendix.)

CAPM is the method used in Massachusetts rate filings in the Automobile and Workers Compensation lines. Myers and Cohn developed the underlying theory.

The method equates the present value of the premium to be charged on a policy to the present value of the losses plus the present value of the underwriting profits tax plus the present value of the tax on invested surplus and premium.

$$PV(P) = PV(L) + PV(UWPT) + PV(IT),$$

where P = Premium, net of underwriting expenses
L = losses plus loss adjustment expenses
$UWPT$ = underwriting profits tax
IT = tax on investments

Losses are discounted at a risk-adjusted rate. The premium portion of underwriting profits is discounted at a risk-free rate and the liability portion is discounted at a risk-adjusted rate. Investment tax is discounted at the risk-free rate. The risk-adjusted rate used in the calculations is derived from CAPM.

$$r_L = r_f + \beta_L(r_m - r_f)$$

where r_L = risk-adjusted rate
r_f = one period risk-free rate
β_L = $\mathrm{Cov}(r_L, r_m)/\mathrm{Var}(r_m)$ = the liability or underwriting beta
r_m = expected rate of return on market portfolio

β_L, the underwriting beta, is a measure of the covariance between the underwriting profits for a line of business and the stock market. It represents the systematic risk to the insurer for writing the policy. Note that β_L is usually considered to be negative. Otherwise insurance companies would incur exposure to risk for a reward equal to or less than the risk-free rate, an illogical conclusion.

Although the Myers-Cohn approach is typically applied in ratemaking to compute risk adjusted premiums for new policies, the risk-adjusted discount rate from the calculation can be used to discount outstanding reserve liabilities as well.

There are at least three approaches to computing β_L. The first method is broadly similar to the direct estimation technique (Method 7 of this section). Here, a time series of publicly traded insurer data is analyzed. A beta of equities is determined from insurance company stock prices. A beta of assets is determined from a weighted average of insurance company asset betas. The liability beta is determined by subtracting the asset and equity betas, weighted by their respective leverage values. The risk margin, as a reduction of the risk-free rate, equals the liability beta times the market risk premium. This is the method used in Massachusetts.

The second method uses accounting data to measure the covariance between insurance underwriting returns and the market.[20] A third CAPM-based approach measures beta for a line of business by quantifying the covariance of that line's underwriting return with the return for all property and casualty lines.[21]

A numerical illustration of the method is shown in the Appendix.

Advantages

- The method has actually been done. In Massachusetts it is the standard method used in the workers compensation and personal auto, with risk margins being positive and stable. Note that this has only been applied to lines that are relatively homogeneous, and where public data is generally available.
- The method is objective and the analysis is reproducible.
- The method has been in use for over a decade and has been reviewed by many economists.

Disadvantages

- Several stages of estimation can produce measurement errors.
  a) Some insurers in the data are also life insurers; carving them out requires estimating the equity beta of the life operation.
  b) The liabilities may be under- or overstated in the financial statements.
  c) Mutual insurers, nonpublic companies, self insurers and captives are not included in the analysis, introducing a potential bias
- Intangible assets like franchise value could distort the results. Another similar problem is that the present value of income taxes is embedded in the liability value and cannot be easily separated from it.
- Measurement errors on the beta for assets have a leveraged effect on the measurement of underwriting betas.
- It relies on the CAPM model, which may not accurately predict returns for insurance firms, as discussed below.

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[20] Kozik, Thomas, "Underwriting Betas-The Shadows of Ghosts," Proceedings of the Casualty Actuarial Society (PCAS) LXXXI, 1994, pp. 303-329.

[21] Feldblum, Shalom, "Risk Load for Insurers", PCAS LXXVII, 1990, pp. 160- 195

The CAPM beta has come under considerable criticism recently in the finance literature. CAPM only recognizes nondiversifiable risk, assuming an efficient, friction-free market. The magnitude of transaction costs to diversify an insurance portfolio violates the friction-free assumption, casting doubt as to the applicability of CAPM to valuing insurance liabilities.

Fama and French have shown that factors other than beta contribute significantly to the explanation of company stock returns.[22] Their work has caused a great deal of discussion in the finance community about the use of CAPM and beta for estimating equity returns and computing cost of capital. Alternatives to CAPM that look CAPM-like but incorporate factors other than beta into the determination of the risk premium have attempted to address some of the deficiencies of the CAPM model. For instance, Fama and French have presented a method for deriving costs of equity that uses two additional factors as well as beta.[23] Some of the models that appear to be generalizations of CAPM and use factors other than beta are better known as examples of the Arbitrage Pricing Model. An introduction to this more general approach is provided by D'Arcy and Doherty.[24]

Members of the actuarial community (as opposed to members of the finance community) have also criticized CAPM approaches. Much of the criticism focuses on the unreliability of estimates of underwriting betas as opposed to estimates of equity betas examined by Fama and French. Kozik[25] notes that a number of authors have measured the underwriting beta to be zero or negative (i.e., no risk load necessary on insurance). He provides a detailed discussion of the flaws in current methods of measurements of the underwriting beta, which can cause such results to be obtained.

Note that much of the underlying theory of CAPM is widely used and accepted, although the actual mechanisms for measurement have been criticized. Some of the criticisms of CAPM have been addressed in extensions of CAPM such as contained in the Automobile Insurance Bureau's Massachusetts Rate Filing (1998). Extending CAPM to address some of its limitations is currently an area of active research.

It should be noted that many of the limitations of the CAPM approach may apply to other methods presented in this paper, whenever those methods use CAPM to determine a rate of return.

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[22] Fama, Eugene and French, Kenneth, "The Cross Section of Expected Stock Returns" Journal of Finance, Vol 47, 1992, pp. 427-465

[23] Fama, Eugene and French, Kenneth, "The Cross Section of Expected Stock Returns" Journal of Finance, Vol 47, 1992, pp. 427-465

[24] D'Arcy, S. P., and Doherty, N. A., "The Financial Theory of Pricing Property-Liability Insurance Contracts," Huebner Foundation, 1988

[25] Kozik, Thomas, "Underwriting Betas-The Shadows of Ghosts," Proceedings of the Casualty Actuarial Society (PCAS) LXXXI, 1994, pp. 303-329.

The Pricing-Based Methods (Methods 2 and 3)

Under this general category of methods, the fair premium for a group of polices (which could be those of a line of business or an entire company) is first determined. In this calculation, the value of all nonliability premium components (such as commissions and general expenses) is excluded from the fair premium calculation. The resulting premium amount, by definition, is the fair value of the liability (losses and loss adjustment expenses). Since the liability fair value and its expected payments are known, the implicit risk-adjusted interest rate at which the payments are discounted can be readily found. Subtracting this value from the risk-free rate gives an estimate of the risk adjustment to the risk-free rate. Note that this approach can be used to compute a dollar-value risk load (to apply to liabilities discounted at the risk-free rate) rather than an adjustment to the discount rate.

This method can be applied to any prospective pricing model that uses expected cash flows. The most prevalent cash flow approaches are the internal rate of return (IRR) and the risk-adjusted discount (RAD) models.

It should be noted that the standard pricing-based methods give a risk margin that is a composite of the risk characteristics of liabilities already incurred and the unexpired policy liability. As the time since policy issuance increases, there may be a significant information gain in a book of liabilities (e.g., the insurer knows more about claims once they are reported) This effect is most pronounced for property insurance with significant catastrophe potential. To separately measure the risk margins in the reserve and unexpired policy portions of the insurer's liabilities, the pricing methods can be modified. For example, in the IRR model, the capital requirement and/or the required ROE may be different per unit of liability for the two liability types.

Method 2 - The IRR method

The IRR method is used by the NCCI in workers compensation rate filings.[26] It does not directly produce a risk margin, but it can easily be adapted to do so. The underlying theory is standard capital budgeting.[27]

Under the IRR method, a cohort of policies, written at the same time, is modeled over time until all claim payments are made. At each stage (usually quarterly or annually) the cash flows (premiums, losses, expenses, income taxes and investment returns) and balance sheet values are estimated. Capital is added based on capital allocation rules, frequently as a fixed proportion to liabilities. The application of these capital allocation rules results in an initial amount of capital,

[26] Cummins, J. David, "Multi-Period Discounted Cash Flow Ratemaking Models in Property-Liability Insurance," Journal of Risk and Insurance, March 1990, Volume 57:1, pp. 79-109.
[27] Brealy, Richard A. and Stuart C. Myers, 1996, "Principles of Corporate Finance (5th Edition)", McGraw-Hill, New York

then a subsequent capital flow, based on the amount of additional or withdrawal of capital necessary to maintain the capital allocation assumption at each point in the policy flows.

When the internal rate of return on the capital contributions and withdrawals equals the required rate of return on the capital (equity), then the fair premium is obtained.

The inputs to the IRR method are the capital allocation rules (e.g., the required amount of equity per unit of liability), the expected payments pattern of the policy flows, the investment return on cash flows, the income tax rate and the required return on equity. Note that the expenses and the premium cash flows need not be included in this calculation, since we are only trying to value the liability itself.

The required ROE can be determined using a variety of approaches. A simple approach often used by insurance companies is to select a rate of return based on examining actual historical rates of return on equity for insurance companies. Roth advocates this approach.[28] Another approach is to use CAPM to estimate the industry-average insurer equity beta and then to derive the appropriate ROE, given beta. An alternative way to estimate the required ROE is to use the dividend growth model, which has been documented in rate filings. Still another approach might use the "hurdle rate" for an insurer that is derived from its experience raising capital.

The required capital could be based on the company's internal capital allocation rules. Absent this, industry-wide "rules of thumb" or rating agency dictated norms might be used. Note that the capital typically used in this calculation is "required" or "target" capital, not actual capital. Care must be taken where the capital allocation assumption is dependent on the required ROE assumption.

An additional complication arises where fair value rules require the use of "market assumptions" wherever possible, over individual company assumptions. This could imply that the capital allocation rules that drive the market price (if one can be said to exist) should be used instead of the company's own internal capital assumptions.

The investment return under a fair value paradigm typically is the set of currently available market yields for investments. This may be complicated by investment in tax-exempt investments, especially where the company has significant tax advantages or disadvantages relative to the market. Many users of IRR models make the simplifying assumption that all investments are made in taxable securities.

A numerical illustration of the method is shown in the Appendix.

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[28] Roth, R., "Analysis of Surplus and Rates of Return Using Leverage Ratios,", 1992 Casualty Actuarial Society Discussion Paper Program - Insurer Financial Solvency, Volume 1, pp 439-464

Advantages

- The IRR is commonly used to price insurance products. The extension to calculate risk margins is straightforward and will produce positive and stable risk margins.
- The method is conceptually simple and easy to explain.
- The method is objective and the analysis is reproducible.
- The method will work at the individual insurer level.

Disadvantages

- All of the methods for determining the required return on equity have problems and they can produce different answers:
  a) A required ROE based on historical returns depends on the historical period chosen.
  b) A required ROE based on CAPM is subject to the limitations and criticisms that apply to CAPM (see Method # 1 above).
  c) The dividend growth method requires some subjective estimation — it will not work for companies with erratic or no dividends.
  d) Internal management "hurdle" rates, based on a company's experience in raising capital, are very subjective and may not be consistent with the market value approach under fair value.
- The number of steps required makes this a fairly indirect method.
- Estimating the present value of income taxes requires a modification to the method.
- A required capital estimate is needed. There is no agreed upon method for doing this, and no consensus as to whether it should be the company's or the industry's capital allocation or requirement.

Method 3 - The Single-Period RAD (Risk-Adjusted Discount) method

This method shares some features of the above IRR method. It is based on the risk-adjusted discount method.[29,30] Here the relationship between the required ROE, the expected investment return, the income tax rate and the capital ratio is used to find the implied risk-adjusted interest rate. Like the above IRR method, the balance sheet values are fair value quantities. It is simpler than the IRR model since the risk adjustment is derived directly from a formula (shown in the Appendix), rather than by an iterative process.

The inputs to the single-period RAD method are the required amount of equity, the investment return on cash flows, the risk-free rate, the effective income tax rate and the required return on

[29] Butsic, Robert, "Determining the Proper Discount Rate for Loss Reserve Discounting: An Economic Approach," 1988 Casualty Actuarial Society Discussion Paper Program - Evaluating Insurance Company Liabilities, pp. 147-188.

[30] D'Arcy, Stephen P., 1988, "Use of the CAPM to Discount Property-Liability Loss Reserves", Journal of Risk and Insurance, September 1988, Volume 55:3, pp. 481-490.

equity. The required ROE can be determined using one of the methods described above for the IRR approach. The required capital and the investment return are estimated using historical industry data, or from one of the alternative methods described above for the IRR approach. Note that the required capital needs to be consistent with the fair value of the liabilities. For example, if the fair value of reserves were less than a non-fair value such as ultimate undiscounted liabilities, the required capital would go up.

The simplicity of this method arises from the assumption that the risk adjustment (as a reduction to the risk-free rate) is uniform over time. Thus, evaluating an insurance contract over a single period will be sufficient to determine the risk adjustment. To illustrate the method, we assume the following:

- capital is 50% of liability fair value,
- required ROE is 13%,
- expected investment return (EIR) is 7%,
- risk-free rate (RFR) is 6%,
- income tax rate is zero, and
- fair value for the liability is $100 at time zero.

The formula for the risk adjustment is:

$$\text{risk adjustment} = \text{capital ratio} \times (\text{ROE} - \text{EIR}) + \text{RFR} - \text{EIR}$$

$$= 0.02 = 0.5 \times (0.13 - 0.07) + 0.06 - 0.07$$

The formula for the resulting risk-adjusted interest rate is:

$$\text{risk-adjusted interest rate} = \text{RFR} - \text{risk adjustment}$$

$$= 0.04 = 0.06 - 0.02$$

To see that this works, note that the beginning assets are the fair premium for the liability of $100 plus the required capital of $50. This amount grows to $160.50 (i.e., $150 x 1.07) at the end of the year. The expected amount of liability grows at the risk-adjusted rate of 4% to $104. Subtracting this amount from assets gives $56.50, which represents the required 13% return (56.5 / 50 = 1.13) .

The income tax rate, however, is not zero, so the formula for the risk adjustment (see the Appendix) is somewhat more complicated than shown here. The Appendix provides the complete formula and also gives a numerical illustration of the method.

Advantages

- The method is very simple and transparent. It is easy to explain and to demonstrate with a spreadsheet.
- The method is reliable, robust and will produce positive and stable risk margins.
- Inputs are presently available from published sources. For example, many rate filings with state insurance departments have estimates for required ROE and capital leverage.

Disadvantages

- The method will only produce an industry-average or company-average risk adjustment (to the risk-free rate). It would be difficult to apply the method to produce specific lines of business risk adjustments.
- This method has the same disadvantages relative to the selected ROE as the IRR method.
- This method has the same disadvantages relative to the selected "required capital" as the IRR method.

Method 4 - Methods Based on Underwriting Data

A pragmatic approach to developing liability risk adjustments is to use published underwriting data. Over a sufficiently long period of time companies are assumed to earn enough in profit on the policies they write to be adequately compensated for the risk they bear. This method assumes that the historical returns indicate the true market perception of the fair profit for bearing insurance risk. The historic profit or risk load can then be related to the risk adjustment required for discounted liabilities.

Typically, risk adjustments based on underwriting data use information published in insurance companies' annual statements. To obtain stable results by line of business applicable to a typical company, data aggregated to industry level by sources such as A. M. Best can be used.

The published literature on risk adjustments using underwriting data primarily focuses on estimating a risk adjustment to the factor used to discount liabilities. Alternative methods for computing risk-adjusted discount rates use a CAPM approach to compute the risk adjustment.

Although we focus on using underwriting data to compute risk-adjusted discount rates, the same data can be used to derive an additive risk load instead.[31] Risk adjustments incorporated through the discount rate are discussed first, followed by discussion of risk adjustment via an additive risk load.

Using Underwriting Data to Adjust the Discount Rate

Butsic introduced the concept of using risk adjusted discount rates to discount insurance liabilities.[32] He argued that a liability whose value is certain should be discounted at a risk free rate. The appropriate risk free rate to use for the certain liabilities is the spot rate for maturities equal to the duration of the liabilities. If certain liabilities are discounted at the risk free rate, then uncertain liabilities should be discounted at a rate below the risk free rate. The formula for the risk-adjusted rate is:

[31] There are several different ways to make a risk adjustment. One way is through an additive risk load to the otherwise calculated present value estimate (based on risk-free discount rates). A second is by discounting the expected cash flows using a risk-adjusted discount rate. A third is by adjusting the individual expected cash flow amounts for each time period, replacing each uncertain amount with the certainty equivalent amount (i.e. the fixed amount for which the market would be indifferent between it and the uncertain amount being estimated.) A fourth is by adjusting the timing of the estimated cash flows (sometimes used when timing risk is thought to dominate amount risk).

[32] Butsic, Robert, "Determining the Proper Discount Rate for Loss Reserve Discounting: An Economic Approach," 1988 Casualty Actuarial Society Discussion Paper Program - Evaluating Insurance Company Liabilities, pp. 147-188.

$$i_L = i - e\,(R - i),$$

where i_L = the risk-adjusted discount rate for liabilities,
i = the risk free rate for duration equal to the duration of the liabilities,
e = a leverage factor, equal to surplus divided by the present value of liabilities,
$(R - i)$ = the market risk premium, i.e., the excess of the market's return over the risk-free rate. The market return is usually measured as the return on a stock market index such as the S&P 500 or the return for all NYSE stocks, but other interpretations are possible.

The above term "$e\,(R - i)$" represents the adjustment to the risk free rate for the riskiness of the liabilities.

There is an analogy between this formula and that for a company's cost of equity based on the CAPM.

$$i_E = i + \beta_c\,(R - i)$$

where i_E = the cost of equity for a company,
i = the risk-free rate,
β_c = the company's beta, based on the covariance between the return on the company's stock and the market's return,

The specific procedure for computing the adjustment is described in detail in the Appendix.

Note that the method's results can be very sensitive to the historical time period used as the source of the underwriting data. For example, the selection of an historical period that includes a major market disruption, such as a workers' compensation crisis, major catastrophe, or mass tort eruption, can produce drastically different indications than a time period that excluded this major disruption. Thus, it is necessary to consider how long a time period is required to obtain stable and reasonable results and whether the method is unstable over time. The longer the historical period used for computing the risk adjustment, the more stable the results will be, but the less likely they are to reflect current trends in the underwriting cycle or business environment. The shorter the historical period used, the more likely it is that the adjustment will reflect the current environment, but at a cost of being more unstable and more susceptible to infrequent random events such as catastrophes (or the short-term absence of the long-term catastrophe or large loss risk).

An additional effect that must be considered is the effect of taxes. As shown by Myers and Cohn[33]

[33] Myers, S and Cohn, R, "A Discounted Cash Flow Approach to Property-Liability Rate Regulation," Fair Rate of Return in Property-Liability Insurance, Cummins, J.D., Harrington S.A., Eds, Kluwer-Nijhoff Publishing, 1987, pp. 55-78

and Butsic[34], taxes increase the premium needed to obtain a target rate of return and therefore decrease the effective risk-adjusted discount rate. This effect is embedded in the data used to derive the risk-adjusted discount rate. It might be desirable to segregate this effect from the pure risk adjustment. A procedure for doing this is discussed in the Appendix.

Advantages

- The approach produces an adjustment to the discount rate without requiring the computation of a liability beta. As discussed above in the CAPM method for estimating a risk adjustment, the liability beta is one of the more controversial features of the CAPM approach.
- The approach does not require the computation of a leverage ratio
- The approach is relatively easy to implement. Spreadsheets can be placed on a web site containing a sample calculation
- The data required, such as Bests Aggregates and Averages, is relatively inexpensive and readily available
- A paper presenting the approach has been included in the syllabus of the Casualty Actuarial Society for over 10 years. A description of this technique is, therefore, readily accessible to actuaries (or anyone else who accesses the CAS web site.)
- This method can easily be applied to individual lines where annual statement data is available.

