

*CAS Dynamic Financial Analysis Handbook*  
CAS Valuation and Financial Analysis Committee  
Subcommittee on the DFA Handbook

**Casualty Actuarial Society**  
**Dynamic Financial Analysis**  
**Property/Casualty Insurance Companies**  
**Handbook**

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## **Introduction**

## Introduction

Dynamic Financial Analysis (DFA) is the process by which an actuary analyzes the financial condition of an insurance enterprise. Financial condition refers to the ability of the company's capital and surplus to adequately support the company's future operations through an unknown future environment.

The purpose of this *Dynamic Financial Analysis Handbook* is to provide suggestions and guidance to actuaries in performing DFA studies. As such, the *Handbook* is not a Standard of Practice and is not binding upon any actuary. Nor is the *Handbook* intended to define an acceptable standard of care which-if not followed-would indicate the actuary has acted negligently. Rather, the *Handbook* provides a list of considerations for actuaries to refer to when performing DFA. The *Handbook* is not exhaustive, but is intended to be revised and edited regularly as knowledge of DFA evolves. The release date of the *Handbook* appears on the cover page of the document, as well as at the top of each page.

The *Handbook* does not prescribe reporting requirements regarding DFA. The actuary performing DFA should decide on the format of any required report and comply with regulatory or professional requirements regarding such reports. The report allows the reader to clearly determine the key material threats to the company's solvency. The report assists in quantifying the company's surplus over the projection period and allows the reader to better understand the impact of alternative business scenarios on surplus. The report is not an absolute statement regarding the financial condition of a company, but rather a tool to identify material risks to solvency faced by the company.

In addition to assisting management and regulators with understanding solvency risks, the DFA process generally permits management to gain a better understanding of both the risks and opportunities inherent in the company under various business conditions and stress factors. This understanding allows management to better control the company's risk profile and to allocate surplus more effectively and efficiently. It also allows management to test the impact of various proposed business strategies under a variety of possible future conditions.

The *Handbook* does not prescribe a specific projection period for the entire process of analyzing the company's financial condition. The length of the projection period is determined by either the actuary performing the testing, or the regulators. However, if a long projection period is used, the actuary must use greater care in choosing assumptions and generally test a broader array of assumptions.

The process of DFA involves testing a number of adverse and favorable scenarios regarding an insurance company's operations. DFA assesses the reaction of the company's surplus to the various selected scenarios. This assessment of the test results is contained in the DFA report. The *Handbook* does not present the scenarios to be used in the testing process. However, normally, the company's business plan will serve as the base scenario for

this process. The choice of additional scenarios is determined by actuarial judgment, and/or regulatory guidance. Scenarios may vary greatly depending on an individual company's circumstances.

The actuary is expected to select a set of plausible scenarios sufficient to test all material threats to the company's solvency. It is expected that an actuary performing solvency testing will focus most heavily on those scenarios for which a material adverse impact on surplus is plausible. The reporting actuary, therefore, should define plausible scenarios and a materiality standard. By definition, large balance sheet items like claims reserves, unearned premium reserves, invested assets, and other material receivables and payables, as well as future profitability, should be tested under various scenarios. Influences such as pricing strategy, reserving methodology, reinsurance arrangements, growth targets, and investment policy should be analyzed. Items the actuary reasonably believes to be relatively immaterial, such as a slightly higher than average broker commission level, need not be addressed. It may be interesting to management, but if the situation is not likely to impair solvency, or materially impact profitability, then it need not be rigorously tested.

In performing DFA, as in any actuarial analysis, the actuary should assess the credibility of the data used to perform the analysis. If the data is not credible, the actuary should augment it with external data sources. Indeed, many of the potential threats to the solvency of a company are external, and the actuary should gather information from many external data sources, such as information on the economy, reinsurers, and emerging environmental risks. Each actuary performing DFA should assess the reliability and quality of each company's management information systems, and policy information systems. This can become complicated if a company owns many subsidiaries, particularly in foreign or non-U.S. locations. To properly analyze the financial condition of a company with subsidiaries, each subsidiary should be analyzed separately.