Disadvantages

- Results can be very different depending on the historical time period used. This committee's research indicates that changing the time period used for the calculation in one instance changed the all-lines risk adjustment from 4.5% to 1.0%. The committee believes that the results for recent historical periods reflect certain well-known market disruptions such as the impact of the recognition of asbestos and environmental liabilities. Also, the industry has been in a protracted soft market, which has depressed underwriting profitability in the recent historical data.
- Results for a single line can be unstable. Some lines are unprofitable for extended periods of time and this method may not produce a positive risk load. Useful data for lines with very long tails (or without industry data available) may be a problem. Examples of such include medical malpractice-occurrence and directors & officers (D&O, for which industry accident year data may not be available).
- Pricing adequacy may vary by line based upon individual line characteristics such as regulatory environment, market conditions, geography, etc. An impact of this is cross subsidization of lines where some lines are undercharges at the expenses of other lines. Thus the results for a single line, even over relatively long time periods can be misleading. (Our research showed that at least one regulated line had a negative risk adjustment using this approach for 30 years.)

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[34] Butsic, Robert P., 2000, Treatment of Income Taxes in Present Value Models of Property-Liability Insurance, Unpublished Working Paper.

- Results will be affected by "smoothing" in published financial numbers.
- The method requires accident year data to do the computation correctly, or else it is susceptible to distortion from events with long-term latency issues, such as mass torts or construction defect.
- Results using individual company data may be too volatile, hence, the method has usually been applied mostly to industry data.

Computing Additive Risk Loads Instead of Risk Adjustments to the Discount Rate

Since the procedures described here focuses on computing a risk adjustment to the discount rate, the procedure to compute an additive, dollar-value risk load must convert the risk-adjusted rate into a risk load (as a ratio to the liability value). However, it is possible to compute the risk load directly using the same data for computing a risk adjustment to the discount rate. This approach might be preferred for a short tail line.

One approach to computing an additive risk load is simply to calculate the ratio of the profit on the policies at the beginning of the period to the average discounted losses, where losses are discounted at a risk-free rate rather than a risky rate. Thus, the risk load (expressed as a percentage of the present value losses) is equal to the present value of the premiums minus the present value of expenses minus the present value of the losses (plus loss adjustment expenses) divided by the present value of the losses. All quantities are discounted at the risk-free rate.

Unlike the adjustment to the discount rate, this risk load would not be meaningful unless computed by line, since the duration of the liabilities varies by line. An example of this computation is shown in the Appendix.

Method 5 - Actuarial Distribution-Based Risk Loads[35]

The evolution of this approach relative to pricing is given first, followed by the extension to the valuation of liabilities.

Pricing context

Probability-based actuarial risk loads are among the oldest procedures developed by actuaries for estimating the risk adjustment to losses. These approaches continue to develop, even as other approaches, which largely evolved from other disciplines (such as economics and finance), continue to add to the tools used for deriving risk loads. Distribution based loads arose in the context of insurance pricing to fill the perceived need to apportion the targeted underwriting profit to different classes of business according to their actual riskiness, as described mathematically by the probability distribution of the loss.

The first approaches to the problem focused on the volatility of the individual loss, characterized mainly by the severity distribution. In 1970, Hans Bühlmann set forth three possible principles that might be applied to the problem:

- The Standard Deviation Principle: Risk Load = λ SD[Loss],
- The Variance Principle: Risk Load = λ Var[Loss],
- The Utility Principle: U(Equity) = E[U(Equity + Premium - Loss)].

Actuarial distribution-based risk loads often invoke collective risk theory to explain the derivation of the risk load. Collective risk theory provides a model of the insurance loss generating process that can be used to derive aggregate probability distributions. The theory also allows derivation of the distribution parameters such as standard deviations or variances, which are used in the risk load formulas. Recent developments in collective risk theory have given rise to an additional principle used to derive risk loads:

- The expected policyholder deficit (EPD[36]) principle: Risk Load = λ Surplus Requirement.

Surplus is determined based on the expected policyholder deficit, which is derived from the

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[35] This exposition draws heavily on Glenn Meyers' September 18, 1998 presentation to Casualty Actuaries of New England (CANE).

[36] The "expected policyholder deficit" is the total expected level of uncompensated losses over the total expected level of all losses, for a given level of assets (reserves plus surplus) supporting a risk. For example, assume 99% of the time losses are only $1, 1% of the time they are $100, and the total level of assets supporting this risk is $90. Then expected uncompensated losses are $0.10. Total expected losses are $1.99. The expected policyholder deficit is 0.10/1.99, or around 5%. For further discussion of this concept, see " Solvency Measurement for Property-Liability Risk-Based Capital Applications" By Robert P. Butsic, published in the 1992 CAS discussion paper program titled "Insurer Financial Solvency".

aggregate probability distribution of either losses or surplus (assets minus losses). This principle is very similar to the tail-value-at-risk principle proposed by Meyers.[37]

Each of the above principles contains an arbitrary coefficient λ, constant across classes of business (and concealed in the utility function), that can be adjusted to yield the desired overall underwriting profit or rate of return on surplus. In much of the literature the time element is not addressed explicitly. It is straightforward, however to apply the risk load to discounted liabilities.

The first two of the principles were applied in the practical context of increased limits ratemaking at the Insurance Services Office (ISO) in the late seventies and early eighties.

During the eighties, regulatory pressures brought the Capital Asset Pricing Model (CAPM) into the debate regarding how to incorporate risk into insurance prices. CAPM is founded on certain axioms that are violated in the context of insurance pricing (e.g., no default, frictionless markets), but this intrusion of modern financial theory stimulated much thought as to how the risk load formalism can address enterprise-wide and market-wide issues that had been neglected in the earlier formulations. The concept of systematic risk, already familiar to actuaries as parameter risk, was incorporated into practical treatments intended for actual insurance pricing.

The Competitive Market Equilibrium approach to risk load incorporates parameter uncertainty and other mechanisms, which generate correlations among distinct insurance contracts (e.g., the catastrophe mechanism, which can affect many contracts, in different lines of insurance, in a single event).[38] This scheme attempts to integrate capital market theory and collective risk theory in the development of risk loads for insurance pricing. The procedure requires all parties to agree that more variance is worse and less is better. (Note that the CAPM disagrees. It treats variance not related to the market as not valued by the market and not a concern, as it can be diversified away. It assumes no transaction cost to do so.)

The answer given by this scheme gives a contract risk loading proportional to the change in the variance of the insurer's bottom line caused by the addition of that one contract to the insurer's portfolio. This raised an interesting parallel with work being done at about the same time on reinsurance pricing based on marginal surplus requirements.[39] The Competitive Market Equilibrium result can be re-expressed in terms of the marginal surplus (risk capital) required to support the additional business, and thus linked to the cost of risk capital. More recent work using probability distributions has referenced the expected policyholder deficit concept, rather than standard deviation, variance or probability of ruin to motivate the computation of marginal

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[37] Meyers, Glenn, "The Cost of Financing Insurance", paper presented to the NAIC's Insurance Securitization Working Group at the March 2000 NAIC quarterly meeting.

[38] Meyers, Glenn G., "The Competitive Market Equilibrium Risk Load Formula for Increased Limits Ratemaking," Proceedings of the Casualty Actuarial Society (PCAS), LXXVIII, 1991

[39] Kreps, Rodney E., "Reinsurer Risk Loads from Marginal Surplus Requirements," Proceedings of the Casualty Actuarial Society (PCAS), LXXVII, 1990, p. 196

surplus requirement and, therefore, of risk load.[40, 41]

Extension to Loss and Expense Reserves

The above methods apply prospectively to situations where the losses have not yet taken place and only rating information is available. For risk-adjusted valuation of insurance liabilities, such methods would apply to the Unearned Premium Reserve (UPR) and Incurred But Not Reported Reserves (IBNR). As long as one has some kind of runoff schedule giving estimates of number and type of claims not yet reported, one can apply these methods to estimate the variability of unreported claims.

Estimating the variability of reported claims is a different problem because of the information available to the insurance company about actual reported claims. Meyers has addressed the problem in the context of reserving for workers' compensation pensions, using a parametric model for the mortality table and calculating the variance of conditional future payments.[42] Hayne has used the collective risk model with information about claim counts and severities as the claim cohort ages and assumptions as to distributions and correlation structures to estimate the distribution of outstanding losses.[43] Heckman has applied distribution and regression techniques to estimating the expected ultimate value of claims already reported and of IBNR claims.[44] For the two latter methods, the conditional loss distribution provides the information needed to calculate risk loads for the reserves.

There are some unsolved problems associated with approaches based on probability distributions. Research is in progress to develop methods for measuring correlations of lines or segments of the business with other segments, but there is no generally accepted approach for incorporating correlations into the measure of risk. This is believed to be important, as these correlations may make a significant contribution to, and in some cases may reduce overall risk. In addition, some of the risk load procedures such as those based on standard deviation and variance approaches are not value additive. That is, the risk load of the sum is not equal to the sum of the risk loads.

Advantages

- Actuaries have used the approaches for a long time to compute risk loads.

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[40] Meyers, Glenn, "The Cost of Financing Insurance", paper presented to the NAIC's Insurance Securitization Working Group at the March 2000 NAIC quarterly meeting.

[41] Philbrick, Stephen W., "Accounting for Risk Margins," Casualty Actuarial Society Forum, Spring 1994, Volume 1, pp. 1-87.

[42] Meyers, Glenn G., "Risk Theoretic Issues in Loss Reserving: The Case of Workers Compensation Pension Reserves," Proceedings of the Casualty Actuarial Society (PCAS), LXXVI, 1989, p. 171

[43] Hayne, Roger M., "Application of Collective Risk Theory to Estimate Variability in Loss Reserves," Proceedings of the Casualty Actuarial Society (PCAS), LXXVI, 1989, p. 77-110

[44] Heckman, Philip, "Seriatim, Claim Valuation from Detailed Process Models," paper presented at Casualty Loss Reserve Seminar, 1999.

- This is an area of active research with many worked out examples of how the method can be applied.
- The method is intuitive: risk load is related to actual risk for a body of liabilities.
- The data required to compute the risk loads is readily available within many insurance companies and many actuaries are qualified to perform the computation.
- Many reserving actuaries are familiar with using aggregate loss probabilities to establish confidence intervals around their reserve estimates.
- This method can be used with company-specific data.
- This method can be used by line to reflect unique line of business risks.

Disadvantages

- The approaches have often been criticized as being inconsistent with modern financial theory, as classically formulated, relative to compensation for diversifiable risk. For example, the risk loads often fail to satisfy the *one-price rule*, whereby two insurers offering identical insurance coverage would charge the same price.
- Sometimes the weight given to process risk relative to parameter risk in determining the risk load can appear to be too large. Many researchers and practitioners believe that risk loads apply only to nondiversifiable (parameter or systematic) risk not to unique (or process) risk. It should be noted that it is not universally accepted that only diversifiable risk matters when computing risk loads.[45,46]
- The risk loads may not satisfy value additivity. As a result, two companies with identical lines but a different mix can have different risk margins (see discussion below).
- A large number of methods for doing these calculations exist, yielding a variety of results. There is little guidance regarding which of the available methods is appropriate for a given set of circumstances.
- Certain parameters are not only subjective, but there is little guidance on how to calibrate them. For instance, only the more recent papers discuss a conceptual framework for selecting λ.
- Parameters are often determined in a subjective manner and may therefore be inaccurate.
- Actuaries are still struggling with measuring the correlations between lines of business. This may be a significant source of risk to companies.

Note that the lack of value additivity is not universally accepted as a disadvantage. For example, some believe there is much less risk in a $1 million (undiscounted) share of a large company's auto liability reserves than in the entire $1 million in undiscounted auto liability reserves for a small regional insurer. Thus, the former may be worth more than the latter (i.e., valued with a smaller risk margin).

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[45] Cornell, Bradford, "Risk. Duration and Capital Budgeting: New Evidence on Some Old Questions", Journal of Business, 1999 vol 72, pp 183-200.

[46] Stulz, Rene, "Whats wrong with modern capital budgeting?", Address to the Eastern Finance Association, April, 1999

Method 6 - Using the reinsurance market to estimate the fair value of liabilities

The reinsurance market offers the most direct approach to estimating the fair value of an insurance company's liabilities. Blocks of liabilities are often sold either on a retrospective basis, in transactions such as loss portfolio transfers, or on a prospective basis in more commonly purchased excess of loss treaties. The price structures associated with these contracts provide another glimpse of the implicit risk load required to record the liabilities at their fair value.

Reinsurance prices may require some adjustment before they could be used to estimate the fair value of liabilities. For example, market prices offered by some reinsurers reflect an embedded option value equal to the value of their default on their liabilities. Such market prices would have to be adjusted upward to remove this default value. Another example is portfolio transfers that include customer lists or renewal rights. The effect of these lists or rights on the total price would have to be isolated and removed before the portfolio transfer price could be used for a fair value estimate.

There are numerous practical issues that need to be addressed before the method can be implemented in practice. For example, how would a ceding company measure the risk loading in the reinsurer's price structure? How could the analysis of a particular treaty structured to reinsure a portion of the company's liability be generalized to estimate the fair value of all its liabilities? Possible approaches are:

- Reinsurance Surveys: On a regular basis, leading companies can be surveyed to evaluate the risk loading implicit in their reinsurance structure. The survey can be structured to discriminate between various lines of insurance and sizes of ceding companies. The implicit risk loading can then be published and employed by all companies with a particular set of attributes (size, type of business, balance sheet leverage, etc.). Note that this is a controversial suggestion. (*Asking companies to share loss information is one thing. Asking them to share pricing information is something else entirely. First, the pricing "assumption" may not be as objective an item as a loss amount. It may be a gut call that varies by sale. Second, there are many more antitrust issues in sharing pricing information than in sharing loss information.*)

Conceptually, this would operate similarly to the PCS Catastrophe Options currently offered by the Chicago Board of Trade. These options are priced based on an index, which is constructed in the following way:

> *"A survey of companies, agents, and adjusters is one part of the estimating process. PCS conducts confidential surveys of at least 70% of the market based on premium-written market share. PCS then develops a composite of individual loss and claim estimates reported by these sources. Using both actual and projected claim figures, PCS extrapolates to a total industry estimate by comparing this information to market share data."* [47]

- Extrapolating from a company's own reinsurance program: Companies that submit their reinsurance programs to bid will receive reinsurance market price information from a number of providers. At a minimum, even the information contained in one well-documented bid may be sufficient to compare the reinsurer's price to the ceding company's best estimate of the ceded liabilities discounted at the risk-free rate. In practice, a number of adjustments to this risk load may be appropriate. For example, if the only reinsurance purchased is high layer excess, then the risk loading will be commensurate with the increased risk associated with that layer. Publicly available increased limits tables (e.g., ISO) might be suitable in some cases to evaluate the relative risk at each layer of coverage. An insurer's policy limits profile can then be employed to evaluate the weighted total limits of their liability portfolio and the resulting risk load.

Advantages

- The reinsurance market is the closest structure to a liquid market for insurance liabilities;
- Most insurers have access to the reinsurance market and can therefore gain information regarding their unique risk profile;
- Similar to catastrophe options, once the survey results are published, it would be relatively straightforward to estimate fair value

Disadvantages

- Results can be sensitive to capacity changes in the reinsurance market. As such, the values at any point in time may not represent future values. In fact, in highly competitive market cycles, a negative risk load could be obtained for some coverages.
- Unstable reinsurance prices also make it difficult to update estimates for each reporting period. If the information required for the fair value estimate could not be obtained quickly enough, all estimates would have to be recalculated each reporting period.
- The credit risk of the reinsurer's default on its obligation is embedded in the price. For reinsurance, this can be material, and would have to be removed, but the isolation of this item from the total price (and other risks) may be problematic.
- This approach would also raise difficulties in updating the values, as it would require

[47] Chicago Board of Trade web site: PCS Catastrophe Insurance Options – Frequently Asked Questions

regular surveys or continual shopping of ceded business to reset the risk charges.[48]

- Some reinsurance quotes are not transparent, so that the implied risk loading may be difficult to ascertain. Often, the insurer and reinsurer would each have different estimates of the expected loss and other components of price.
- The users of this method will only sample the reinsurance market. I.e., they will not be using the entire market for estimation. This could introduce bias.
- Reinsurance markets focus much more on prospective exposures rather than past exposures, partly due to current accounting treatment of most retroactive reinsurance contracts. As such, there are fewer market prices potentially available (and a much smaller market) for reinsurance of existing claim liabilities.
- Reinsurance prices embed antiselection bias. The price of reinsurance for the portion of an insurer's portfolio ceded may be higher than the price if all risks were ceded.

[48] Note that continual updates would be required under fair value accounting. This is because fair value accounting is meant to be an idealized market value, i.e., an actual market value if a sufficiently active market exists, or an estimate of what a fair market value would be otherwise. As such, a fair value estimate would have to be updated as often as an active market value would be updated. In general, market values in an active market change constantly.

Method 7 - Direct estimation of market values

This is the method of Allen, Cummins and Phillips.[49] In this approach, a time series of publicly traded insurer data is analyzed. The output of the analysis is an estimate of the market value of each insurer's liabilities for each year of the history. The market value of liabilities is derived by subtracting the market value of the equity from the market value of total assets. The market value of equity is calculated by extending the method of Ronn and Verma to avoid the problem of including intangible asset values in the equity measurement.[50] Here, the equity value is determined so that the measured volatility of the insurer's stock price and of its asset values are consistent. This method is described in the section on measurement of credit risk The market value of assets is estimated from the separate asset categories, most of which are publicly traded.

The market value of liabilities thus obtained contains an embedded option value equal to the value of default on the liabilities. This value of the default can be separately determined by the of Ronn-Verma method.

Adding back the default value gives the market value of the liability as if there were no credit risk. Next, the nominal (undiscounted) value of the liability is compared to the no-default market value to determine the implied interest rate at which the nominal value is discounted to get the market value. This calculation requires an estimation of the payment pattern of the liabilities (also used in the above-average payment duration). The risk margin, as a reduction to the risk-free rate, is the difference between the risk-free rate and the implied rate underlying the market value.

A numerical illustration of the method is shown in the Appendix.

Advantages

- The method is theoretically sound. It produces a risk load consistent with modern financial theory without requiring the calculation of a beta.
- The method is objective and the analysis is reproducible
- The method is a type of direct measurement of liabilities that may be desirable by the accounting profession. However, the measurement is direct for the industry, but not for a particular company

Disadvantages

- There are difficulties with the estimation of parameters:
  a) Some insurers in the data are also life insurers, or involved in multiple lines not relevant to a particular company at issue; carving them out requires estimating the

[49] Allen, Franklin, J. David Cummins and Richard D. Phillips, 1998, "Financial Pricing of Insurance in a Multiple Line Insurance Company", Journal of Risk and Insurance, 1998, volume 65, pp. 597-636.
[50] Ronn, Ehun I., and Avinash K. Verma, 1986, Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model, Journal of Finance, 41(4): 871-895.

market equity value of these other operations.

b) Some companies are members of financial conglomerates, or general conglomerates (e.g., General Electric).

c) Not all insurers are publicly traded. These include foreign companies, privately held companies and mutuals or reciprocals.

- The liabilities may be under- or overstated in the financial statements. Therefore, the market value may reflect an adjustment to the book value, based on market perceptive of this bias. Any perceived change in this bias may make prior history unusable.
- Measurement problems make it difficult to provide a stable estimate for individual line of business risk margins. It is also difficult to get a reliable estimate for an individual firm.
- Most actuaries don't have any experience with this method. It has not yet been used in practice.

Method 8 - Distribution Transform Method

A number of authors have proposed risk-loading procedures based on transforming the aggregate loss probability distribution.[51] The risk-loaded losses are computed from the mean of the transformed distribution. A simple example of such a transform is the scale transform:

$$x \rightarrow kx$$

where x = the aggregate losses
$k > 1$

As a simple, but unrealistic example (because insurance losses tend to have positive skewness), x is a normal variable, that is, if aggregate losses follow a normal distribution and k is 1.1, then the loss distribution's expected mean is shifted upwards by 10%. Thus, a company purchasing the liabilities would require 10% above the present value of the liabilities (at a risk-free rate), in order to be adequately compensated for the riskiness of the liabilities. If one is using this distribution to compute primary losses for an exposure where the limits applied to losses in the aggregate, the expected mean would be increased by less than 10%, but losses excess of the primary limit will be increased by more than 10%.

In the more recent literature on the transform method the power transform is used.[52] (Other transforms such as the Esscher transform also appear in the literature). This approach raises the survival or tail probability to a power.

$$S^*(x) = S(x)^r$$

where $S(x)$ = the original survival distribution, $1\text{-}F(x)$, or 1 minus the cumulative probability distribution);
$S^*(x)$ = the transformed survival probability.

If r is between 0 and one, the tail probabilities will increase and the transformed distribution will have a higher mean than the original distribution.

The choice of the transformation parameter r is guided by the uncertainty of the business being

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[51] Venter, Gary G., 1991, Premium Implications of Reinsurance Without Arbitrage, ASTIN Bulletin, 21 No. 2: 223-232. Also,
Wang, Shaun, 1998, Implementation of the PH-Transform in Ratemaking, [Presented at the Fall, 1998 meeting of the Casualty Actuarial Society]. Also,
Butsic, Robert P, 1999, Capital Allocation for Property Liability Insurers: A Catastrophe Reinsurance Application. Casualty Actuarial Society Forum, Fall 1999.

[52] Wang, Shaun, 1998, Implementation of the PH-Transform in Ratemaking, [Presented at the Fall, 1998 meeting of the Casualty Actuarial Society]. Also,
Venter, Gary G., 1998, (Discusssion of) Implementation of the PH-Transform in Ratemaking, [by Shaun Wang; presented at the Fall, 1998 meeting of the Casualty Actuarial Society]

priced. The greater the uncertainty, the lower r will be. In practice, this may mean that one calibrates the parameter by selecting a transformation that approximates current market premiums for a given class of exposures. Wang suggests that using a distribution transformation to derive risk loads is the equivalent of including a provision for parameter risk, but not process risk, into the formula for risk loads. Thus, one might select r based on subjective probabilities about the parameter uncertainty of the business.

Wang (1998) has suggested that one could apply this approach in two ways.[53] The first applies a transform separately to the frequency and severity distributions used to price policies. The second transforms the probability distribution of aggregate losses (i.e., the convolution of the frequency and severity distributions). However, Venter suggests that one could obtain inconsistent results when applying a transform to aggregate losses, and prefers working with the frequency and severity distributions.[54]

Option pricing theory and the distribution transform method are related. The parameters of the probability distributions used in the option pricing formulas typically reflect "risk neutral" probabilities, rather than real probabilities. Thus, for example, the parameters used to price interest rate options are generally derived from current actual prices of bonds of different maturities, or from the current yield curve, rather than from empirical time series data of the various interest rates. One could view the "risk neutral" probabilities as a transformation of the distribution for the underlying asset values.

Advantages

- The method produces a risk load consistent with modern financial theory without requiring the calculation of a beta. Risk loads are value additive. (Note again that there is not universal agreement among actuaries that risk loads should be value additive.) The approach is similar to that used in pricing options.
- The method is conceptually straightforward to understand and explain. Once r or a similar parameter has been selected, it can be reused subsequently.
- This approach is currently used in reinsurance pricing.
- It is theoretically viable for estimating risk loads by layer. Many of the other methods do not address layers or deductibles.
- It is an area of active research for those investigating risk load methodologies.

Disadvantages

- It is not in common use for producing prices or risk loads on primary business. Currently its primary use is in producing risk load for layers.

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[53] Wang, Shaun, 1998, Implementation of the PH-Transform in Ratemaking, [Presented at the Fall, 1998 meeting of the Casualty Actuarial Society].

[54] Venter, Gary G., 1998, (Discusssion of) Implementation of the PH-Transform in Ratemaking, [by Shaun Wang; presented at the Fall, 1998 meeting of the Casualty Actuarial Society]

- As currently applied, in order to calibrate the parameters, it often requires knowledge of the risk loads on primary business.
- Because it is a new approach, actuaries are not as familiar with it as with some of the others presented in this paper.
- The parameters may be selected based on the analyst's experience with a particular line of business. This introduces an element of subjectivity, where different analysts may choose different values for the parameter.
- It is not clear which transform choice to use. Many of the transformation methods are chosen for their mathematical tractability, and are not supported with empirical evidence.

Method 9 - The Rule-of-Thumb Method

The methods presented so far require that the person computing the risk-adjusted present value of liabilities do original analytical work. In some situations there may not be adequate data or other resources to develop the risk adjustment from scratch. In such situations it might be appropriate to use a rule of thumb that provides a "quick and dirty" way to derive a risk adjustment. Such methods would be relatively easy to apply but would produce broadly reasonable results. Examples of rules of thumb would be:

- Compute a risk adjusted discount rate by subtracting 3% from the risk-free rate.
- The risk load should be 10% of the present value of General Liability liabilities and 5% of the present value of Homeowners liabilities.

The numbers in the examples above are for illustrative purposes only. A separate body of actuaries and other experts could determine actual guideline values. This group would review existing research and perform additional studies where necessary. Quite likely, it would consolidate results from using one or more of the other methods in this document.

Advantages

- For the individual company, it would be simpler to apply than any of the other alternatives. It would reduce the work effort for actuaries and others, who would not have to separately develop risk adjustments.
- This approach may lead to industry standard risk adjustments being used, thus creating comparability from company to company.
- It may reduce the likelihood that a risk adjustment methodology can be used to manipulate a company's financial statements.

Disadvantages

- Fair values produced using this approach may be less accurate because the unique risk factors for a company may not be reflected.
- It precludes actuaries from applying methods that reflect new developments for determining risk adjustments.
- An industry body may be required to perform research to parameterize the risk adjustments. This may create antitrust issues. It is not clear that the industry body would be sufficiently authoritative for its research to be used in financial valuations.

Method 10 - Alternative Methods

This paper has presented a number of possible approaches to estimating the fair value of insurance liabilities. Most of these approaches are rooted in analytical methods documented in the actuarial literature. However, research continues into how to determine risk adjustments. Not all current developments are covered in this paper and undoubtedly others will be published. A company may wish to use alternative approaches not presented in this paper. In such cases, there are a number of points one should consider:

- Once selected, the approaches should be used consistently. Changing approaches from year to year may result in inappropriate income statements.
- If the method is changed, it should be documented adequately.
- The risk margin should be positive.

Converting a risk adjusted discount to an additive risk load

A number of the methods presented in this paper produce an adjustment to the risk-free discount rate. Risk adjusted present values of liabilities are then derived by discounted the liabilities using the risk-adjusted rate. An approach to deriving a dollar-value risk load is to work from the risk-adjusted discount rates. This approach might be used if one wanted to discount losses at the risk-free rate and apply the risk load to the losses directly. The procedure begins by discounting the liabilities at the risk-adjusted and the risk-free rate. It then computes the difference between the two discounted quantities. The risk load is this difference divided by the present value of the liabilities, discounted at the risk-free rate. The table below presents an example where this calculation is performed for liabilities of various durations, when the assumed risk-free rate and the risk adjustment remain constant.

Risk Free Rate:	6.0%		
Risk Adjustment	3.0%		
Duration	PV @ Risk-Free Rate	PV @ Risk-Adjusted Rate	Risk Load
1	94.3%	97.1%	2.8%
2	89.0%	94.3%	5.6%
3	84.0%	91.5%	8.3%
4	79.2%	88.8%	10.8%
5	74.7%	86.3%	13.4%
6	70.5%	83.7%	15.8%
7	66.5%	81.3%	18.2%
8	62.7%	78.9%	20.5%
9	59.2%	76.6%	22.8%
10	55.8%	74.4%	25.0%

Unearned Premium (or Unexpired Policy) liability methods

As noted in the background section, a fair value accounting system focuses on the measurement of assets and liabilities, not income. As such, the current recording of unearned premium under U.S. GAAP accounting conventions would be replaced with the fair value of the business written but not yet earned. The methods used to estimate this fair value have much in common with the above methods that estimate the fair value of the liabilities for unpaid losses. However, additional methods may be applicable since it may be easier to discern the market prices underlying earned premium. One can argue that the booked premium represents the "market price" charged by the particular insurer.

One area where such additional methods may be needed is property insurance, particularly where catastrophe exposure exists.

Possible methods to consider include:

- The price at which the business was written, the original entry price. The initial fair value for a policy's liability may be the premium charged (less expenses).
- The price at which the company is currently writing similar business.
- The price at which similar business is currently being written by the market, e.g., a broad average price. It is an indication of the current entry price. (This value may only be available retrospectively shortly after the balance sheet date.)
- The price at which reinsurance is being purchased for this risk, both quota share reinsurance, which prices the entire risk, or excess of loss reinsurance, which should provide a market guide to one of the more volatile components of the risk. This also is an indication of the current exit price.
- An actuarial estimate of the expected value of discounted losses associated with the business written but not yet earned, adjusted for risk. The estimate of the necessary risk adjustment would be based on the above methods for estimating the market value of unpaid losses. In particular, return on equity models, internal rate of return models, and models based on the aggregate probability distribution of losses, can be directly applied to future losses (losses not yet incurred on business written).

Note that the actuarial methods applicable to lines of business that contain a significant catastrophe potential may require modification to consider the seasonality of the exposures.

Summary

A number of methods for computing risk adjustments to discounted liabilities have been presented. These are the approaches that the committee thought were worthy of discussion. Not all would be feasible for the individual company actuary to implement. As fair value becomes established as an accounting procedure, more research and application will be performed, and more methods will become feasible.

Some methods would require an "official" body such as a committee of the American Academy of Actuaries to perform research to establish parameters. Once established, the parameters could thereafter be used at individual companies without further research or analysis being required. This would hold only if one agrees that it is acceptable to ignore risks that are unique to companies, such as those classified under diversifiable risk.

Methods such as those based on CAPM and IRR pricing models should be straightforward to modify for estimating the fair value of liabilities. Actuaries are also well acquainted with methods based on aggregate probability distributions. Actuaries should be able to apply one or more of the methods to a line of business for which they are computing risk-adjusted discounted reserves.

Some methods are more appropriate for some lines of business. For instance, methods based on using risk-adjusted discount rates have been applied to lines of business with longer tails such as Automobile Liability and Workers Compensation. However, they may be inappropriate for short tail volatile lines such as property catastrophe because the risk is not time-dependent. Methods based on applying aggregate probability distributions might be appropriate for such short tail volatile lines. However, their use outside of increased limits and catastrophe pricing has not been well researched.

The direct estimation method is relatively new and has only been applied by academic researchers. Therefore, it could be difficult for practitioners to apply until further study has been done. Using reinsurance pricing to develop a risk load is, in principle, the most consistent with computing market-based estimates of liabilities. However, due to limitations on available data, the extent of the market and a lack of published research on the approach, it might be difficult to apply in practice. There might be special situations where it could be used, such as in evaluating catastrophe liabilities.

In general, risk adjustments based on industry-wide information will be more stable than risk adjustments based entirely on company-specific data. Also, risk adjustments based on individual line of business data will be less stable than risk adjustments established using all-lines data. However, such risk adjustments will fail to incorporate some of the risk components of that are unique to lines of business or to companies.

This summary and discussion provided by the task force of methods available for computing the risk adjusted present value of liabilities demonstrates that actuaries have the theoretical understanding needed to implement fair valuing of insurance liabilities. We have identified a number of models that are available and appropriate for actuaries to use in estimating fair value liabilities. No issues have been identified that are not susceptible of actuarial estimation.

The following table summarizes our findings on the methods of deriving risk adjustments.

Summary of Features of Estimation Methods

Method	Uses Industry Data	Uses Company Specific Data	Has Specific Time Element	Uses Leverage Ratios	Incorporates Systematic Risk	Incorporates Process Risk	Is Value Additive	Commonly Used in Pricing	Commonly Used for Reserve Margins
CAPM	X		X	X	X		X		
Internal Rate of Return	X	X	X	X	X		X	X	
Single Period RAD	X	X	X	X	X		X	X	
Using Underwriting Results	X		X		X	X	X		
Based on Probability Distributions	X	X			X	X			X
Based on Reinsurance	x	x							
Direct Estimation	x		x		x		x		
Distribution Transforms	x			x	x	x			
Naive Methods	x				x		x		

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Section E - Accounting Presentation Issues

The purpose of this section is to discuss financial reporting presentation issues resulting from a change to fair value accounting. Financial reporting presentation deals with the design of the reporting template, i.e., what financial values should be displayed, and in what format. It assumes that any required value can be determined, such as through the various methods in Section D. While many implementation issues may arise from the choice of a particular reporting template, such issues will not be discussed in this section. All implementation issues will be discussed in the next section (Section F), whether arising from the estimation method chosen (Section D), or arising from the presentation template chosen.

The following actuarial presentation issues will be discussed. This list is meant to stimulate awareness of the various actuarial issues/concerns surrounding presentation and fair value accounting. It is not meant to give definitive guidance on how presentation should be done. The final choice of any presentation template is a judgment call, depending on the goals, priorities and preferences of the template designer(s).

- Historical loss development:
  - risk margins
  - time value of money
- Disclosure of fair value estimation methods.
- Gross versus net (of reinsurance, other recoverables).
- Recognition of premium revenue.
- Income classification:
  - Unwinding of interest discount
  - Interest rate changes
  - Experience adjustments, changes in assumptions.
- Consistent treatment of assets and liabilities
- Different financial statements for insurance vs. noninsurance entities
- Disclosure of credit standing impact
- Consolidated financial statements
- Regulation and tax requirements

1. *Historical Loss Development* - Currently some financial statement exhibits show historical loss development. These exhibits are useful for evaluating management's previous estimates of liabilities, and for evaluating the risk inherent in the estimates. Should these exhibits show historic fair value estimates? Issues associated with doing so on such exhibits include:

   a) Risk margins. The risk margin for a given coverage year runs off over time to a value of zero as the losses are paid. In addition, the perception of risk changes over time. For example, the risk margin of hurricane losses would have been valued less before the recent large hurricane losses in Florida. The perceived risk for mass tort liabilities is also now much greater than believed in the 1970s and prior. Are the purposes of these historical exhibits furthered or distracted by including historic risk margin estimates in

the reported history?

b) Time value of money. The amount of discount runs off to zero as losses are paid out. Interest rates also fluctuate over time. As such, historical exhibits that reflect the time value of money might show development trends impacted strictly by changes in new money investment yields or the unwinding of interest discount. The economic impact of these trends depends on the how the corresponding asset portfolio was impacted. How should the historic loss development exhibits handle this issue?

A possible way of addressing the above two sub-issues might be to require historic loss development exhibits to be on an undiscounted, expected value basis. This would isolate the issues surrounding the expected value estimate (although it would ignore the issues surrounding the amount of the discount or risk margin). An alternative approach for evaluating the amount of the discount would be to require loss development exhibits to show all actual and projected values discounted back to the beginning of the coverage year. This would allow reflection of time value of money issues and expected value estimate issues, without the distortion from interest rate fluctuations. The issue would remain regarding whether to use the historical interest rates at the first valuation of the coverage year or restate at the current interest rates.

2. *Disclosure of fair value estimation methods* - Should the methods used to determine the fair value estimates be disclosed in the financial statements and if disclosed, where, and in what levels of detail? Depending upon the method(s) employed, the fair value components may differ by line of business as well as subline of business, duration of payments, location of the liabilities, and the currency that will pay out the liabilities. In addition, any changes to the method(s) or the values used to determine the fair value of liabilities may need to be disclosed in the financial statement.

3. *Gross versus net (of reinsurance, other recoverables).* - A decision needs to be made with regard to how much of the fair value presentation should be on a gross versus net basis. Should fair value adjustments be included in both gross and recoverable reportings, or would an overall net adjustment suffice? Where various amounts are reported in more detail, should these fair value adjustments be disclosed in the aggregate or by individual reinsurer or excess insurer (for a self-insured's financial statement)?

4. *Recognition of Premium Revenue* – How should premium revenue be recognized, under a fair value accounting system? Currently, premium revenue is recognized for property/casualty companies based on earned premiums, which equal written premiums plus the change in the unearned premium reserve. Since fair value accounting would require estimating the future losses associated with the unexpired portion of the policy, should this estimate of future losses be included in the loss reserves, and premium revenue become written premium? If so, the unearned premium reserves could disappear.

Long duration policies cause additional presentation issues if premium revenue is defined as written premium. Should revenue from long duration policies be reported or disclosed separately in financial reports, so as not to distort analyses of annual exposure growth? These policies may also distort otherwise reported policy year loss development trends. Should a single long duration policy be broken into separate 12-month policies for the purposes of policy year loss development exhibits?

Special policy features such as death, disability, and retirement benefits may also be impacted by a change in premium recognition. Should such benefits be accounted for as loss reserves or as unexpired policy benefits, under a fair value system?

5. *Income classification.* - Under a fair value accounting system, recorded balances (such as loss reserves) will reflect the time value of money, estimated future cash flows, and risk adjustments. Any of these components are subject to change over time, as the balance runs off. How should the changes in this components be reflected in income? The following discussion contains a discussion of the components.

   a) Unwinding of interest discount – The principal question here is whether the unwinding of interest discount should be separately reported in income, and if so, where? Currently when companies discount property/casualty loss reserves for anticipated investment income, the unwinding of this discount over time flows through underwriting income, as a change in incurred losses, and is not separately identified. Discount unwinding for life insurance reserves also flows through as a change in incurred losses, but is separately identified in U.S. statutory accounting statements. Alternatively, the unwinding could be reported as interest expense, not in underwriting income.

   Reflection of this unwinding in incurred losses maintains consistent treatment of any item affecting paid or outstanding losses, at the cost of distorting comparisons of losses to charged premiums. This distortion is caused by premiums being fixed in time, with no reflection of future investment income potential. If loss reserve discount is all unwound in incurred losses, then reported histories of incurred losses to premiums will tend to show excessive loss ratios for any long-tail line, distorting the true profitability picture. Reflection in interest expense allows more direct comparisons of losses to charged premiums.

   b) Interest rate changes. How should changes in market interest rates used in discounting existing liabilities be reflected? Should the effect of these changes flow through underwriting? Should the effect flow through investment earnings? Should it be reflected in the same manner as unrealized capital gains, as a change in interest rates should affect both liabilities and assets similarly in a matched portfolio? Or should changes in loss reserves for any purpose other than unwinding of discount (e.g., change in expected ultimate payout, change in expected payment pattern, change in interest rates, etc.) all be reported in the aggregate, with no differentiation as to the cause?

c) Experience adjustments, Changes in assumptions. Another issue is how should an insurer present the effect of experience adjustments and changes in assumptions? Should changes due to actual cash flows being different from expected be reported separately from changes in assumptions about the future? The first are "realized" and the second are currently "unrealized". Should there be an effort to keep consistency with how similar issues for invested assets are treated? Should changes in risk margins be isolated, or combined with changes in any other assumptions?

6. Consistent Treatment of Assets and Liabilities - This issue arises whenever recoveries are available (beyond the initial premium) to offset changes in the estimated liabilities. Examples include retrospectively rated insurance policies, deductible policies, policyholder dividends, (re)insurance policies for which reinsurance (or retrocession) protection exists, and contingent commission plans (on reinsurance contracts). In these examples the change in a claim (or similar) liability should lead to an offsetting change (either in full or partial) in either an asset or another liability.