The actuary preparing the financial condition report may choose to rely on the work of another professional. Such professionals include auditors, both external and internal, investment professionals, insurance company senior management, and other actuaries who have expertise in areas that may be useful to the actuary preparing the report. Any actuary who relies on another professional should establish a basis for doing so. In addition, the actuary should formally communicate the significance of the process to those professionals whose advice is to be included in the report, so the professional is aware of and understands the significance of their contribution.

To properly assess the financial condition of a company, the actuary should have access to all relevant documents, systems, and employees. This *Handbook*, does not grant authority for that access. The actuary should look to the regulatory body of the jurisdiction requiring the DFA for access to those areas, or to the company's senior management if the analysis is being performed for internal purposes.

When an actuary identifies one or more plausible scenarios as a material threat to solvency, the actuary should suggest possible corrective actions or control strategies. Further action steps that may be required, such as possible notification of regulators, external auditors, or audit committees of boards of directors, are beyond the scope of this *Handbook*.

This *Handbook* is divided into six sections that provide guidance in particular facets of DFA. These sections are pricing/business planning, reserve considerations, mass tort exposure, reinsurance considerations, invested assets, and other assets and liabilities.

These major sections focus on the most common exposure risks to the *typical* property/casualty insurance company. The major categories of *risk* identified are:

*Inappropriate pricing*—generally underpricing and often coupled with excessive growth.

*Inappropriate business plan*—generally (excessive) growth in areas with significant underpricing, or areas for which there is little data or limited company expertise.

*Inappropriate reserving*—under-reserving due to lack of data, inadequate techniques, and/or management pressure, often coupled with underpricing.

*Inappropriate reinsurance program*—a company retains too much risk relative to surplus, or over-relies on one or a few reinsurers who subsequently experience financial difficulty.

*Inappropriate investment portfolio*—the company invests too much of its portfolio in asset classes that are overly volatile, poorly understood, overly concentrated with a few issuers who subsequently experience financial difficulty, or the portfolio is severely mismatched relative to the cash flow demands of the liabilities during a time when the portfolio is weak.

Each section contains a commentary focusing the topic, and an outline that can serve as a checklist for the actuary conducting DFA.

Other risks, beyond those enumerated in this *Handbook*, may at times overwhelm the enumerated risks. Examples of such risks include management fraud or incompetence, successful unanticipated shareholder lawsuits, significant off-balance sheet guarantees, or unusually adverse circumstances that go beyond what the actuary believes constitute reasonably plausible adverse scenarios. Therefore, it is incumbent upon the actuary to clearly express that these tests in no way constitute an implicit or explicit guarantee of future solvency.

**Section I**  
**Pricing/Business Planning**

## **Pricing/Business Planning**

### **Preface**

Adequate pricing and sound business planning are paramount to the sound financial condition of property/casualty insurance companies. Two of the most serious risks associated with the pricing and business planning process are:

- inadequate rates (or overly aggressive pricing), and
- excessive growth in areas where rates are inadequate, or where the company has limited expertise.

Inadequate rates can impair financial results of the company for several years if, for example, regulatory constraints prevent approval of more adequate rates, or the rate inadequacy is not identified for several years, which might be the case for new products. Inadequate rates can also result if management is persistently optimistic in its projections of ultimate losses, selection of trend factors, or ability to take effective remedial actions. Exit barriers in certain lines or geographic areas can exacerbate these problems. In short, an adequate rate structure and a sound realistic business plan are the cornerstones of the company's future financial health.

### **Pricing**

The ratemaking and pricing process involves numerous components each of which may play a key role in overall profitability. A company may initiate the pricing process using adequate manual rates but may end with inadequate rates via the injudicious use of schedule credits, preferred rate programs, inappropriate use of dividend plans or retrospective rating plans, etc. Therefore, the actuary should be aware of rate modifiers as well as the technical details of initial manual rate adequacy.

The actuary should be knowledgeable about significant expense items such as commission schedules and changes thereto, significant changes in staffing levels, and significant reinsurance purchase decisions. For example, the cost of catastrophe reinsurance may overwhelm virtually all other expense items for certain lines and markets.