   For example, a direct retrospectively rated insurance policy may be subject to reinsurance. This could result in at least three balance sheet entries after losses have started to occur:
   - a liability for direct claims
   - an asset (liability) for additional (return) premiums on the retrospectively rated policy
   - an asset or contra-liability for the portion of the claim liability that is recoverable from reinsurers.

   The presentation issue regards the manner of reporting these amounts and their fair value adjustments in a consistent manner, and in such a way that their individual adjustments will not easily be taken out of context.

   (Note that to the extent the retrospective rating plan and the reinsurance coverage transfer risk, the overall net risk adjustment for all three items should be less than the risk adjustment on direct claim liabilities. This implies that the risk adjustment for some of the individual components may be a help to surplus.)

7. Different Financial Statements for Insurance Versus Non-Insurance Entities - Should financial statement requirements differ for insurance versus non-insurance entities? This issue arises when comparisons are attempted between insurers and self-insurers, traditional insurers and captive insurers, or insurers and other financial services companies selling similar products. The issue also arises with consolidated financial statements when the reporting entity includes both insurance and non-insurance operations.

8. Disclosure of Credit Standing Impact – If the fair value of liabilities is to include the impact of credit standing, these impacts should probably be disclosed separately in the financial statements. (The credit standing issue is discussed in more detail in Section H.)

9. Consolidated Financial Statements – Fair valuation generally requires that transactions be measured as if they were at arms-length. A key question regarding consolidated versus legal entity reporting is the difficulty in measuring fair value for legal entities of the same quota share group, especially when applied to a fresh start valuation of old claim liabilities. Thus, it may be necessary to estimate fair value for each pool member's direct book of business separately, rather than determining the fair value of the total quota share pool and then allocating the total pool result to the pool members.

   A related issue is how to report values containing risk margins if the component reporting entities have risk margins that do not add to the total risk margin of the consolidated entity. Should the component risk margins be scaled back to show value additivity?

10. Regulation and Tax Requirements – The change to fair value will impact both the absolute value of many of the statement items as well as the format of the financial statements. This may impact existing regulatory and tax use of financial information that may have come to depend on the existing financial statements. The final "fair value" statements may have to include accommodations for these needs. Alternatively, the regulatory and tax processes could be changed to adapt to the new financial statements. A third alternative would be to create additional supplemental reporting, based on the old accounting standards, as if nothing had changed. Examples of areas potentially impacted include federal income taxes, solvency testing, and market conduct exams.

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Section F - Implementation Issues

Introduction

Up to now, this paper has dealt primarily with two areas associated with fair valuing insurance liabilities. The first of these areas was contained in Sections C and D, "Fair Value Alternatives" and "Methods of Estimating Risk Adjustments." Sections C and D discuss a variety of ways that a liability's fair value could be determined in theory. The second area addressed so far in the paper was that of presentation. This was the subject of Section E.

The current section, Section F, goes the next step, discussing issues arising from the implementation of these concepts and methods and presentations. Implementation issues can be categorized as:

1. **Issues related to the availability and usability of market information.** These include:
   - 1.1. The robustness of the transactions occurring in the marketplace.
   - 1.2. Intangibles included in market prices that might not be relevant in a fair value liability valuation.
   - 1.3. Influence of information asymmetry on market prices.
   - 1.4. The existence of disequilibriums or temporary disruptions in market prices.
   - 1.5. The lag between event occurrence and the reporting of the event in the marketplace.
2. **General issues related to developing parameters for fair value methods.** These are issues that are not related to any particular fair value methodology. Rather they deal with concepts that can be thought of as some of the theoretical underpinnings of fair value accounting. These include:
   - 2.1. Whether or not a risk charge should always be included in the fair value of a liability.
   - 2.2. What properties a risk charge should have, specifically related to the inclusion of a value for diversifiable risk and value additivity.
   - 2.3. Whether an adjustment for an entity's own credit risk should be included in that entity's fair value valuation of its liabilities.
   - 2.4. The issues that need to be weighted when deciding to use industry-wide data or company-specific data in a fair value calculation.
3. **Application of fair value methodologies – general issues.** This section discusses issues that relate to questions that fair value practitioners will need to address when preparing fair value financial statements. These issues are ones that relate to how to physically create numbers to put on fair value financial statements, but that are not specific to any one methodology. Included under this heading are:
   - 3.1. The steps the actuarial profession might need to take to prepare for the implementation of a new requirement.

3.2. What items should contain fair value adjustments in their carrying value?

3.3. How renewal business ought to be considered when developing fair values.

3.4. How judgment should be accommodated when developing fair value estimates.

4. **Application of fair value methodologies — method-specific issues.** This section highlights issues associated with different methods that a practitioner ought to be aware of when choosing a fair value methodology. The specific issues being highlighted are:

   4.1. Methods that rely on CAPM.

   4.2. Methods that rely on public data.

   4.3. Methods that produce results on a total company-basis only.

   4.4. Time period sensitivity of some methods.

   4.5. The inclusion or exclusion of a value for process risk in valuations created by different methods.

   4.6. The existence or lack thereof of value additivity in valuations created by different methods.

   4.7. The appropriateness of different methods for the valuation of volatile, short-tailed lines of business.

5. **Presentation issues**. These are issues associated with the actual presentation of results in a fair value financial statement. Items include:

   5.1. Updating carried values from valuation date to valuation date, especially between full-scale analytical re-estimations of appropriate carrying values (in accounting parlance, a "fresh-start" valuation).

   5.2. Issues associated with the initial development of exhibits that show historical development.

1. Issues related to the availability and usability of market information

This is the first item to be discussed because it is FASB's and the IASC's stated preference that market valuations be used wherever possible. However, we are skeptical as to the usability of market information for developing fair value valuations of insurance liabilities. The five specific reasons for this skepticism are as follows:

1.1. Is the observed market active and robust enough for fair value estimation purposes? A key principle espoused by both FASB and the IASC is that the first choice for the development of fair values is from the marketplace.[55] However, there is not currently much of an active market that can be used to establish price comparisons. Moreover, the transactions that are being done may suffer from a lack of "market relevancy" whereby the marketplace transaction was for a block of liabilities that was similar but not exactly the same as the block of liabilities a company is trying to value. The company in this situation is faced with trying to decide how the market would respond to the differences between the company's liabilities and those that were involved the marketplace transaction.

1.2. The observed market values may contain intangibles not relevant to the valuation at hand. A similar but unrelated marketplace issue is the quantification of the value of noneconomic considerations in a market price. A company could have a variety of reasons for accepting one market price over another that are particular to that company. One example could be the nature of the relationship that exists with a particular reinsurer. The chosen reinsurer might not be the lowest cost option available to the company, but because the company trusts its relationship with the reinsurer, the company may feel the noneconomic "relationship value" is worth the extra cost. A different company looking to price a similar block of liabilities might not have the same relationship with a reinsurer. For the second company, then, the relationship value does not exist and the market price assigned to the first company's liabilities would not be appropriate valuation for the second company's liabilities.

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[55] There is no universally accepted definition of "fair value" to-date, although they all follow the same general concept given by this short definition. The detailed definition that FASB is proposing can be found in FASB's Preliminary Views document titled "Reporting Financial Instruments and Certain Related Assets and Liabilities at Fair Value," dated December 14, 1999, and labeled "No. 204-B." The definition starts on paragraph 47, with discussion and clarification continuing through paragraph 83. Paragraph 47 states: *"Fair value is an estimate of the price an entity would have realized if it had sold an asset or paid if it had been relieved of a liability on the reporting date in an arm's-length exchange motivated by normal business considerations. That is, it is an estimate of an exit price determined by market interactions."*

The IASC has a similar definition (found on page A181 of their Insurance Issues Paper, released November 1999). It reads: *"The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction."*

1.3. **Available market information, such as stock analyst estimates, or isolated reinsurance prices may not be reliable due to information asymmetry.** The market price for an actual liability traded on an active market is likely to be quite different than the market value of an insurer's entire portfolio of liabilities. It is the latter item that is important in fair value accounting, not the former. Unless all the insurer's liabilities are transferred, the assuming reinsurers will quite rationally believe that the ceding insurer is selecting against the reinsurer. This situation arises because the market (the reinsurers) does not have access to the insurer's private information on the liabilities. Thus, the "actual market price" might not be a better fair value representation than an internal cash flow-based measurement unless most of the insurer's liabilities are actually transferred.

1.4. **Market data available at a given valuation date may be distorted by disequilibriums or temporary disruptions.** The existence of an underwriting cycle can be viewed as tangible evidence of the ongoing disequilibrium in the insurance marketplace, whereby product pricing swings back and forth between underpricing and overpricing generally over a seven-to-ten-year cycle. Market disruptions can be characterized as new events that lead to significant uncertainty and temporary disruption in the market for insurance products. Examples can include a threatening hurricane, a newly released wide-ranging court decision and new legislation (e.g., Superfund, or California Proposition 103). At such times, market prices right after the event may be wildly speculative, or the market may even be suspended, greatly complicating the use of market prices for fair value valuations.

1.5. **The data available in the marketplace may be out of date.** Depending upon the source being considered, there are often lags between event occurrence and event reporting. For example, an insurer, on behalf of its participation in an underwriting pool, may be exposed to certain liabilities that will ultimately be shared by all members of the underwriting pool. If someone were to base a fair value estimate on the pool's reported financials, the fair value estimate could reflect a lag of anywhere from several months to several years between when the pool actually experienced the results being reported and the reporting of them.

2. General issues related to the development of parameters for fair value methods

These issues are ones that do not specifically pertain to any one fair value method. These are "concept-type" items. Some of these, such as risk charge and credit risk, are items that relate to the general concepts that will underlie fair value implementation. Others, such as the use of industry-wide versus company-specific assumptions are issues that can not be resolved with a global decision and instead will need to be considered each time that a fair value methodology is applied.

2.1. **Should a risk charge always be incorporated into the fair value of a liability?** Most of the guidance to date (from the FASB and IASC) mandates including such a risk charge when it is material and estimable, and can be "estimated" from market information.

Paragraph 62 of FASB's Statement of Financial Accounting Concepts No. 7, Using Cash Flow Information and Present Value in Accounting Measurements, says:

> "*An arbitrary adjustment for risk, or one that cannot be evaluated by comparison to marketplace information, introduces an unjustified bias into the measurement. ... in many cases a reliable estimate of the market risk premium may not be obtainable.... In such situations, the present value of expected cash flows, discounted at a risk-free rate of interest, may be the best available estimate of fair value in the circumstances.*"

Given that there is no active market for many insurance liabilities, there is no readily available, direct information on the market risk premium associated with their fair value. The market risk premium would have to be estimated. It is unclear as to what marketplace information would be required under such guidance for an acceptable estimate of the risk premium. Would the information have to be insurance specific or even insurance product specific, or could it be based on overall market pricing for risk in general financial markets? It is also unclear how much judgment may be used to produce an acceptable estimate of this risk premium.

If the guidance is worded and interpreted too stringently, then it may never be possible to include a risk premium in the fair value of insurance liabilities. Liabilities of high risk would be indistinguishable from liabilities of low risk, as long as the present value of expected cash flows was the same. More lenient interpretations may allow risk premiums for the more common liabilities, but the more unusual or higher risk liabilities may not qualify for a risk premium. This would result in a lower liability value (due to absence of a risk premium) for the highest risk items, a counterintuitive result. Attempts to always include a risk margin may raise reliability and auditability issues.

2.2. What properties should risk margins have? The following two items are separate, but related. They are separate in that each is an issue in its own right, but they are related in that it may only be possible to reflect one or the other, depending upon the fair value methodology that is chosen. For example, a methodology that reflects process risk in each line of business within a company might result in a series of fair values for each line, that when added together, produce a fair value in excess of the fair value that would be applicable to the company as a whole. This would be a reflection of process risk that violates value additivity. Both of these are discussed in greater detail in Section D.

- Should a value be placed on process (diversifiable) risk in the valuation?
- Should results have value additivity or not?

2.3. Should an adjustment for an entity's credit risk be incorporated into that entity's fair value of its liabilities? Section H contains the discussion of this issue.

2.4. Use of industry-wide assumptions. The two options for data and assumptions to be used in the methodologies described in Sections C and D are industry-wide or company-specific ones. Consideration must be given to the balance between the greater reliability of the industry data and the greater applicability of the company-specific data. Availability of data at the industry or company level is also a factor in selecting data for risk adjustment computations. Industry-wide data provides more consistent and reliable results, but may overlook important differences between the risks underlying the industry data and the company-specific risks being valued. Company-specific data will be more reflective of the underlying nature of the risks being valued, but the volume and the volatility of the data must be considered. If the company-specific data is too sparse or too volatile, it might not be usable. This is an issue that will need to be addressed on a situation by situation basis.

3. Application of fair value methodologies – general issues

These issues relate to the questions that fair value practitioners will need to address when preparing fair value financial statements. These issues are ones that relate to how to physically create numbers to put on fair value financial statements, rather than concept issues such as "what does fair value mean?" In this section, application issues are divided into two groups: issues that are not specific to any one methodology ("general" application issues) and those that are methodology specific. This segment will address the general issues. The methodology-specific issues are discussed after the general issue discussion.

3.1. What steps will the actuarial profession need to take to prepare for the implementation of a new requirement? As with any new requirement, the switch to a fair value valuation standard for property/casualty insurance liabilities would probably result in many unanticipated consequences. Many of these consequences would not be evident at first, and may take time to resolve once they are discovered. This may involve refinement of existing and development of new actuarial models and revisions to the initial accounting standards.

3.2. Fair value accounting will affect more than just loss reserves. Should the same methodologies that are being used for loss reserves also be used for other items? How can consistency of underlying assumptions be maintained in the valuation of all items with fair value adjustments?

Examples of the items that might warrant fair value adjustments include:

- The liability associated with the unexpired portion of policies in-force at the valuation date
- Liability associated with the unexpired portion of multi-year contracts
- Reinsurance contracts with embedded options, including commutation terms, cancellation terms, contingent commission provisions, etc.
- Differences between the fair value of liabilities on a net basis versus a gross basis
- Accrued retrospective premium asset or liability

- **Salvage and subrogation**

The real issue is not so much ***what*** contains fair value adjustments as ***how*** the adjustments are to be made. The accounting standards will determine those items that should contain fair value adjustments. The challenge will be to quantify the adjustments for these different items in a manner that is consistent with the adjustments underlying loss reserves. The implementation issue facing fair value practitioners is to keep in mind that there should at least be consistency of assumptions when producing fair value adjustments for all those items requiring adjustments.

3.3. Should renewal business be considered in the fair value estimate and if so, how? While future accounting guidance will include some discussion of what renewal guarantees are required for renewals to be included in fair value estimates, there undoubtedly will be areas of gray, such as how far a contractual provision regarding renewals has to go before it is considered a ***guarantee*** of renewal. For example, would a guarantee of a renewal at a price no more than the full policy limit (i.e. a riskless contract for the insurer) be considered a renewal guarantee?

3.4. How should judgement be accommodated in the development of fair value estimates? All fair value methodologies have at least some judgmental elements within them. One of the objectives of fair value is to have the same liability held be two different entities have identical carrying values on each of the entities financial statements. The inclusion of judgement in the development of fair value estimates could result in situations in which different analysts are looking at similar liabilities but produce different results solely because of the judgmental elements.

4. Application of fair value methodologies – method-specific issues

Clearly from the pros and cons that accompany each of the methods discussed in sections C and D, no one method is appropriate in all situations. Each method has its strengths and weaknesses that may make it more or less appropriate as a technique for quantifying a liability's fair value. Rather than repeating the methods in sections C and D and identifying each method's implementation challenges, this section will describe implementation issues that are common across methods. A table summarizing the implementation issues associated with each method follows the descriptions.

4.1. Methods that rely on CAPM: as described in section D, the CAPM beta has been subject to criticism from both finance and actuarial sources. Finance theorists note that CAPM only recognizes nondiversifiable risk, assuming an efficient, friction-free market. However, insurance is not characterized by an efficient, friction-free market, which throws into question CAPM's applicability to insurance. Additionally, subsequent research has shown that more factors than just beta are needed to explain company stock returns. From the actuarial perspective, the concern is that estimates of underwriting betas have shown great volatility as well as the possibility of becoming negative.

4.2. **Methods that rely on public data:** not all companies' data is publicly available. This makes any method that relies on publicly available data subject to whatever distortions might exist from using a subset of all companies. Additionally, the data that is publicly available can contain distortions arising from systematic overstatement or understatement of liabilities by the entities providing the data. Lastly, there could be data compatibility issues arising from changes in the available data sets due to such things as mergers, insolvencies, divestitures, acquisitions, restructurings, etc. that alter the entities included in the data sets.

4.3. **Methods that produce results only on a total company basis:** if a method is used that produces results on an all-company basis but presentation requires that fair value results be displayed at a more detailed level, the methodology must be adapted to the presentation needs.

4.4. **Time period sensitivity:** the selection of the historical time period used as the basis for determining future parameters and assumptions could greatly influence the results.

4.5. **Incorporates process risk:** not all methods produce results that include a value for process risk.

4.6. **Value additivity:** not all methods produce results that are value additive.

4.7. **Nature of the line of business:** some methods are not well suited to the development of fair value estimates of liabilities arising from volatile short-tailed lines. All of the methods can be used for the development of fair value estimates of long-tailed lines' liabilities.

List of Considerations when Selecting an Estimation Method							
Method	Reliance on CAPM	Reliance on Public Data	Produce Results only on a Total Company Basis	Time Period Sensitivity	Incorporates Process Risk	Is Value Additive	Not Designed for Short Tail Volatile Lines
Undiscounted Value						X	
Present Value at a risk-free interest rate						X	
Present Value at a conservative interest rate						X	X
Entity-specific measurement						?	
Cost-accumulation measurement							
CAPM	X	X		X		X	X
Internal Rate of Return	X*			X		X	X
Single Period RAD	X*		X	X		X	X
Using Underwriting Results		X		X	X	X	
Based on Probability Distributions				X	X		
Based on Reinsurance		X**		X	X		
Direct Estimation		X	X	X		X	X
Distribution Transforms		X		X	X	X	
Naive Methods		X				X	?

* Can use other methods to develop the parameter input for the required return on equity.

** Public data is required when using public reinsurance quotes. Public data is not needed if the fair value estimates are derived from quotes made specifically for the entity that is developing the fair value estimate.

5. Presentation issues

The items presented here relate to the actual presentation of fair value results in a financial statement. These items are not "actuarial" in nature, but rather relate to the mechanics of financial statement presentation and disclosures required within the financial statement framework.

5.1. The selected method or methods may be appropriate for fresh-start valuations but not interim valuations. Fresh-start in this context refers to the accounting concept, not the tax one. The accounting concept of fresh-start involves "remeasuring an item using current information and assumptions" at each valuation date. (IASC Insurance Issues Paper, page A182.)

For example, suppose a company performs a full-scale actuarial review of reserves for a block of business twice a year. The company must publish financial statements quarterly, though. The liabilities booked after each full-scale review would be viewed as fresh-start valuations. However, for the financial statements produced between reviews, the company will need to have some other method of quantifying the proper liability value to record. The company can't just keep the same liability value from the previous financial statement. At a minimum, the company will need to adjust the recorded value to reflect payments made, unwinding of discount, and changes in the discount rate between the two statement dates. This process of updating the reported value without undergoing a full-scale analysis is an example of an interim valuation.

5.2. How should a restatement of historical exhibits to reflect historical fair value estimates be done? Any exhibits that show historical data would need to be restated to a fair value basis the first time fair value financial statements are produced. The question is how to do the restatement. Fair value should reflect conditions and market perceptions at the valuation date. It is difficult, if not impossible, to reconstruct these items after the fact, when what the outcomes of situations that were then uncertain are now known.

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Section G – Accounting Concepts

Introduction

This section discusses the proposed fair value adjustments in terms of the attributes demanded for sound accounting bases. We set out below the criteria (termed accounting precepts) that accountants and accounting standard setters judge accounting bases by, and consider who the users of financial statements are. We then consider each of the major fair value adjustments in terms of the accounting precepts. The fair value adjustment for the entity's own credit standing is discussed in section H.

Fair value accounting could be applied to any financial reporting; GAAP financial statements, statutory (regulatory) financial statements or even tax returns or internal management reports. While, in the U.S., GAAP financial reporting is determined by the FASB and the SEC, statutory financial statements will remain the responsibility of the NAIC. Even if fair value accounting were adopted for GAAP financial statements, a different non-GAAP basis might well be maintained for statutory financial statements.

Generally accepted requirements for 'good' accounting

The two relevant accounting pronouncements that discuss how to select the most appropriate accounting treatment from a range of alternatives are:

- FASB – Statement of Financial Accounting Concepts no. 2: Qualitative Characteristics of Accounting Information.
- IASC – Framework for the presentation of Financial Statements.

Fortunately, to a large extent the two documents agree as to what is desirable. The FASB document is longer and more discursive.

The IASC framework document defines the object of financial statements as:

> *"to provide information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of users in making economic decisions."*

The desired traits of an accounting system are:

- Relevance
- Reliability
- Comparability and Consistency
- Neutrality
- Cost Benefit

Relevance. To be relevant information must be capable of making a difference to users' decisions. This is achieved either because the information can directly feed into a prediction of the future position of the enterprise, or because the information can be used to refine previous expectations. Untimely information generally has little relevance. The IASC framework details a separate characteristic of "understandability," stating it is an essential characteristic of financial statements that the information is readily understood by diligent users. This is implicit in the FASB concept of relevance, information which cannot be readily understood lacks the characteristic of being able to inform users' decision making. Also implicit in the two concept statements is the concept of transparency, i.e. that items in financial statements should be clearly disclosed so as to maximize their utility to financial statement users. (Neither the IASC nor FASB documents listed above mention transparency explicitly, although the IASC notes "substance over form," that is, following the economic substance rather than legal form as a basic requirement).

Reliability. Reliability depends on the representational faithfulness with which a reported item reflects the underlying economic resource, obligation or transactions. Reliability does not imply a need for certainty, and reporting the degree of uncertainty in an item may provide a better representation of the underlying economic reality than a single point estimate. In certain cases the measurements of the financial effects of items could be so uncertain that enterprises would not be allowed to recognize them in their financial statements (for instance, nonpurchased goodwill). Financial statements should be free from bias in their measurements. FASB, but not the IASC, notes verifiability as a characteristic that helps constrain bias in financial statements.

Comparability and Consistency. Financial statements should be comparable over time and between different enterprises in order to be able to ascertain trends and the relative position of different companies. Conformity to a uniform set of accounting standards helps achieve comparability and consistency.

Neutrality. Financial statements should be free from bias. However, the IASC framework notes that where an element of a financial statement is subject to uncertainty a degree of caution is needed in the exercise of judgment in making the required estimates.

Cost Benefit. The balance between cost and benefit is a constraint on "good" accounting paradigms rather than one of their qualities. If accounting information can only be generated at substantial cost, the relevance and utility of that information to users needs to be established before it is sensible to adopt accounting standards that demand such information.

Fundamental Assumptions

The IASC framework notes two fundamental assumptions for the preparation of financial statements. These are:

- ***The Accruals basis***: Transaction are recognized when they occur, not when cash changes hands, and reported in the financial period to which they relate.

- ***The Going Concern basis***: Financial statements are prepared on the basis that the enterprise will continue in business for the foreseeable future. If there is the likelihood or intention to substantially curtail business or to cease to trade, financial statements may need to reflect this in their choice of accounting policies, and the circumstances are to be disclosed.

Accounting paradigms

There are two types of modern accounting paradigm.

There is the ***deferral-matching*** approach, such as in traditional property casualty accounting. This approach can be characterized as income statement focused. They aim to match revenue and expenses of a period in the income statement of that period, and "park" surplus contractual income flows (future income) and surplus costs (such as deferred acquisition costs) in the balance sheet so they can be reflected in a subsequent periods' income flows.

The alternative is the ***asset-liability*** approach. These models are balance sheet focused. Their aim is to accurately reflect the assets and obligations of a company at periodic intervals. The changes in the values of assets and obligations become the profit (or loss) for that period. A fair value accounting approach for the assets and liabilities of insurance enterprises is one potentially available asset-liability paradigm.

The IASC paper essentially analyses three alternative methods of accounting for insurance: the current deferral-matching model, full fair value accounting, and an alternative asset-liability model.

Who uses financial accounting, what are their needs, and on what do they focus

Shareholders, analysts and potential capital providers

Shareholders and potential capital providers fall into two classes, the professional, often institutional, investor and the individual investor. Both may be interested in the long-term earnings potential of the stock, or the potential for short-term capital gains from holding the stock. Both groups will be interested in earnings trends, the adequacy of reserves for future payments and the value and quality of assets held. Sophisticated users should be able to unravel almost any accounting treatment given sufficient disclosure, (although whether they will in practice be attracted to doing this is questionable). For unsophisticated users it is highly desirable that trends in current earnings can be distinguished from fluctuations arising from volatile shifts in fair value measurements. In addition, they may find it useful to have clear indications of balance sheet risk. Sophisticated users are also likely to welcome user-friendly presentation, particularly in the income statement, and clear indications of balance sheet risk.

Policyholders, potential policyholders, brokers and rating agencies

Personal and some small commercial policyholders are unlikely to resort to examining insurers financial statements before purchasing insurance. If they use an independent broker for their purchase, the broker is more likely to rely on rating agencies' assessments than to carry out their own assessment of insurers.

Most prospective commercial insureds and reinsureds and their brokers are interested in the solidity of (re)insurers with whom they place business. Essentially they need to evaluate the risk of the (re)insurer being unable to pay claims in full once they become due. While income statement information is not irrelevant, their basic focus is on the balance sheet strengths and weaknesses of the company.

Existing commercial policyholders and in particular policyholders with outstanding claims against insurers/reinsurers of doubtful solvency, require that financial statements provide them with sufficient information to evaluate the credit risk they face from their existing policies' receivables, so that they may plan and act accordingly.

Rating agencies have similar aims as commercial insureds and reinsurers. Their basic focus is on balance sheet solidity. They, like insurance sector analysts are sophisticated users of financial information, and have access to more detailed financial information than that presented in the financial statements.

Bankers and Other Creditors

Bond issues and bank loans are most likely to be the obligation of the holding company of insurance groups, not the individual insurance entities underneath the holding company. The bond holders and bankers behind this debt will be interested in the ability of insurance groups to service borrowings and repay loans, this is a function of both balance sheet strength and the future profitability of the company. In addition both these creditor groups may be interested in ascertaining that covenants are satisfied.

Regulators

Regulators have, at least in the US, two perspectives on insurance companies. First, they are interested in the solidity of insurance companies and in minimizing any call on guarantee funds. Second, they may wish to use the financial statements as a resource in the regulation of prices. Regulatory analysis in both these areas might be made more difficult if reported profit measures are volatile. Well understood and accepted measures of shareholder equity would also be advantageous. Regulators have access to other financial information. Indeed, in the US, statutory financial reports will be their primary source for the financial review of an insurance company's operation.

Outside the US, regulators make more use of a company's general purpose financial statements, and generally desire a single accounting paradigm for general purpose and regulatory financial reports.

Employees

Employees will be concerned primarily with two questions: how secure is the company? and how well is it doing? Most employees will be unsophisticated users of financial statements.

Discussion of fair-value valuation bases in the context of accounting precepts.

Fair value adjustment – marking investments to market.

The principal actuarial issue associated with marking of investments to market is balance sheet consistency. If investments are marked to market, then their value will fluctuate with various financial variables, such as interest rates. If the same variables also impact the economic value of the liabilities, but not the stated value per accounting rules, then reported income and equity will be distorted. These reported income and equity values, and especially the reported changes in those values, will not be relevant and will not be representationally faithful.

If insurance company investments are recorded at fair value, then reporting insurance liabilities at fair value will create consistent balance sheet accounting, and will improve relevance and

representational faithfulness of reported income and equity.

There are alternatives to fair value accounting for liabilities that react to some, if not all, of the same variables impacting the investment market value. These alternatives may produce more relevant financial reports than the current status quo for U.S. GAAP (where most liabilities are undiscounted but many assets are at market). They may also be easier to implement that full reflection of fair value for liabilities. The risk is that they may cause an unacceptable level of inconsistency relative to the assets, for those financial variables that would impact market values but not the alternative standard liability values.

Fair value adjustment – discounting
(as applied to loss and expenses reserves, reinsurers' share of loss reserves, unearned premium reserves and possibly debtor balances and deferred taxation.)

Currently, most p/c reserves are carried at an ***undiscounted*** value. This current use of undiscounted reserves for loss reserves has the following advantages and disadvantages.

Advantages
- It is easy to understand
- It locks in a margin that cannot be distributed to shareholders. (A plus in the eyes of regulators and policyholders)

Disadvantages
- It is typically an unreliable measure of the economic value of liabilities. Further, the degree of distortion varies between different enterprises depending on their mix of business and growth history. As a result, return on equity comparisons are distorted both within the insurance sector and with other industries. In particular, insurance company equity is understated in most cases compared to values for other industries. This understatement of insurance company equity leads to an overstatement in returns on equity.
- It results in different valuation bases for assets and liabilities, which can result in spurious earnings volatility when interest rates change even when the underlying cash flows are broadly matched.
- It distorts profit recognition.
- Booking undiscounted reserves may provide grounds for accounting arbitrage.

Fair value proponents, and others in favor of moving to a ***discounted*** basis for insurance liabilities, would argue that moving to a discounted basis for loss reserves, etc., removes or at least substantially reduces:
- The inconsistency between the valuation basis of assets and liabilities, to the extent assets are either at market or at some version of cost (which is effectively an historic market value).

- The inconsistency between enterprises writing different classes of business where the economic value of two reserves shown at the same amount may be substantially different.
- The conservative bias that may be implicit in undiscounted liability values.

They would argue that the profits reported on a discounted basis would be a better (more relevant) reflection of an enterprise's earnings for a period. The use of a fair value liability valuation (in conjunction with holding assets as market) will put assets and liabilities on a consistent footing, so that changes in the values of assets and changes in the discounted value of liabilities broadly mirror each other when interest rates change, so long as liabilities and assets are matched. This will eliminate that part of the interest rate volatility that does not reflect economic change for the insurance enterprise. Further, fair value proponents would maintain that the balance sheet values calculated on a discounted basis better discern between different enterprises; that is they are more relevant, and do not contain conservative biases; that is they are neutral.

Fair value proponents would also argue that well thought out presentation in the income statement matching of investment return and the unwinding of the discount could do much to mitigate the potential confusion that may be suffered by some users as a result of moving to a discounted basis for loss reserves.

Others who oppose the introduction of discounted amounts would argue that liability values currently reported by insurers reflect two offsetting biases, i.e., lack of provision for future investment income and optimistic evaluation of ultimate settlement values (resulting in insurance liabilities that they believe are already implicitly discounted). The introduction of explicit discounting would remove one of the two biases. However, valuing loss reserves at discounted values without addressing the second bias would probably be a disservice to all users as it would overstate available capital and overstate profitability.

Further such observers might argue that if fair values are assessed by direct comparison to exit prices available in the reinsurance market, there is a danger that values substantially different from the net present value of the cost to the enterprise of running off liabilities may be recorded. Substantial overvaluations are possible when there is a hard reinsurance market. Substantial undervaluations are possible when there is a soft reinsurance market, precisely the time at which such valuations cause regulators most concern.

The use of discounted liabilities will not necessarily result in more or less reliable estimates than the undiscounted ones. Discounting techniques are well understood and generally introduce little additional subjectivity into the liability valuation process. When the uncertainties are concentrated in the tail, discounting of the reserves may even reduce the uncertainty in the estimated liability value. In this task force's opinion, fair value accounting in practice may not

significantly alter the inconsistency between different company's accounts due to variations in reserve strength.

Essentially similar arguments apply to the introduction of discounting for the estimates of other insurers' liabilities or assets

Fair value adjustment – risk margins
(as applied to loss and expenses reserves, reinsurers' share of loss reserves and unearned premium reserves.)

Fair value proponents would argue that discounting in conjunction with adding risk margins to liabilities provides the best basis for profit recognition. The profit on the book of business will emerge as the associated risk expires.

This approach has the drawback that it is a difficult concept to grasp and may confuse amateur (and some professional) users of accounts. Clear disclosure of the risk adjustment may help such users.

The lack of market depth in the exchange of insurance liabilities between enterprises makes a direct market assessment of the price for the risk margin impossible in most instances. Risk adjustments derived from methods that use industry-wide data to derive industry level risk adjustments may not succeed in producing financial information that can be used to distinguish between one insurance enterprise and its peers. In addition market-based information will be impossible to obtain in countries that do not have significant stock markets, or that have integrated financial service industries where the major insurance carriers also have banking and securities interests within one quoted vehicle.

Other enterprise-specific risk measures can to a greater or lesser extent be criticized as requiring significant subjective input. Proponents of such methods would argue such judgment calls are inherent in arriving at other accounting measures such as the bad debt adjustment to trade receivables in manufacturers' balance sheets.

This is an area where standard setters may well be faced with determining a trade off between reliable (less subjective) and relevant measures.

If there is a wide range of acceptable methods for calculating fair value adjustment this may well lead to a greater spread of the range of acceptable "values" for the various elements of financial statements. Accounting/actuarial guidance is likely in practice to increase the consistency of the calculation of the risk margin.

The introduction of subjective elements into fair value assessments also means that there is additional scope for managing (or manipulating) financial results. Methods that reduce the scope for subjectivity in the assessment, such as an IRR model using regulatory capital, curtail the scope for inconsistency between different insurance enterprises (but, possibly, at the expenses of relevance, see above). More company specific methods may result in greater scope for inconsistency (the scope might well in practice be reduced by accounting or actuarial guidance).

The task force suspects however that the increase in inconsistency due to differences in the basis on which fair values are calculated are likely to be of second order compared to differences in the strength of company's loss reserves.

Opponents of risk margins would argue that a risk margin for insurance liabilities cannot be reliably determined, so that (per FASBs Concepts Statement No. 7, paragraph 62) discounted values with no risk adjustment should be used. Others would argue that undiscounted values would be preferable to discounted values without risk adjustments, which they would contend, could grossly understate a company's liabilities.

Fair value adjustment – To reserves and creditors to reflect a company's own credit standing.

This is the most contentious of the fair value adjustments, and is separately discussed in section H.

Taxation

The extent of the link between taxes and the financial statements of enterprises varies between different countries. Where the calculation of taxable profits is substantially based on the profit disclosed in the enterprise's general purpose (i.e., GAAP) financial statements, it is certainly possible that at least some companies may suffer a greater burden of taxation. It is possible this may be mitigated to some extent by the recognition for tax purposes of some allowance (i.e., risk margin) for the uncertainty in estimated claim liabilities. In the U.S., the explicit recognition of risk margins may cause them to be removed from allowed claim liability deduction, thereby increasing federal income taxes unless the margins are allowed by the IRS as a part of the liabilities' economic value. If the reserves are currently reported at expected value, the risk margins would have no impact on taxes (if the margins are accounted for as an asset) but would restrict the disposable income.

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Section H – Credit Standing and Fair Value Liabilities

A highly controversial proposed adjustment to estimated cash flows in the determination of fair value liabilities is the impact of the entity's (or obligor's) own credit standing. Under some proposals, the weaker the obligor's financial situation, the lower the fair value of their liabilities would be. This adjustment would recognize that a financially weak company would be less likely to satisfy its obligations in full than a financially strong company.

This issue may not be material for most insurers, as it is very difficult for an insurer to be both viable and of questionable financial health. Companies viewed to be strong financially have historically experienced very small rates of default.[56] Therefore, the concern and controversy surrounding this issue is focused largely on its impact on troubled companies.

This section of the white paper presents the arguments for each side of the issue, without stating an overall preference. It also discusses the issues associated with estimating, implementing and presenting liabilities that reflect the obligor's credit standing.

This section is organized as follows:

- Arguments ***for*** reflecting credit standing in fair valuing liabilities.
- Arguments ***against*** reflecting credit standing in fair valuing liabilities.
- Methods for estimating this effect.
- Presentation issues.
- Implementation issues.

Arguments for reflecting credit standing in fair valuing liabilities.

- Credit risk is reflected in the fair value of assets, and the assets and liabilities should be valued consistently.
- The public debt of a company has a market value, and that market value reflects the debtor's credit standing. Hence, requiring a company to report their publicly issued debt (a liability for them) at market value leads to requiring them to reflect their own credit standing when valuing a liability. The alternative, not requiring a company to report such debt at market value, would allow a company to manipulate its earnings by buying back existing debt or issuing new debt.
- If public debt is to be held at a fair value that reflects credit standing, then all liabilities should be reported at a fair value that reflects credit standing. This is the argument FASB made in their Concepts Statement Number 7, paragraph 85.
- Parties owed money by a company of questionable solvency will frequently settle for less than the stated amount of the obligation, due to the risk of possibly getting much less if that company (i.e., the obligor) goes insolvent. In other words, reflecting an entity's own

[56] One year default rates for debt rated A or above (by Moody's) were less than 0.1%, for 1983-1999. Ten-year default rates for the same rating category were less than 4%, for 1920-1999. Source: January 2000 report by Moody's on Corporate Bond defaults from 1920-1999.

credit standing in valuing its liabilities reflects the true market cost to settle those liabilities.

- The obligor's credit standing is easily measurable, at least in those jurisdictions where established rating agencies exist.
- Due to limited liability, the owners' interest (e.g., as reflected in share price) of a company can never go below zero. Thus, the fair value of its equity is always greater than or equal to zero. If the fair value of the equity is greater than or equal to zero, and the fair value of the assets is less than the contractual "full value" liabilities, then the fair value of the liabilities must be less than this "full value."

Arguments against reflecting credit standing in fair valuing liabilities.

- There is no active market for such liabilities; hence there is no reliable way of measuring this adjustment for credit standing.
- Users of financial statements could be misled as to the financial strength of weak companies.
- A liability valuation that reflects the liability holder's credit standing would not be relevant to a potential "buyer" of the liability. In the insurance situation, and possibly other situations, the buyer would not be able to enforce the same credit standing discount on the obligee. The obligee would view the prior liability holder's credit standing as totally irrelevant. Hence, the buyer would also view the credit standing of the liability seller as irrelevant to the liability's market value.
- An obligor's financial statements that included a reduction in the fair value of its liabilities due to the obligor's credit standing would not be relevant to creditors.
- An insurance company's principal product is its promise to pay. In return for cash up-front, an insurance company sells a promise to pay in the event of a specified contingency. If an insurer attempts to pay less than the full initial promise, due to its weakened credit standing, it is in effect abandoning its franchise. In fact, a troubled company that is trying to remain a going concern will do all it can to pay the full amount, in an attempt to retain its franchise. As such, reflection of credit standing in the estimation of fair value liabilities is counter to going-concern accounting, and is relevant only to liquidation accounting for a runoff business. (The party trying to collect from a troubled company is also arguably negotiating under duress. As such, any settlement amount they would arrive at would not meet the definition of "fair value.")
- If credit standing is reflected in liability valuation, then favorable business results could cause a drop in earnings, due to an improved credit standing increasing the fair value of liabilities. Likewise, unfavorable results that lead to a drop in credit standing could result in earnings improvement. This is counterintuitive and noninformative.
- It does not make sense to reflect credit standing in the value of liabilities without also reflecting the impact of credit standing on intangibles. A company with a worsening credit standing may see the fair value of its liabilities decrease, but it would also see the fair value of various intangibles, such as franchise value, decrease. In fact, the existence

of the intangible franchise value helps keep insurers from increasing their operational risk in order to increase shareholder value at the expense of policyholders. Therefore, while the fair value of a company's liabilities may be decreasing as credit standing decreases, it is offset by an item not to be reflected in the fair value accounting standards as currently proposed by the FASB and IASC. If intangibles are not to be estimated nor reflected in a fair value standard, then the impact of credit standing on the liabilities should not be reflected.