The actuary needs to consider a host of both external and internal issues relevant to pricing decisions. Examples of external issues include anticipated inflation rates, interest rates, general economic strength/growth in the lines being priced, market cycles, nature of and growth in involuntary market mechanisms, and various regulatory issues. Examples of internal considerations include changes in underwriting programs, subline or classification mix changes, changes in claim department settlement practices and use of attorneys, marketing initiatives, etc.



The actuary should be knowledgeable about likely investment returns and needed profit loads. Consideration should be given to achieving a return on equity sufficient to provide adequate capital growth to support the company's business plan objectives.

## **Business Planning**

The business plan should be consistent with the results of the pricing review as well as overall economic and market conditions. The plan should be realistic in that it is within the financial and managerial capacity of the company.

During the business planning process, the actuary should keep in mind the length of the planning horizon. As the horizon increases, additional uncertainty is added to the process. In addition to reviewing the company's internal activities, it is important to make assessments of the perceived market rate adequacy, activities of competitors, and regulatory environments (including exit barriers).

The business plan should show a sufficient level of detail and identify any significant items that impact cash flow. The written and earned premium components, planned growth, rate/price levels and exposure growth assumptions should be consistent with the pricing cycle, regulatory environment, and anticipated changes in these environments. Projections of loss ratios should also be consistent with the pricing cycle, while allocated loss adjustment expense ratios should be consistent with trends in legal environments and claim department practices.

The actuary should also include ceded and assumed reinsurance in the business planning process, and consider the type of coverage, attachment points, limits, risk tolerance, cost and financial strength of the reinsurer.

Changes in the mix of business can impact on expense, profits and geographic concentration. Several scenarios should be considered to determine the sensitivity of the plan to various changes in operating, economic, and regulatory environments. Items to consider include the impact of catastrophes, changes in internal operations impacting payout patterns, significant changes in interest rates or investment strategies, and rate approvals that are less than originally anticipated.

The plan should also consider possible changes in anticipated reserve needs, emanating from prior accident years and possible mass tort activity during the plan horizon.

The plan should reflect the differences between the various accounting methods to which insurance companies are subject (statutory, GAAP, tax), in addition to likely changes in these accounting methods. Lastly, the actuary should consider the impact of the above scenarios on surplus, regulatory monitors such as RBC, rating agency perceptions, and the ability to raise capital.

The nature of any changes in business direction and the company's ability to monitor the shift are two very important considerations to include in the DFA analysis. A company that has adequate management information system capabilities, and procedures in place to

monitor their plan progress, will be in a position to react to potentially adverse outcomes and take prompt corrective action. On the other hand, a company with inadequate management information systems may not recognize when their plans are not being followed, or when conditions and underlying assumptions have changed enough to warrant changes in the basic plan.

## Pricing

- I. Source of rates
  - A. Bureau
    1. Is individual company experience consistently better or worse than bureau average? If so, what is the cause?
      - a. Different underwriting guidelines
      - b. Level of underwriting expertise
      - c. Different claims handling practices (for example, more or less aggressive in defending/litigating claims)
    2. Are individual company determined expense loads (or pure premium multipliers or loss cost multipliers) appropriate?
  - B. Deviation from bureau—What is the motivation for the deviation?
    1. Is the deviation justified by company experience?
    2. Is the company trying to grow significantly by cutting rates?
  - C. Company filed—Are rates justified by company experience or based heavily on competitors' rate structure?
  - D. Account specific
- II. How frequently are rates reviewed and filed? How frequently is pricing adequacy reviewed?
- III. What ratemaking data is available?
  - A. Industry
    1. Is it applicable to individual company book?
    2. What is the level of integrity?
    3. What level of detail is available?
    4. How many years of history are available?
  - B. Company
    1. Is the data sufficiently credible?
    2. What is the level of integrity?
    3. What level of detail is available?
      - a. Policy year, accident year, calendar year
      - b. Line, class, subline, limit, deductible, account, etc.
      - c. Direct, assumed, ceded, net
    4. How many years of history are available? Is this adequate for the line being reviewed?
    5. Has mix of business by class, deductible, policy limit, attachment point, etc., been consistent? That is, is past experience representative of future experience? If not, can data be adjusted to make it representative?
- IV. Ratemaking considerations—for each ratemaking component, what should be

considered/analyzed?

- A. What type of data is used? (How responsive is the method to changes?)
  - 1. Accident year
  - 2. Policy year
  - 3. Exposure year
  - 4. Contract year
  - 5. Pool year
- B. Current and historical loss and ALAE Development—Have appropriate development factors been selected given consideration to the following? (See Section II, "Reserve Considerations for DFA.")
  - 1. Incurred loss
    - a. Have past development patterns been distorted due to any of the following?
      - (1) Changes in claim department practices that would affect
        - (A) Case reserve levels (new case reserve philosophy)
        - (B) Reporting patterns (For example, telephone reporting may reduce time lag between accident and notice date.)
        - (C) Settlement patterns (incentives or disincentives to close claims more quickly, workload per adjuster, change in management)
      - (2) Changes in mix of business by class, limit, state, etc.
      - (3) Changes in underwriting standards/guidelines
      - (4) Changes in type of policy (guaranteed cost, retro, large deductible, excess of SIR, service only)
      - (5) Changes in type of coverage (occurrence, claims-made)
      - (6) Changes in policy language or exclusions and legal interpretation of such
      - (7) Changes in policy limits or deductibles
      - (8) Changes in reinsurance purchased (net basis)
      - (9) Changes in laws (For example, Superfund, workers compensation state benefits, administration rules, etc.)
      - (10) Changes in judicial or administrative decisions that establish precedents (new dispute resolution procedures)
      - (11) Changes in discounting or escalation procedures (inflation assumptions)
      - (12) Catastrophes
      - (13) Indirect changes in reporting patterns (For example, for workers compensation, fewer medical only claims may be reported under large deductible policies to reduce the experience mod)
      - (14) Changes in medical management

- (A) Impact of health maintenance organizations (HMO's) and preferred provider organizations (PPO's)
- (B) Use of capped rates versus fee-for-service
- (C) Incentives for HMO's
- b. If so, can the data be adjusted to be consistent with planned future business?
- c. If not, what is the likely impact on ultimate loss projections?
- 2. Paid loss (same as incurred loss)
- 3. Incurred ALAE
  - a. Have development patterns been distorted due to any of the following?
    - (1) Changes in the definition of ALAE
    - (2) Changes in treatment of ALAE (within the limit versus in addition to the limit)
    - (3) Changes in claim department practices or new expense items such as medical cost containment that would affect
      - (A) Case reserve levels (if case reserves are established)
      - (B) Reporting patterns
      - (C) Payment patterns (For example, partial payments of legal fees versus pay at the end, new type of expenses that occur early on such as medical cost containment and management)
    - (4) Changes in defense philosophy that would impact
      - (A) Amount of litigation
      - (B) Cost of litigation (use of in-house versus independent attorneys)
      - (C) Success of litigation
    - (5) Changes in mix of business by class, limit, state, etc.
    - (6) Changes in underwriting guidelines
    - (7) Changes in type of policy (guaranteed cost, retro, large deductible, excess of SIR)
    - (8) Changes in type of coverage (occurrence, claims-made)
    - (9) Changes in policy language/interpretation that may impact duty to defend
    - (10) Changes in policy or deductible limits
    - (11) Changes in reinsurance purchased (net basis)
    - (12) Changes in laws (For example, Superfund, workers' compensation state benefits, administrative rules, etc.)
    - (13) Changes in judicial or administrative decisions that establish precedents