- Credit standing is (usually) an attribute of the corporate whole, not the individual business segments. Hence, business segment reporting could be complicated drastically by this approach, as the segment results would not add to the corporate whole without an overall credit standing adjustment.
- To the extent that the credit standing adjustment is based on the obligor's judgment, a potential moral and ethical dilemma exists. Management may be forced to state the probability that it won't pay its obligations at the same time that it may be professing before customers, partners, capital providers, etc. its integrity, financial soundness and full intent to meet all obligations.
- If an entity's own credit standing is reflected in valuing their liabilities, and the valuation considers the reduced amounts their policyholders may be willing to accept as claim settlement, some companies may be motivated to employ unreasonably optimistic assumptions in setting their reserve levels. Troubled companies may be incented to anticipate that claim settlements will be resolved on extremely favorable terms and hence record an inappropriate reserve.

Methods for estimating the impact of credit standing on liabilities, if included in the fair value definition.

Our task force was able to envision several methods that might be used to estimate this credit risk adjustment. Four such methods are listed here. It is important to note that, to our knowledge, none of these methods have actually been used to estimate the fair value of liability default for property-liability insurers in any practical setting. The first three methods are discussed in more detail in the appendix, including examples.

Method 1 - Implied Option Value

The reflection of credit standing in the valuation of fair value liabilities (i.e., the "credit risk adjustment") involves estimating the expected fair value of liability default. In the finance literature, the default value has been shown as equivalent to a put option on the insurer's assets.[57]

[57] Cummins, J. David, 1988, Risk-Based Premiums for Insurance Guaranty Funds, Journal of Finance, September, 43: 823-838. Also,
Doherty, Neil A. and James R. Garven, 1986, Price Regulation in Property-Liability Insurance: A Contingent-Claims Approach, Journal of Finance, December, 41: 1031-1050. Also,
Derrig, Richard A., 1989, Solvency Levels and Risk Loadings Appropriate for Fully Guaranteed Property-Liability

Thus, the theory underlying the credit risk adjustment (in the insurance context) is that the fair value of owners' equity is increased by the value of the option implicitly given to the equity owners by the policyholders. If the liabilities are measured without the credit risk adjustment, then the fair value of the owners' equity is understated.

The implied option value can be determined by the method of Ronn and Verma[58], which is used in the Allen, Cummins and Phillips analysis.[59] Under this method, the market value of the firm's assets is first estimated. Then the implied volatility of the firm's market value is estimated from the Black-Scholes formula for the value of the equity owners' call option.[60] Other inputs required for this estimation are the undiscounted liability value, the average time until payment of the liabilities and the risk-free interest rate.

Once the above inputs are obtained, the default value is determined by applying the Black-Scholes option model with a set time to expiration and an exercise price equal to the expected liability value at the end of the same time horizon. The call option is valued relative to the asset market value. The Appendix provides an example of the calculation.

Advantages

- For publicly traded insurers, this approach can provide results using an insurer's own data.
- The method is relatively straightforward in terms of the complexity of the calculation.
- The method has been used to measure default risk for both insurance firms and banks. It is well known in the finance literature.

Disadvantages

- This method can only be done for publicly traded companies.
- It is difficult to carve out the property/casualty pieces of firms that have non-property/casualty business segments.
- The method is sensitive to variations in input values.
- The method relies on accounting value of liabilities. This presents problems with measuring reserve adequacy.
- It ignores side guarantees or implicit guarantees, such as that from a majority owner with a reputation to uphold. Such an entity cannot afford to walk away without losing brand-name value. It also ignores the side guarantee arising from an insurance guaranty fund.

Insurance Contracts: A Financial View, Financial Models of Insurance Solvency, J. D. Cummins and R. A. Derrig eds., Kluwer Academic Publishers, Boston, 303-354. Also,
Butsic, Robert P., 1994, "Solvency Measurement for Property-Liability Risk-Based Capital Applications", Journal of Risk and Insurance, 61: 656-690.

[58] Ronn, Ehun I., and Avinash K. Verma, 1986, Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model, Journal of Finance, 41(4): 871-895.

[59] Allen, Franklin, J. David Cummins and Richard D. Phillips, 1998, "Financial Pricing of Insurance in a Multiple Line Insurance Company", Journal of Risk and Insurance, 1998, volume 65, pp. 597-636.

[60] Black, Fischer and Myron Scholes, 1973, The pricing of Options and Corporate Liabilities, Journal of Political Economy, May-June, 81: 637-659.

- It may ignore the relative credit-worthiness for different lines or entities within the corporate total, if they have separate publicly traded securities.

Method 2 - Stochastic modeling using Dynamic Financial Analysis (DFA)

Stochastic modeling is frequently used in Dynamic Financial Analysis to model insurance company operations. The process typically involves modeling assets, liabilities and future income from the runoff of reserves as well as new business. Key variables driving outcomes are modeled using probability distributions.[61] In addition to projections of future cash flows, stochastic DFA models can produce Statutory and GAAP balance sheets and income statements.

DFA models attempt to incorporate the dynamics of the insurance business by including interactions between the different variables. Some DFA models also attempt to model the underwriting cycle.

Among the outputs of stochastic DFA models are probability distributions of future surplus. They can be used to compute the expected policyholder deficit (the expected cost of default), or the average amount of unpaid liabilities, should the company experience insolvency in the future. Insolvency would be deemed to have occurred whenever the company's surplus dropped below a pre-specified level.

Advantages

- The method is insurer-specific.
- The method can be applied to all insurers.
- A comprehensive DFA model can better incorporate important company-specific risk factors than the other methods.
- Many companies currently use these models to make strategic business decisions. A great deal of research effort has recently been devoted to their development.

Disadvantages

- Good DFA models tend to be complex and are therefore labor-intensive and expensive. (However, if an insurer already has such a model, adapting it to estimate credit risk may require little additional cost.)
- DFA models are designed to work off of data. They may not reflect risks that are not in the historical data.
- Not all insurers currently have these models, since their management has determined that they are not worth the cost. Insurers would need the models to be tailored to the unique features of their business.
- There is presently not enough expertise available to construct a suitable DFA model for each insurer.
- The models may not produce comparable results for similar companies, due to different model structures and parameter assumptions.
- The ability of these models to reliably estimate insolvency probabilities is not universally accepted. Many believe that these models are stronger at estimating the normal variation

[61] This is a feature of stochastic DFA models, but not necessarily all DFA models.

resulting from the current processes, and not the shocks and paradigm shifts that may be more likely to be the cause of an insolvency. Therefore, they may not be reliable when applied to the stronger companies (although these companies are not expected to have a material credit-standing adjustment).

- It may be impractical to model insolvency for large, multinational or multi-industry conglomerates.
- Business and legal problems may exist for companies estimating their own probability of reneging on their obligations, either directly or through a DFA model estimate.

Method 3 - Incorporate historic default histories by credit rating from public rating agencies.

This method would use publicly available historic default rates by credit rating, based on the entity's current credit rating from A. M. Best, S&P, Moody's or some other public rating service. At least one of these rating services (Moody's) publishes historic default rates by credit rating, for a one year and multiple-year horizon, by year and averaged over several decades. These default rates would allow determination of the expected default rate — some other method would have to be used to determine the risk premium associated with this expected value.

Advantages

- Simple to use and explain, when using the expected cost of default from the public data.
- Requires little direct analytical cost to the insurer.
- Avoids an entity having to estimate its own probability of reneging on promises.

Disadvantages

- Ambiguity would exist if the various public ratings are not consistent. For example, it is common for the ratings from Moody's and S&P to differ. This would add judgment to the process and potential manipulation.
- Not all companies are rated.
- A single rating may exist for the enterprise (such as a group rating), that may not be appropriate for a particular group member or a line of business.
- Would require default history for a given rating. These may not be available from some rating agencies.
- Requires ratings to be consistently applied over time. This may not be the case, as rating methodologies change over time.
- Ratings may exist for debt, but not for all other liabilities. This problem could be compounded by the existence of guaranty funds, particularly where those guarantees vary by state and line.

Method 4 - Utilize credit risk-based spreads observable in public debt.

This method would utilize observed interest rate spreads on public debt to quantify the credit risk adjustment. Public debt has no amount risk, other than default risk, and no timing risk (absent call provisions). Hence, it can be used to isolate the market's pricing of credit risk. The discount that the market places on a dollar owed at time X, given a credit rating of Y, compared to the same market value for a dollar owed at time X by the U.S. government, quantifies the credit risk adjustment for a time horizon of X, rating of Y.

Ideally, this would be done based on the market value for each company's publicly held, noncallable debt. If not available, then public debt of companies with a similar credit standing (as measured by a public rating agency) could be used instead.

It may also be possible to use the developing market for credit derivatives rather than public debt in applying this approach.

Advantages

- Relatively simple to use and explain.
- Requires little direct analytical cost to the insurer.
- Avoids an entity having to estimate its own probability of reneging on promises.
- Consistent with credit risk adjustment for public debt issued by the same entity.
- Relies heavily on market-based values rather than internal estimates.

Disadvantages

- Requires information on a range of public debt instruments that may not exist for all companies. The entity may not have any actively traded public debt, or may not have a broad enough range of noncallable public debt to handle all the time horizons of interest.
- Where reliance is made on other entities' public debt with similar credit standings, it requires a determination of whether or when another entity has a similar credit standing. This adds additional judgment and estimation to the method.
- Debt holders credit risk is not perfectly aligned with policyholder credit risk. Due to the different priorities of creditors in a bankruptcy or insolvency proceeding, the amount recoverable under a bankruptcy could be drastically different for policyholders as opposed to debt holders. In addition, since debt is frequently at the holding company level, it is possible that the bankruptcy administrator could arrange for a buyer to take over the insurance operation such that the policyholders would be made "whole", at the expense of the debt holders.
- Does not allow for guaranty funds or other side guarantees not applicable to public debt. These guaranty funds and side guarantees can also vary by state and line, further distancing the public debt information from the task at hand.
- The public debt may only exist for the enterprise (e.g., parent or holding company), which may include many other businesses and operations besides the insurance operation. The net credit risk may actually vary drastically by operation, so that the enterprise's public debt credit risk is not indicative of the insurance operation credit risk.
- To the extent that the observed debt is callable, this could distort the application of observable spreads to liability credit standing adjustments.
- Observed spreads versus U.S. Treasuries could include factors other than credit risk, such as relative liquidity.

Presentation issues.

The following are a few presentation issues surrounding the reflection of credit standing in the fair value of liabilities, assuming that such a reflection is made.

- ***Historical loss development*** - Should historical loss development include the impact of changing credit ratings (of the liability holder)? Choices are to include this impact, to

exclude this impact, or include this impact but separately disclose this impact.

- ***Current balance sheet impact*** - The task force generally agreed that the current impact of credit standing reflection on the balance sheet should be disclosed, so as to provide useful information for those interested in the total legal obligations of the entity.
- ***Impact on income*** - Should the impact of credit standing reflection be separately disclosed when reporting period earnings?
- ***Impact on segment results*** - Most financial statements include various types of "segment" disclosures, i.e., disclosures about certain business or operating segments of the business. Current U.S. statutory reporting also includes many disclosures by product or line-of-business. Where a corporation's debt is held principally at the holding company corporate level, and not at the segment or operating level, it many not be appropriate to reflect credit standing adjustments in business or operating segment results. In such a case, credit standing adjustments would be reported only at the total corporate level, as an overall adjustment to the business segment "pieces." Alternatively, credit standing could be incorporated at the business-segment level, at the cost of potentially misstating the earnings or value of the business segment.

  If reported at the business-segment level, credit standing adjustments could distort reported business-segment results in another way. Consider the case where most debt is at the holding company level, the total corporate credit standing is weak, and the principal cause is a single business unit. If credit standing is reported at a detail level, operating earnings of the stronger business units would be impacted by the results of the unrelated, poorly performing unit. Worsening results in that poorly performing unit could lead to improved earnings (due to reduction in liability valuations) for the stronger units, while improving results for the poorly performing unit could cause lower earnings for the stronger units.

Implementation issues. The following are some possible implementation issues associated with reflection of credit standing in fair value estimates.

- ***Multiple credit standings.*** - It is possible for the different entities in a corporate whole to have different credit standings. For example, it is conceivable that the flagship of a quota share pool may be weaker than one of the quota share pool members. In such a case, it may be difficult to quantify all the differences, especially if all the publicly available data regarding credit standing is applicable only for the pool flagship.
- ***Incorporating credit standing adjustments when multiple risk adjustment methods are used.*** - Section D discussed several different methods for estimating the fair value risk adjustment. It is possible a single company would find itself using different methods for different lines. It may be difficult to incorporate the chosen credit standing adjustment consistently into the results of these various methods.

- ***Consistent treatment where offsets exist***. - Some liabilities have corresponding offsets, recorded either as assets, contraliabilities, or even as other liabilities. Examples include accrued retro premiums for retrospectively rated business, deductible recoverables, and contingent commissions. If a liability is valued in a manner that reflects the obligor's credit standing, then the valuation of offsets for that liability should also be impacted in a consistent manner. This may not be a simple task, and may materially complicate the estimation process for both the direct liability and the offsets.
- ***Guaranty fund reflection***. - The credit standing adjustment of a liability could be materially impacted by any guaranty fund (or similar) protection. The rationale is that the party owed money (e.g., a claimant) may be unwilling to consider lowering their cash settlement demands despite the financial weakness of the obligor, to the extent that there is backup protection provided by a guaranty fund. Guaranty funds do not exist for all lines nor in all states. They typically provide less than full protection (e.g., many funds cap the benefits, and may pay claims only after significant delays). As such, proper reflection of guaranty fund impacts may be very difficult, especially for a writer of multiple products in multiple states.
- ***Management dilemmas*** - It may be difficult for management to value its liabilities reflecting less than full contractual obligations, at the same time it is making assurances and promises to consumers and creditors, especially when the impact of the credit standing is significant.
- ***Auditor dilemmas*** - Whoever audits a company reporting fair value liabilities lowered for credit standing impacts may find itself in the same position as a rating agency. That is, it may be forced to quantify the likelihood of client solvency when auditing their financial statements. This may be outside their normal expertise, and could open up additional areas of auditor liability.

CAS Task Force on Fair Value Liabilities
White Paper on Fair Valuing Property/Casualty Insurance Liabilities

Section I – Professional Readiness

Previous sections of this white paper have discussed what fair valuing means, what methods can be used to accomplish it, and what theoretical and practical issues must be dealt with in order to implement the fair valuing of insurance liabilities. This section discusses what the actuarial profession needs to do to prepare for its role in this process. Evaluating what casualty actuaries need to do to prepare for fair valuing insurance liabilities requires addressing the following four issues:

- Do actuaries currently have a theoretical understanding of fair value concepts adequate to estimate liabilities under a fair value standard?
- Are models currently available that can be used by actuaries to estimate fair value liabilities?
- Are actuaries prepared to implement these models and make these estimates in practice?
- What steps can the profession take to aid individual actuaries in implementing effective processes for fair valuation of insurance liabilities for their companies or their clients?

Note that professional readiness for this task should be evaluated relative to a hypothetical implementation date sometime in the future. Fair valuing insurance liabilities is not currently required of insurers in the United States, and we assume that initiation of such a requirement would be accompanied by a reasonable implementation period.

Adequate theoretical understanding and appropriate models

The analysis done by the task force and presented in the preceding sections demonstrates that actuaries have the theoretical understanding needed to implement fair valuing of insurance liabilities. We have identified a number of models that are available and appropriate for actuaries to use in estimating fair value liabilities. No issues have been identified that are not susceptible of actuarial estimation.

Ability to make estimates in practice

As noted above, fair valuing insurance liabilities is not a current requirement for most insurers in the United States. Therefore, actuaries generally have not established the systems and procedures that would be required to efficiently support fair valuation of liabilities for the financial reporting process. However, casualty actuaries performing insurance pricing and corporate financial functions have used many of the fair value models that have been identified in prior sections of this white paper, and the task force believes that this precedent demonstrates that actuaries can estimate fair value liabilities

in practice.

The task force has identified a number of issues concerning fair value that require clarification prior to implementation. The task force presumes that many of these issues will be clarified later in the accounting standards development process. The task force also presumes that a reasonable period will be provided for implementation of any new accounting standard requiring fair valuing insurance liabilities. Given those assumptions, the task force believes that actuaries will be able to develop and use models that provide efficient and effective estimates of the fair value of insurance liabilities in accordance with those new accounting standards.

Steps the profession can take

The task force believes that there are a number of steps that can and should be taken by the actuarial profession to aid individual practitioners if fair value accounting for insurance liabilities is adopted for U.S. GAAP or statutory accounting. Depending on the course of future accounting standards developments, the same may be true if the IASC adopts fair value accounting for insurance liabilities.

1. You hold in your hands the first step, a white paper that discusses fair valuation of insurance liabilities for general or property/casualty insurers. The task force hopes this document will aid accounting standards setters in developing higher quality standards for insurers. The task force also hopes this document will be a starting point for casualty actuaries seeking both to better understand the issues underlying fair value accounting and to plan what methods to use in fair valuing insurer liabilities for their own companies or clients.

2. The actuarial profession should continue its active participation in the ongoing discussions of fair value accounting for insurers. As is evident from the prior sections of this white paper, fair value accounting is a complex issue, and actuaries should continue to provide active assistance to accounting standards setters in order to insure that the adopted standards are of high quality and are practical to implement.

3. The profession should seize any opportunities to broaden the numbers of actuaries engaged in the discussion of fair value accounting. CAS meetings and the Casualty Loss Reserve Seminar (CLRS) are the most obvious opportunities to discuss these concepts with more casualty actuaries. Publication of this white paper in the CAS *Forum*, on the CAS web site, and in other appropriate public forums should also be encouraged.

4. Once an accounting standard setting organization adopts fair valuing for insurance liabilities, a practice note designed to highlight the issues that practicing actuaries may wish to consider in implementing that standard should be produced as soon as

possible. Practice notes are designed to provide helpful information quickly, so they do not go through the due process required of a new Actuarial Standard of Practice (ASOP). Accordingly, neither are they authoritative for actuaries. In addition to being published, any such practice note should be presented at the CLRS and at CAS meetings.

5. Finally, the task force believes that issues will arise during implementation that have not been anticipated in advance. Initially these should be handled through updates to the practice note. Once some experience has been accumulated, there may be need for consideration of a new or revised ASOP. The task force has not identified any need for a new or revised ASOP at this time and believes it is better to defer developing any such standard until actual practice under a fair value accounting standard has had a chance to develop. Premature development of an ASOP may mean that unanticipated but important issues are not addressed in the ASOP. Also, an ASOP developed too soon may tend to impede the development of good practice by requiring more justification for estimation methods not yet contemplated during the drafting of the ASOP.

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Section J – Summary and observations

This white paper has discussed many of the major issues involved in fair value accounting as applied to insurance liabilities. While the focus has been on property/casualty insurance liabilities, many of the issues are also applicable to other insurance liabilities.