- (14) Indirect changes in reporting patterns
      - b. If so, can the data be adjusted?
      - c. If so, what is the likely impact on ultimate ALAE projections?
    - 4. Paid ALAE (same as incurred ALAE)
  - C. Loss trend—Have appropriate trend factors been applied given consideration to the following?
    - 1. Trend period
      - a. What is the length of the trend period?
      - b. Is it consistent with the effective policy period?
    - 2. Magnitude of trend
      - a. Is the trend being applied consistently with industry trends or are differences explainable?
      - b. Is the trend being applied consistently with internal and/or external indices?
      - c. What external indices are considered?
    - 3. Type of trend—what type of trend is justified?
      - a. Linear
      - b. Exponential
      - c. Other (For example, econometric)
    - 4. Consistency of trend indications based on the various considerations above
  - D. Treatment of large losses
    - 1. Basic limits versus total limits
      - a. At what level are losses capped if at all? Is this level appropriate?
      - b. Are the losses above the cap spread back and if so, on what basis are they spread?
    - 2. How are increased limits rates made?
  - E. Catastrophe provision
    - 1. Historical
      - a. How many years of history are considered in determining the load?
      - b. Have changes in geographical exposure been considered when applying past experience to current exposure?
      - c. Are event frequency and PML estimates reasonable?
    - 2. Simulation based?
    - 3. What perils have been considered?
      - a. Hurricane
      - b. Tornado
      - c. Earthquake
      - d. Hail storm
      - e. Freeze
  - F. Premium development

1. Is audit premium included?
2. Are loss sensitive premium adjustments included?
- G. Premium trend
  1. Trend period
    - a. What is the length of the trend period?
    - b. Is it consistent with the effective policy period?
  2. Magnitude of trend
    - a. Is the trend being applied consistently with industry trends or are differences explainable?
    - b. Is the trend being applied consistently with internal and/or external indices?
    - c. What external indices are considered?
  3. Type of trend—what type of trend is justified?
    - a. Linear
    - b. Exponential
    - c. Other (For example, econometric)
  4. Consistency of trend indications based on the various considerations above
  5. Exposure base (Is appropriate recognition given to inflation sensitive versus non-inflation sensitive exposure bases?)
- H. Earned premium at current rates (adjusted for both rate and benefit level changes)
- I. Weighted trended on-level loss ratio
  1. How many years of experience are averaged? Is this appropriate for the line of business?
  2. How are the loss ratios weighted together? That is, how responsive is the method to change?
    - a. All receive equal weight
    - b. Weight increases for more recent accident (or policy) years
    - c. Exclude outliers
    - d. Is there a trend or pattern to the loss ratios?
- J. Credibility
  1. What form of credibility is applied?
    - a. Square-root rule
    - b.  $P/(P+K)$
    - c. Other
  2. To what is the complement of credibility applied? (class, state, countrywide, industry data, peer group data, etc.)
- K. Unallocated loss adjustment expense
  1. Have appropriate adjustments been made for planned changes in volume and staffing?
  2. Have charges been appropriate in the past (especially for large accounts demanding high quality and quantity of service)?



- L. Commissions
  - 1. Are any changes in commission structure (including contingent) appropriately reflected?
  - 2. Are agents incented only for volume or volume and profit?
- M. Taxes, licenses and fees
  - 1. Second injury funds (Are past costs representative of future costs?)
  - 2. Other assessments (Are past costs representative of future costs?)
- N. Profit and contingency
  - 1. Considerations for the profit load
    - a. What method is used to calculate the profit loading?
      - (1) Discounted cash flow
      - (2) Internal rate of return
        - (A) Capital asset pricing model
        - (B) Arbitrage pricing theory
        - (C) Option pricing theory
      - (3) Other models
    - b. Are the assumptions used appropriate?
      - (1) Discount rate
      - (2) Risk charge
      - (3) Premium to surplus
      - (4) Investment yield
      - (5) Other
    - c. Is the load appropriate for the risk being taken?
  - 2. Is the appropriate credit risk reflected for national accounts?
  - 3. How is the contingency factor, if any, determined?
    - a. Historical need
    - b. Future potential
- O. General expense
  - 1. Does it accurately reflect expected expenses during the period the rate will be in effect?
  - 2. Are special expenses for a particular line or state adequately reflected?
- P. Policyholder dividends (Do rates reflect the appropriate dividend rate for the selected loss ratio?)
  - 1. Sliding scale
  - 2. Fixed
- Q. Assigned risk overburden—Are estimates of assigned risk pool deficiencies accurate and appropriately reflected in pricing where possible?
- R. Reinsurance (See Section IV, "Reinsurance Considerations for DFA.")
  - 1. Should more or less reinsurance be purchased based on cost, past results and management's level of tolerance for variability in operating results?
  - 2. Is the type of reinsurance purchased appropriate for the lines of business being covered?

3. Is the cost appropriately spread back to business unit and line?
  4. Is the cost appropriately reflected in rates or are rates calculated on losses gross of reinsurance?
- S. Investment income (See Section V, "Invested Asset Issues for the Appointed Actuary.")
1. How was the investment yield determined?
    - a. New money rate
    - b. Imbedded yields
  2. What type of investments underlie the selected yield?
    - a. "Safe" yields—Treasury bills
    - b. Risky yields—higher risk bonds or stocks or others such as derivatives
  3. Is there appropriate recognition of asset/liability mismatch risk?
  4. Are various interest rate, loss ratio and payout scenarios considered?
- T. Implied ROE
1. Are some lines, states, etc., being subsidized by others? Is this acceptable?
  2. Does overall ROE meet shareholders' expectations for stock companies and allow for adequate capital growth for mutual companies?
  3. Does by line and overall ROE meet management's expectations?
- U. Guaranty fund assessments
- V. Pricing Considerations
- A. What pricing practices may lead to inadequate prices in spite of adequate rates?
1. Are degree of use and amount of schedule rating credits justified?
  2. Are preferred rate programs overused?
  3. Are retrospective rating and dividend plans used appropriately?
  4. Are loss limits and maximums used appropriately for business being underwritten?
  5. Are premium audits accurate and adequate?
  6. Are agents/brokers reviewed for profitability?
    - a. Are there appropriate incentives?
    - b. Are contingent commissions based on growth only or growth and profitability?
  7. Are MGA's used?
    - a. Level of authority
    - b. Use of sub-agents
  8. Misapplication of rates
  9. Change in underwriting standards
  10. Shifts in distribution among rating classes to inadequately priced classes
- B. Issues impacting level of accuracy of rates

1. Are individual risk premiums rated on a loss sensitive basis? How wide a swing?
  2. Is the class plan highly segmented or broad?
  - C. Other considerations
    1. In general, what is the company's degree of retained risk versus risk sharing with policyholders, reinsurers, etc.?
    2. Is coverage on a claims made or occurrence basis?
    3. Have aggregate limits been taken into account?
    4. Elasticity of demand
- VI. New product
- A. Level of expertise of actuaries (hired externally or developed internally), underwriters, management, reinsurers
  - B. Source and adequacy of initial rates or underlying data used to construct rates? Determined relative to competitors? Competitors profitable?
  - C. Surplus requirement
  - D. Start-up versus on-going expense costs
  - E. Profitability
    1. Is a higher loss ratio expected to begin with?
    2. How long before profitable?
  - F. What has the experience of other carriers with a similar product been?
  - G. Is there sufficient demand for the product relative to supply, both presently and as anticipated in the future?

## Business Planning

- I. What is the planning horizon? 1 year, 3 years, 5 years?
- II. Are the planning assumptions consistent with the actuarial pricing reviews or indications?
- III. Ability to achieve the plan goals. This risk may be the major risk (particularly for a new line of business or for a management with an unsatisfactory historical track record relative to achieving plan).
- IV. Assessment of environment/market conditions
  - A. Underwriting cycle/perceived rate adequacy
  - B. Competition
    1. Who is the competition?
    2. Is competition growing or shrinking?
    3. How do you compare?
      - a. Rate level
      - b. Profitability
      - c. Coverage provided
      - d. Service
      - e. Strengths and weaknesses
    4. Are you a major or minor player?
    5. Are you new to the market?
      - a. Burn your way in?
      - b. Other strategy?
    6. What do you bring to the table that makes you unique?
    7. Why will insureds do business with you?
  - C. Regulatory environment
    1. Product
    2. State
    3. Territory
- V. Level of detail? (line of business, market, product) (guaranteed cost, retro, service only, large deductible)
- VI. Components
  - A. Written and earned premium
    1. Are growth assumptions realistic given regulatory environments and the underwriting cycle?
    2. Are premium equivalents for servicing type business appropriately reflected?
    3. Are assumed exposure level changes reasonable given economic