In brief, some are the major findings of this paper include:

- ***New task*** - Generally, fair value accounting rules have not yet been applied to property/casualty insurance liabilities. Therefore, implementation of fair value accounting would likely result in unforeseen consequences and a learning curve for those charged with implementing the new rules. (One way to address this issue may be to field test a fair value accounting system before full implementation, possibly via footnote disclosure.)
- ***More work*** - Implementation of fair value accounting for these liabilities would be an increase in workload for those setting the liabilities. New systems and procedures would have to be set up, and additional estimation variables would have to be monitored.
- ***More assumptions*** - Fair value accounting would increase the number of subjective assumptions required for most property/casualty reserving. The impact of these additional assumptions, however, may still be of second order importance when compared to the variability across companies in the (undiscounted, pre-risk adjustment) expected loss estimates.
- ***Multiple methods*** - A critical component in fair value estimation is estimation of the risk margin, or risk adjustment. There are several methods that can be used to estimate these risk adjustments. Each method has advantages and disadvantages, and, depending on the variation in liabilities to be estimated, the use of multiple methods may be necessary.
- ***Can be done*** - No issues have been identified that are not susceptible of actuarial estimation.
- ***Not without concerns*** - As mentioned previously, problems would undoubtedly occur during any initial implementation of fair value accounting.
- ***Evolutionary process*** - Familiarity, expertise and available methods for estimation of fair value liabilities should grow over time, once fair value accounting for insurance liabilities is implemented. Many of the initial estimation problems should diminish over time.
- ***Presentation and Implementation issues, in addition to estimation issues*** - There are issues besides strict estimation issues that actuaries (and accountants) will have to deal with. These include questions as to how historic loss development should be presented in a fair value paradigm, and whether the lack of "value additivity" is an advantage or disadvantage of an estimation method.
- ***Alternatives exist*** - There are other accounting paradigms besides the fair value paradigm focused on by this white paper. Some of these alternatives contain several of the advantages sought by fair value proponents, but at a smaller cost (in resources, subjectivity.) Each alternative also brings its own disadvantages, hence

there is no clear "right" answer. The selection of any financial accounting paradigm is at least partially a value judgement, not a pure scientific exercise.

- ***Reflection of credit standing is a controversial issue*** – There are arguments for and against the reflection of credit standing in fair value estimates of insurance liabilities. The task force has consciously avoided taking a position on this issue. Instead we have attempted to present both sides in a clear, objective fashion.

The task force chair wishes to thank all involved with this project for the tremendous amount of work done in a short period of time. In approximately six months, the task force team (with the help of key contributors) produced what I believe to be an excellent workproduct, one that hopefully will be a major contribution to the profession's understanding of the fair value issue. Thank you, once again.

Casualty Actuarial Task Force on Fair Value Liabilities
December 1999 - August 2000 members

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CAS Task Force on Fair Value Liabilities
White Paper on Fair Valuing Property/Casualty Insurance Liabilities
Section K - Appendices

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Appendix 1: CAPM Method

This appendix presents an example of computing a risk-adjusted discount rate using CAPM.

In its simplest form, the approach used in Massachusetts assumes that the equity beta for insurance companies is a weighted average of an asset beta and an underwriting beta. The underwriting beta can therefore be backed into from the equity beta and the asset beta.

here
β_e is the equity beta for insurance companies, or alternatively for an individual insurer
β_A is the beta for insurance company assets
β_u is the beta for insurance company underwriting profits
k is the funds generating coefficient, and represents the lag between the receipt of premium and the average payout of losses in a given line
s is a leverage ratio

Since

$$\beta_e = \frac{\mathrm{Cov}(r_e, r_M)}{\mathrm{Var}(r_M)}$$

or the equity beta is the covariance between the company's stock return and the overall market return divided by the variance of the overall market return. It can be measured by regressing historical P&C insurance company stock returns on a return index such as the S&P 500 Index. Similarly, β_A can be measured by evaluating the mix of investments in insurance company portfolios. The beta for each asset category, such as corporate bonds, stocks, real estate is determined. The overall asset beta is a weighted average of the betas of the individual assets, where the weights are the market values of the assets.

Example:
Assume detailed research using computerized tapes of security returns such as those available from CRISP concluded that β_e for the insurance industry is 1.0 and β_A for the insurance industry is 0.15. By examining company premium and loss cash flow patterns, it has been determined that k is 2. The leverage ratio s is assumed to equal 2. The underwriting Beta is

$$\beta_u = \frac{\beta_e - (ks+1)\beta_A}{s}$$

or $\beta_U = .5*(1. - (2*2+1).15) = .125$

Once β_U has been determined overall for the P&C industry, an approach to deriving the beta for a particular line is to assume that the only factor affecting the covariance of a given line's losses with the market is the duration of its liabilities:
$\beta_L = -k\beta_U$

So if the average duration in a given line is 2, its beta is -2*.125= -.25

In order to derive the risk-adjusted rate, the risk free rate and the market risk premium are needed. Assume the current risk free rate is 6% and the market risk premium (i.e., the excess of the market return over the risk free return) is 9%. Then the risk-adjusted rate is:

$r_L = r_f + \beta_L(r_m - r_f)$

or $r_L = .06 - .25 * (.09) = .06 - .0225 = .0375$

An alternative approach to computing the underwriting beta is to regress accounting underwriting returns in a line of business on stock market returns. The method suffers from the weakness that the reported underwriting returns often contain values for the liabilities that have been smoothed over the underwriting cycle, thus depressing their variability.

Appendix 2: IRR Method

All balance sheet values are at fair value. Thus, the liability value at each evaluation date must be calculated using a risk-adjusted interest rate. Since we are trying to find this value, it is an input that is iterated until the IRR equals the desired ROE. (This is easily done using the "Goal Seek" function in an Excel spreadsheet.)

The present value of the income taxes is a liability under a true economic valuation method. However, in the FASB and IASC proposals, it is not included.[1] The basis for this calculation is found in Butsic (Butsic, 2000). To a close approximation, the PV of income taxes equals the present value of the tax on investment income from capital, divided by 1 minus the tax rate. The PV is taken at an after-tax risk-free rate.

Exhibit A2 shows an example of the risk adjustment calculation, using the IRR method, for a liability whose payments extend for three periods.

[1] Note that the present value of income taxes is not the same as the deferred tax liability. For example, the present value of income taxes includes the PV of taxes on *future* underwriting and investment income generated by the policy cash flows.

Exhibit A2
Calculation of Risk Adjustment Using Internal Rate of Return Model

	Fixed Inputs		**Loss & LAE cash flow patterns**		
1	Risk-free rate	0.060			
2	Expected investment return	0.080		Proportion	
3	Income tax rate	0.350	Time	of Total	
4	Equity beta	0.800	0	0.000	
5	market risk premium	0.090	1	0.500	
6	Capital/reserve	0.500	2	0.300	
7	Loss & LAE	1000.00	3	0.200	
8			Total	1.000	
9	**Calculated values**				
10	Required ROE	0.1320			
11	Risk-adjusted yield	0.0346			
12	After-tax risk-free rate	0.0390			
13	Premium	968.75			
14					
15	**Iterative Input**				
16	Risk adjustment	0.0254			
17					
18	**Balance sheet, at fair value**		Time		
19		**0**	**1**	**2**	**3**
20	*Assets*				
21	Investments, before dividend	960.14	1018.12	469.03	110.55
22	Investments, after dividend	1432.21	725.53	292.97	0.00
23					
24	*Liabilities*				
25	Loss & LAE	944.15	476.81	193.31	0.00
26	Income tax liability	24.60	10.31	3.01	0.00
27	Capital, before dividend	0.00	531.00	272.71	110.55
28	Capital after div (required amount)	472.07	238.41	96.66	0.00
29					
30	**Income**				
31	Underwriting income	24.60	-32.67	-16.50	-6.69
32	Investment income		114.58	58.04	23.44
33	Net income, pretax	24.60	81.91	41.54	16.75
34	Inv income, capital (risk-adjusted)		28.32	14.30	5.80
35					
36	**Insurance Cash Flows**				
37	Premium	968.75	0.00	0.00	0.00
38	Loss & LAE	0.00	-500.00	-300.00	-200.00
39	Income tax	-8.61	-28.67	-14.54	-5.86
40					
41	Income tax, capital (risk-adjusted)		9.91	5.01	2.03
42					
43	**Capital flow (dividend)**	472.07	-292.59	-176.06	-110.55
44					
45	**Internal rate of return**	**13.20%**			

Notes to Exhibit A2

Rows (Note that "R1" denotes Row 1, "R2" denotes Row 2, etc.):

1. Rate for portfolio of U. S. Treasury securities having same expected cash flows as the losses.
2. Expected return for the insurer's investment portfolio. Note that the yield on a bond is not an expected return. The yield must by adjusted to eliminate expected default. Municipal bond yields are adjusted to reflect the implied return as if they were fully taxable.
3. Statutory income tax rate on taxable income.
4. Estimates can be obtained from Value Line, Yahoo Finance or other services.
5. Estimates are commonly available in rate filings (e.g., Massachusetts).
6. All-lines value an be estimated by adjusting historical industry reserve values to present value and adding back the after-tax discount to GAAP equity. See Butsic (1999) for an example. For individual lines, a capital allocation method can be used, such as Myers and Read (1999).
7. An arbitrary round number used to illustrate the method.

10. R1 + (R4 x R5).
11. R1 – R16.
12. (1 – R3) x R1
13. R25 + R26 (at time 0).

16. This value is iterated until the IRR (Row 45) equals R10.

21. R22 (Prior Year) + R37 + R38 + R39.
22. R21 + R43.

25. Present value of negative R38 using interest rate R11.
26. Present value of R41 using interest rate R12. Result is divided by (1 – R3).
27. (R6, capital/reserve) x R25.
28. R27 + R43.

31. Time 0: R37 – R25. Time 1 to 3: – R11 x R25 (Prior Year).
32. (R22, Prior Year) x R2.
33. R31 + R32.
34. (R28, Prior Year) x R1.

37. R13.
38. – R7 x payment pattern in Rows 4 though 7.
39. – R3 x R33.

41. R3 x R34.

43. R28 – R27

45. Internal rate of return on Row 43 cash flows.

Appendix 3: Single Period RAD model

All balance sheet values are at fair value.

The discussion of the income tax liability is the same as in Appendix 2.

Here, there is no iteration needed, since the risk adjustment is derived directly from the equations relating the variables to each other. Butsic (2000) derives this result.

The formula is

$$z = c\left[\frac{R - r_f}{1 - t}\right] + (r_A - r_f)\left[1 + c\frac{1 + r_f}{1 + r_f(1 - t)}\right],$$

where the variables are:

z	risk adjustment to the risk-free rate
c	capital as a ratio to the fair value of the liability
R	required rate of return on capital (ROE)
r_A	expected return on assets (includes bond yields net of expected default)
r_f	risk-free rate
t	income tax rate

Although the risk adjustment can be calculated directly from the above formula, we have provided Exhibit A3, which shows that the risk adjustment in fact produces the required ROE and internal rate of return. The format of Exhibit A3 is similar to that of Exhibit A2. However, only a single time period is needed.

Note that exhibits A2 and A3 give slightly different results for the risk adjustment. This is because capital is needed for both asset and liability risk. In a multiple period model, the relationship between the assets and loss reserve fair value is not strictly proportional. This creates a small discrepancy.

Exhibit A3
Calculation of Risk Adjustment Using Single Period ROE Model

	Fixed Inputs		
1	Risk-free rate	0.060	
2	Expected investment return	0.080	
3	Income tax rate	0.350	
4	Equity beta	0.800	
5	market risk premium	0.090	
6	Capital/reserve	0.500	
7	Loss & LAE	1000.00	
8			
9	**Calculated values**		
10	Required ROE	0.1320	
11	Risk-adjusted yield	0.0348	
12	After-tax risk-free rate	0.0390	
13			
14	Premium	981.38	
15	Risk adjustment	0.02518	
16			
17	**Balance sheet, at fair value**	Time	
18		**0**	**1**
19	*Assets*		
20	Investments, before dividend	976.12	546.96
21	Investments, after dividend	1459.30	0.00
22			
23	*Liabilities*		
24	Loss & LAE	966.35	0.00
25	Income tax liability	15.02	0.00
26	Capital, before dividend	0.00	546.96
27	Capital after div (required amount)	483.18	0.00
28			
29	**Income**		
30	Underwriting income	15.02	-33.65
31	Investment income		116.74
32	Net income, pretax	15.02	83.10
33	Inv income, capital (risk-adjusted)		28.99
34			
35	**Insurance Cash Flows**		
36	Premium	981.38	0.00
37	Loss & LAE	0.00	-1000.00
38	Income tax	-5.26	-29.08
39			
40	Income tax, capital (risk-adjusted)		10.15
41			
42	**Capital flow (dividend)**	483.18	-546.96
43			
44	**ROE**		**13.20%**
45			
46	**Internal rate of return**	**13.20%**	

Notes to Exhibit A3

Rows (Note that "R1" denotes Row 1, "R2" denotes Row 2, etc.):

1. Rate for portfolio of U. S. Treasury securities having same expected cash flows as the losses.
2. Expected return for the insurer's investment portfolio. Note that the yield on a bond is not an expected return. The yield must by adjusted to eliminate expected default. Municipal bond yields are adjusted to reflect the implied return as if they were fully taxable.
3. Statutory income tax rate on taxable income.
4. Estimates can be obtained from Value Line, Yahoo Finance or other services.
5. Estimates are commonly available in rate filings (e.g., Massachusetts).
6. All-lines value an be estimated by adjusting historical industry reserve values to present value and adding back the after-tax discount to GAAP equity. See Butsic (1999) for an example. For individual lines, a capital allocation method can be used, such as Myers and Read (1999).
7. An arbitrary round number used to illustrate the method.

10. R1 + (R4 x R5).
11. R1 – R15
12. (1 – R3) x R1

14. R24 + R25 (at time 0).
15. R6 x (R10 – R1) / (1 – R3) – (R2 – R1) x [1 + R6 x (1 + R1) / (1+R12)].

20. R21 (Prior Year) + R36 + R37 + R38.
21. R20 + R42.

24. Present value of R7 using interest rate R11.
25. Present value of R40 using interest rate R12. Result is divided by (1 – R3).
26. Time 0: 0; Time 1: R20 – R24 – R25.
27. R6 x R24.

30. Time 0: R36 – R24. Time 1: – R11 x R24 (Prior Year).
31. (R21, Prior Year) x R2.
32. R30 + R31.
33. (R27, Prior Year) x R1.

36. R14.
37. Time 0: 0. Time 1: – R7.
38. – R3 x R32.

40. R3 x R33.

42. R27 – R26

44. (R26, Time 1) / (R27, Time 0) – 1.

46. Internal rate of return on Row 42 cash flows.

Appendix 4: Using Underwriting Data

This appendix describes Butsic's procedure for computing risk adjusted discount rates. The following relationship is used for the computation.

$$C = P(1+i)^{-u} - E(1+i)^{-w} - L(1+i_A)^{-t}$$

Where:

C is the cash flow on a policy and can be thought of as the present value of the profits, both underwriting and investment income, on the policy,
P is the policy premium,
E is expenses and dividends on the policy,
L is the losses and adjustment expenses,
u is the average duration of the premium, or the average lag between the inception of the policy and the collection of premium,
w is the average duration of the expenses,
t is the average duration of the liabilities.
i is the risk free rate of return
i_A is the risk adjusted rate of return

This formula says that the present value cash flow or present value profit on a group of policies is equal to the present value of the premium minus the present value of the components of expenses minus the present value of losses. Premiums and expenses are discounted at the risk free rate. Each item is discounted for a time period equal to its duration, or the time difference between inception of the policy or accident period and expiration of all cash flows associated with the item. Losses are discounted at the risk-adjusted rate. Underwriting data in ratio form, i.e., expense ratios, loss ratios, etc. can be plugged into the formula. When that is done, P enters the formula as 1, since the ratios are to premium.

In ratio form this formula would be:

$$c = 1(1+i)^{-u} - e(1+i)^{-w} - l(1+i_A)^{-t}$$

c is the ratio of present value profit to premium
e is the expense ratio, including dividends to policyholder
l is the loss ratio

Using as a starting point the rate of return on surplus, where the surplus supporting a group of policies is assumed to be eV_m, or the leverage ratio times the average discounted reserve, Butsic (Bustic, 1988) derived the following simplified expression for the risk adjustment:

$$Z = e(R-i) = (1+i)C/V_m \ ,$$

where:
Z is the risk adjustment to the interest rate or the percentage amount to be subtracted from the risk free rate = $e(R - i)$
C and i are as defined above
V_m is the average discounted reserve for the period

V_m is generally taken as the average of the discounted unpaid liabilities at the beginning of the accident or policy period (typically 100% of the policy losses) and the discounted unpaid liabilities at the end of the period. In general, this would be equal to 100% plus the percentage of losses unpaid at the end of the period (one year if annual data is used) divided by 2. The discount rate is the risk-adjusted rate. If V_m is computed as a ratio to premium, then published loss ratios are discounted and used in the denominator.

To complete the calculation, the quantity c, or the ratio of discounted profit to premium should be multiplied by $(1 + i)$ and divided by v_m (V_m in ratio form). To derive initial estimates of the risk adjustment, it is necessary to start with a guess as to the value of the risk adjustment to the discount rate in order to obtain a value for discounted liabilities.

The following is an example of the computation of the risk adjustment using this method. It is necessary to start with a guess for the risk adjustment and then perform the calculation iteratively until it converges on a solution. This example is based on data in Butsic's (1988) paper.

Parameter assumptions	
Interest Rate R_f	0.0972
Fraction of losses OS after 1 year	0.591
Initial Risk Adjustment	0.044

Variable	Nominal Value	Duration	Discounted Value
1 Loss&LAE	0.767	2.300	0.681
2 Premium	1.000	0.250	0.977
3 UW Expense	0.268	0.250	0.262
4 Pol Dividends	0.016	2.250	0.013
5 Average Liabilities	0.610	1.800	0.556

Calculation	
6 Premium-Expenses Discounted (2) - (3) - (4)	0.702
7 Premiums-Expenses-Losses Disc (6)-(1)	0.021
8 C*(1+I) (7)*(1+I)	0.024
9 Z=C*(1+I)/V_m (8)/(5)	0.042

An additive risk load

An additive or dollar risk load can be computed from the same data. The formula for the computation of a risk load is:

$$c = p(1+i)^{-u} - e(1+i)^{-w} - l(1+i)^{-t}$$

$$rl = c / l(1+i)^{-t}$$

Where rl is the additive risk load and i is the risk free interest rate.
An example is shown below:

Parameter assumptions	
Interest Rate Rf	0.0972

Variable	Nominal Value	Duration	Discounted Value
1 Loss&LAE	0.767	2.300	0.620
2 Premium	1.000	0.250	0.977
3 UW Expense	0.268	0.250	0.262
4 Pol Dividends	0.016	2.250	0.013

Calculation	
5 Premium-Expenses Discounted (2) - (3) - (4)	0.702
6 C =Premiums-Expenses-Losses Disc (5)-(1)	0.083
7 C/PV(Losses) (6)/(1)	0.133

Appendix 5: The Tax Effect

More recent work by Butsic (Butsic, 2000) has examined the effect of taxes on the risk adjusted discount rates and insurance premium. Butsic argued that, due to double taxation of corporate income, there is a tax effect from stockholder supplied funds. Stockholder funds are the equity supplied by the stockholder to support the policy. In the formulas above, stockholder supplied funds are denoted by E and taken to be the ratio of e to the present value of losses $V = L(1+i_A)^{-T}$. For a one period policy an amount E is invested at the risk free rate i, an amount E_i of income is earned, but because it is taxed at the rate t, the after tax income is $E_i(1 - t)$. The reduced investment income on equity will be insufficient to supply the amount needed to achieve the target return. In order for the company to earn its target after tax return, the amount lost to taxes must be included in the premium. However, the underwriting profit on this amount will also be taxed. The amount that must be added to premium to compensate for this tax effect is:

$$\frac{Eit}{(1-t)\left[1+i(1-t)\right]}$$

This is the tax effect for a one period policy if the discount rate for taxes is the same as the discount rate for pricing the policy, i.e., the risk adjusted discount rate. Butsic shows that there is an additional tax effect under the current tax law, where losses are discounted at a higher rate than the risk adjusted rate. There is also a premium collection tax effect, due to lags between the writing and collecting of premium. This is because some premium is taxed before it is collected. Butsic developed an approximation for all of these effects taken together, as well as the multiperiod nature of cash flows into the following adjustment to the risk adjusted discount rate:

$i_A' = i - e(1-t)(r_T - i)$, where

i_A' is the tax and risk adjusted rate,
e is a leverage ratio,
t is the tax rate,
r_T is the pre tax return on equity.

This is the effective rate used to discount losses to derive economic premium. The tax effect acts like an addition to the pure risk adjustment. Since premiums as stated in aggregate industry data already reflect this tax effect, no adjustment is needed for the risk adjusted discount rate used for pricing. However, for discounting liabilities, it may be desirable to segregate the tax adjustment from the pure risk adjustment, since the tax effect really represents a separate tax liability. Using the formula above, as well as the formula for determining the pure risk adjustment to the discount rate the two effects could be segregated. One would need to have an estimate of the total pre tax return on equity.

Appendix 6: Using Aggregate Probability Distributions

This example uses the Collective Risk Model to compute a risk load. It represents only one of the many approaches based on aggregate probability distributions. This is in order to keep the illustration simple.

The approach is based on the following model for risk load:

- Risk Load = λ SD[Loss] or Risk Load =λ Var[Loss],

Therefore, in order or compute a risk load, two quantities are needed: λ and Var[Loss], since SD(Loss) = $\text{Var[Loss]}^{1/2}$. The following algorithm from Meyers (Meyers, 1994) will be used to compute the variance of aggregate losses.

The Model:

1. Assume claim volume has an unconditional Poisson distribution.

2. Assume the Poisson parameter, n (the claim distribution mean), varies from risk to risk.

3. Select a random variable χ from a distribution with mean 1 and variance c.

4. Select the claim count, K, at random from a Poisson distribution with mean χn, where the random variable χ is multiplied by the random Poisson mean n.

The Variability of Insurer Losses

5. Select occurrence severities, $Z_1, Z_2, .., Z_K$, at random from a distribution with mean μ and variance σ^2.

6. The total loss is given by:

$$X = \sum_{j=1}^{K} Z_j$$

The expected occurrence count is n (i.e. $E[(\chi n] = E[n] = n$). n is used as a measure of exposure.
When there is no parameter uncertainty in the claim count distribution $c = 0$,

$$\text{Var}[x] = n(\mu^2 + \sigma^2),$$

and variance is a linear function of exposures.

When there is parameter uncertainty:

$$\mathrm{Var}[x] = nu + n^2v,$$

where

$$u = (\mu^2 + \sigma^2)$$

and

$$v = c\mu^2$$

nu is the process risk and n^2v is the parameter risk.

For example, assume an insurer writes two lines of business. The expected claim volume for the first line is 10,000 and the expected claim volume for the second line is 20,000. The parameter c for the first line is 0.01 and for the second line is 0.005. Let the severity for line 1 be lognormal with a mean of $10,000 and volatility parameter (the standard deviation of the logs of losses) equal to 1.25 and the severity for line 2 be lognormal with severity of $20,000 and volatility equal to 2. Applying the formula above for the variance of aggregate losses, we find that the variance for line 1 is 1.05×10^{14} and the variance of line two is 1.24×10^{15} and the sum of the variances for the two lines is 1.34×10^{15}. The standard deviation is $36,627,257.

One approach to determining the multiplier λ would be to select the multiplier ISO uses in its increased limits rate filings. In the increased limits rate filings, λ is applied to the variance of losses and is on the order of 10^{-7}.(Meyers, 1998)

In recent actuarial literature, the probability of ruin has been used to determine the multipliers of SD(loss) or Var(Loss). (Kreps 1998, Meyers 1998, Philbrick, 1994). The probability of ruin or expected policyholder deficit is used to compute the amount of surplus required to support the liabilities. To keep the illustration simple, we use the probability of ruin approach. However, the expected policyholder deficit or tail value at risk (which is similar to expected policyholder deficit) approaches better reflect the current literature on computing risk loads. Suppose the company wishes to be 99.9% sure that it has sufficient surplus to pay the liabilities, ignoring investment income, the company will require surplus of 3.1 times the standard deviation of losses, if one assumes that losses are normally distributed.[2] In order to complete the calculation, we need to know the company's required return on equity, r_e. This can be determined by examining historical return data for the P&C insurance industry. Then the required risk margin for one year is $r_e \times 3.1 \times 36{,}627{,}257$. For instance, if r_e is 10% then the risk margin is

[2] If one assumes that aggregate losses are lognormally distributed, then the company needs approximately $e^{(2.33*.06)}$* the expected losses as surplus, where .06 is the volatility parameter, derived from the mean and variance of the distribution..

11,354,450 or about 2.0% of expected losses. In this example, the parameter lambda is equal to 3.1 r_e. The result computed above could be converted into a risk margin for discounted losses by applying the 2% to losses discounted at the risk free rate. This would require the assumption that the risks of investment income on the assets supporting the losses being less than expected is much less than the risk that losses will be greater than expected. When the assets supporting the liabilities are primarily invested in high quality bonds, this assumption is probably reasonable. (see D'Arcy et. al., 1997)

Philbrick in his paper commissioned by the CAS "Accounting for Risk Margins" had a slightly different approach to determining the risk margin. Philbrick's formula for risk margin, given a total surplus requirement S, (i.e. 3.1* standard deviation in this example), a rate of return on equity r_e and a risk free rate i is:

$$RM = \frac{(r_e - i)xS}{1 + r_e}$$

This is a risk margin for discounted losses not undiscounted losses. . The formula above assumes that some of the required return on surplus is obtained from investing the surplus at the risk free rate. If i = 5%, and r_e = 10% the risk margin in this illustration would be $5,161,113.

In this example, it should be noted that the majority of the standard deviation is due to parameter risk, as process risk for such large claim volumes is minimal. However, only parameter risk for claims volumes has been incorporated. A more complete model would incorporate parameter risk for the severity distribution. This risk parameter has been denoted the "mixing parameter" in the actuarial literature. The algorithm for incorporating this variance into the measure of aggregate loss variance is as follows:

1 - 5. Follow steps 1 through 5 above, describing the selection of frequency and severity parameters for a distribution
6. Select a random variable B from a distribution with mean 1 and variance b.

7. The total loss is given by:

$$X = \sum_{j=1}^{K} Z_j / B$$

The variance reflecting the mixing parameter is given by:

$$\mathrm{Var}[x] = n(1+b)(\mu^2 + \sigma^2) + n^2(b + c + bc)\mu^2.$$

Procedures for estimating b and c are provided by Meyers and Schenker. The procedures use the means and variances of the claim count and the loss distribution to compute b and c. The parameter b can also be viewed as the uncertainty contributed to the total estimate of losses due to uncertainty in the trend and development factors. Methods for measuring the variance due to development are presented by Hayne, Venter and Mack. Regression statistics containing information about the variances of trend factors are published in ISO circulars and can be developed from internal data. To continue our example, we will assume that the b parameter for line 1 is 0.02 and for line 2 is 0.05. Then the standard deviation of aggregate losses is $95,663,174. The risk load using Philbrick's formula is $13,479,811 or 2.7% of expected undiscounted losses. The load is intended to be applied to discounted liabilities where liabilities are discounted at the risk free rate. Thus if losses take one year to pay out the risk margin is 2.8% of the present value of liabilities.

The above risk load is consistent with liabilities that expire in one year. When losses take more than one year to pay, Philbrick uses the following formula to derive a risk load.

$$RM = \sum_j \frac{(r_e - i)S_j}{(1+r_e)^j}$$

This formula can be applied to liabilities of any maturity. Where S_j is the surplus requirement for outstanding liabilities as of year j. In the above example if losses pay out evenly over 3 years then the risk margin is $20,693,737or 4.6% of he discounted liabilities. The calculation is shown below.

(1)	(2) Surplus	(3)	(4)	(5)
t	.227*PV(OS Losses)	1/(1+r(e)^t	(3)*(2)	(r(e)-.05)*(4)
0	219,965,641	1.000	219,965,641	10,998,282
1	146,643,760	0.909	133,312,510	6,665,625
2	73,321,880	0.826	60,596,595	3,029,830
				20,693,737

The computation above assumes that the relative variability of the liabilities remains constant as the liabilities mature. As this may not be the case, refinements to the measure of variability by age of liability may be desirable. One approach to modeling the uncertainty in reserves would derive measures of variability from observed loss development variability. This is the approach used by Zenwirth, Mack and Hayne. Another approach, consistent with how risk base capital is computed, would measure historic reserve development for P&C companies for a line of business from Schedule P.

Appendix 7: Direct Estimation of Market Values

Below we illustrate how to estimate the risk adjustment to the interest rate for a single firm, based on empirical data.

Assume that the market value of assets is 1400 and the book (undiscounted) value of the liabilities is 1000. Both of these values are available from the insurer's published financial statements. Also, assume that using the Ronn-Verma method (see the discussion in the Credit Risk Appendix), the estimated market value of the firm's equity is 500 and that the value of the expected default (the credit risk adjustment) is 10. The market value of the equity adjusted to exclude default is 510.

The discounted risk adjusted liabilities equals the market value of the assets minus the market value of the equity or 900 = 1400 – 500. The implied market value of the liabilities adjusted for default equals the market value of the assets minus the market value of the equity adjusted for default, or **890** = 1400 – 510.

Assume that the risk-free interest rate applicable to valuing the insurer's expected liability payments is 6% and that the liability payment pattern is 10% per year for 10 years (paid at the end of each year). The present value of the liabilities at the risk-free rate is 730. Thus, the risk margin, expressed in dollars is **160** = 890 – 730. Alternatively, the interest rate that gives a present value of 890 using the above payment pattern is 2.18%. This value implies a risk adjustment of **3.82%**.

The following discussion provides an example of the Ronn and Verma method.

Let A be the market value of assets, L the market value of liabilities and σ the volatility of the asset/liability ratio. The formula for the owners' equity, where there is a possibility of default, is the call option with expiration in one year:

(1) $\quad E = A \cdot N(d) - L \cdot N(d - \sigma)$,

where $d = \ln(A/L)/\sigma + \sigma/2$ and $N(d)$ is the standard normal distribution evaluated at d.

Notice that equity value with no default is simply $E_n = A - L$. For an insurer with stochastic assets and liabilities, σ_E, the volatility of the equity, is related to the asset/liability volatility by

(2) $\quad \sigma_E = N(d)A\sigma/E$.

Equations (1) and (2) are solved simultaneously to get E and σ.

The expected default value equals $E - E_A$, or the derived market value of the equity minus the equity value with no default.

The method is easily demonstrated with a numerical example. Assume that A =130, L = 100 and σ_E = 0.5. Solving the simultaneous equations gives E = 40.057 and σ = 0.117. Therefore, the value of the expected default is

0.057 = 40.057 - 40.000.

For an insurer, the market value of assets is readily determined from the published balance sheet. Discounting the reserves at a risk-free rate can approximate the market value of liabilities. The equity volatility can be estimated by analyzing the insurer's stock price over a recent time frame, as done by Allen, Cummins and Phillips.

Appendix 8: Distribution Transform Method

Assume expected claim counts for a policy equal 100 and ground up severities follow a Pareto distribution:

$$F(x) = 1 - \left[b/(b+x)\right]^q \text{ for x>0.}$$

Therefore $G(x) = \left[b/(b+x)\right]^q$

$\mathrm{E}[X] = b/(q-1)$

E(aggregate loss) = 100* E[X]

For the transformation r, $G(x) = \left[b/(b+x)\right]^{qr}$.

If the market risk premium is 10% then risk loaded premiums equal:

$$100\frac{b}{q-1}1.1 = 100\frac{b}{qr-1}$$

This expression can be solves for r:

$$r = \left[(q-1)/1.1+1\right]/q = (q+0.1)/1.1q.$$

If q were 2, r would be 0.95.

Expected values for higher layers could be computed by replacing q with qr in the Pareto distribution and using the Pareto formula for limited expected value to price the excess layers.:

E(X, x) = Limited Expected Value function = $\mathrm{E}[X]\left\{1 - \left[b/(b+x)\right]^{q-1}\right\}$

In the above example, a transformation was applied only to the severity distribution. However, with a little more work, the transformation could be applied to both the frequency and severity distribution.

For instance the formula for the transformed mean of a Poisson distribution with a mean of 100 and transformation parameter r is:

$$\sum_j ((e^{200}\Gamma(j) - \Gamma(j,100))/\Gamma(j))^r$$

This formula could be combined with the formula for the transformed severity distribution to produce a risk loaded mean.

Appendix 9: Credit Risk

The Time Horizon Problem

In general, long-tail liabilities are subject to greater default risk than are short-tail liabilities. To see why this is so, assume that an ongoing insurer has a 1% chance of insolvency each year. The insurer has two lines of business: line A has claims that are paid in one year and line B has claims that are paid in five years. The probability of a claim from line A not being paid in full is 1%. Assuming that each year's insolvency potential is independent of the other years, the probability of a claim from line B not being fully paid is $4.9\% = 1-(1-0.01)^5$, or about 5 times as great as for line A.

An insurance firm's owners normally make capital decisions at an approximate annual frequency, so to truly measure the long-term value of the potential default, it is necessary to consider the future capital flows as well as the current level of capital. (However, note that the fair value accounting proposals purposely ignore future transactions that are not based on current contractual obligations.) The complexity due to future capital flows (which are contingent on future company results and market conditions) makes the estimation of credit risk extremely difficult.

To make the credit risk adjustment calculation more tractable, it is customary to assume an annual time horizon and that future insolvencies have the same probability as for the current one-year horizon. For longer-term liabilities, one can further assume that the insolvency probabilities are independent year-to year and then determine the overall expected default by a formula suggested by the above 5-year calculation:

$$D = \frac{D_1}{p}[1 - w_1(1-p) - w_2(1-p)^2 - \ldots - w_n(1-p)^n] \quad \equiv \quad D_1[w_1 + 2w_2 + \ldots + nw_n].$$

Here, D_1 is the fair value of the expected default for the one-year horizon, p is the one-year insolvency probability and the weight w_i is the expected proportion of loss paid in year i (the weights sum to 1). Using the approximation above, the fair value over an n year time horizon of a company's option to default can be expressed as a function of its one year default value.

It should be noted that the published research relating to bond default rates does not support the assumption that annual default rates over the life of a bond are independent and identically distributed. That is, for many categories of bonds, the default rate during the third and fourth year is higher than the default rate during the first and second years after issuance. If the assumption of independent and identically distributed default rates is inappropriate for bonds, it may be inappropriate for some of the companies issuing bonds (i.e. insurance companies) and therefore the approximations in the above formula would not be appropriate.

A related technical issue that must be addressed in calculating the credit risk adjustment is the length of the *time horizon* over which defaults are recognized. At one extreme, it may be argued the applicable horizon is unlimited. Insurers are obliged to pay claims occurring during the contractual coverage period, no matter how long the reporting and settlement processes take. On the other hand, solvency monitoring and financial reports have a quarterly or annual cycle. Also, it is important to recognize that capital funding and withdrawal decisions are made with an approximate quarterly or annual cycle. An approach that often makes the solution easier to derive is to assume that one may view the time horizon as being a fairly short duration. According to this view, if the company is examined over short increments such as one year, corrective action is applied and insolvency over a longer term is avoided. The task force considers this view to be controversial. The alternative view is that insurance liabilities are often obligations with relatively long time horizons, and these longer horizons need to be considered when evaluating the companies' option to default on its obligations.

In the numerical examples below, we have determined the annual fair value of default. The extension to longer-duration liabilities is straightforward, using the above formula, if one assumes the formula to be appropriate. If one assumes the formula to be inappropriate, many of the methods below can be modified to adjuste for the longer time horizon of insurance liabilities.

Numerical Examples of Credit Risk Adjustment Estimation Methods

1. Implied Option Value: Example

The following (until #2, the DFA example), is a repeat of a few pages ago immediately following Appendix 7,

The following discussion provides an example of the Ronn and Verma method.

Let A be the market value of assets, L the market value of liabilities and σ the volatility of the asset/liability ratio. The formula for the owners' equity, where there is a possibility of default, is the call option with expiration in one year:

(1) $\quad E = A \cdot N(d) - L \cdot N(d - \sigma)$,

where $d = \ln(A/L)/\sigma + \sigma/2$ and $N(d)$ is the standard normal distribution evaluated at d.

Notice that equity value with no default is simply $E_n = A - L$. For an insurer with stochastic assets and liabilities, σ_E, the volatility of the equity, is related to the asset/liability volatility by

(2) $\sigma_E = N(d)A\sigma / E$.

Equations (1) and (2) are solved simultaneously to get E and σ.

The expected default value equals $E - E_n$, or the derived market value of the equity minus the equity value with no default.

The method is easily demonstrated with a numerical example. Assume that A =130, L = 100 and σ_E = 0.5. Solving the simultaneous equations gives E = 40.057 and σ = 0.117. Therefore, the value of the expected default is

0.057 = 40.057 - 40.000.

For an insurer, the market value of assets is readily determined from the published balance sheet. Discounting the reserves at a risk-free rate can approximate the market value of liabilities. The equity volatility can be estimated by analyzing the insurer's stock price over a recent time frame, as done by Allen, Cummins and Phillips.

2. Dynamic Financial Analysis: Example

An insurer has initial liabilities of $100 million, measured at fair value, but under the assumption that all contractual obligations will be paid. Assume that the DFA model has been run using 10,000 simulations. The time horizon is one year. We examine all observations where the terminal fair value (before default) of liabilities exceeds the market value of the assets. Suppose that there are 22 of them, with a total deficit (liability minus asset value) of $660 million. The average default amount per simulation is $0.066 million.

The expected terminal fair value is then discounted at a risk-adjusted interest rate to get the fair value of the credit risk adjustment. With a 4% risk-adjusted interest rate, for example, the fair value of the default is **$0.063 million** = 0.066/1.04. Thus, the fair value of the liabilities, adjusted for credit risk, is **$99.94 million** ($100 million - $.06 million.

3. Rating Agency Method: Example

This example shows how the table of default ratios might look, if a one-year time horizon approach was used. Alternatively, a matrix of default ratios by rating and lag year could be used, similar to those available from Moody's (e.g., Moody's January 2000 report titled "Historical Default Rates of Corporate Bond Issuers, 1920-1999"). Here the ratings are the current A. M. Best categories. The values in the table below are purely hypothetical.

Rating	Annual Expected Default Ratio (Raw Results)	Annual Expected Default Ratio (Adjusted)
A++	0.000%	0.001%
A+	0.000%	0.004%
A	0.013%	0.010%
A-	0.043%	0.050%
B++	0.122%	0.100%
B+	0.155%	0.150%
B	0.432%	0.300%
B-	0.619%	0.500%
C++	0.653%	0.800%
C+	1.221%	1.000%
C	1.554%	1.500%
C-	2.221%	2.000%
D	4.689%	5.000%
E	13.658%	15.000%

The raw results would be based on historical insolvency data. A simulation model or a closed-form model could be applied to a large sample of companies within each rating group to produce the adjusted results. These results might be further adjusted to ensure that a higher rating had a corresponding lower default expectation.

To show how the above table would be applied, assume that an insurer has initial liabilities of $100 million. These are measured at fair value, but under the assumption that all contractual obligations will be paid. Assume also that the insurer has an A- Best's rating. The expected default is 0.05% of $100 million, or $50,000.

The expected terminal fair value is then discounted at a risk-adjusted interest rate to get the fair value of the credit risk adjustment. With a 4% risk-adjusted interest rate, for example, the fair value of the default is **$48,100** = 50,000/1.04. Thus, the fair value of the liabilities, adjusted for credit risk, is **$99.95 million**.

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