- trends?
4. Are assumed rate level and pricing changes reasonable given the regulatory and competitive environment?
- B. Paid and incurred loss ratios—Are loss ratio projections reasonable given past experience, underwriting cycle (projected rate adequacy) and underwriting guidelines?
  - C. Paid and incurred ALAE ratios—Are ALAE ratio projections reasonable given claim department practices, legal environments and recent trends in ALAE costs?
  - D. Unallocated loss adjustment expense
  - E. Other insurance expense
  - F. Commissions (including contingent commissions) (See “Pricing” in this section.)
  - G. Taxes, licenses and fees (including assessments) (See “Pricing” in this section.)
  - H. Policyholder dividends (See “Pricing” in this section.)
  - I. Underwriting income
  - J. Net investment income (See “Pricing” in this section.)
  - K. Other income
  - L. Federal income tax (Are any net operating losses properly reflected?)
  - M. Reinsurance (same components as A-C)
    1. Ceded
      - a. What are the attachment points, deductibles, limits and aggregates?
      - b. Risk tolerance
      - c. Degree of risk transferred
      - d. What is the degree of swing if sliding scale commission?
      - e. Adequate coverage (estimate PML under various scenarios)
      - f. Proportional/Nonproportional
      - g. Facultative/Treaty
      - h. Acceptable cost/Market conditions
      - i. CAT assumption
        - (1) Historical—For example, a 1 in 20 year event
        - (2) Simulation based
        - (3) Perils considered (hurricane, tornado, earthquake, hail storm)
      - j. Reinstatement premium
        - (1) Is there a reinstatement provision?
        - (2) What is the cost?
        - (3) How many?
      - k. Sunset clauses? Deductibles? Aggregates?
      - l. Financial strength of reinsurers
      - m. Write-off for uncollectability (model various plausible

- scenarios)
      - n. Traditional/Finite risk
    - 2. Assumed
      - a. Lines of business, exclusions, layers and limits
      - b. What has been the general loss experience by line and type?
      - c. What is the degree of swing if sliding scale commission?
      - d. Maximum and minimum if retrospective plan
      - e. Profit plan sharing parameters
      - f. Credit risk of cedent
      - g. Risk charge
      - h. Degree of risk assumed
      - i. Proportional/Nonproportional
      - j. Facultative/Treaty
      - k. PML—risk to surplus
      - l. International—foreign exchange risk
      - m. Level of expertise
      - n. CAT assumption
        - (1) Historical—For example, a 1 in 20 year event
        - (2) Simulation based
        - (3) Perils considered (hurricane, tornado, earthquake, hail storm)
  - N. Retention ratios—new versus renewal mix impacts loss ratio
  - O. New business
    - 1. Written premium (growth strategy)
    - 2. Loss ratio
    - 3. Expense ratio
  - P. Retro reserve
  - Q. Other loss sensitive reserves (dividend reserves, contingent commission, sliding scale commission on reinsurance etc.)
  - R. Credit risk
    - 1. Credit-worthiness of creditor? Credit rating (if available)?
    - 2. Type of collateral?
      - a. Letters of credit
      - b. Trust accounts
      - c. Cash
      - d. Surety bond
      - e. Other
    - 3. Write-off for uncollectability
- VII. Other considerations
- A. Mix of business
    - 1. Changes to current mix or volume
      - a. Over-concentration in any line, subline, state, or territory

- b. Impact on expense ratios and profits
    - 2. Changes in policy limits sold
    - 3. New lines
    - 4. Lines in runoff
  - B. Variability of cash flow assumptions
    - 1. Payout patterns
    - 2. Interest rates
    - 3. Other
  - C. Accounting method
    - 1. Statutory
    - 2. GAAP
    - 3. Tax
  - D. Miscellaneous adjustments
    - 1. Salvage and subrogation recoveries (if not already considered)
    - 2. Discount (workers' compensation tabular) or other statutorily permitted discounts
      - a. Accretion of discount—impact on calendar year results
      - b. Special amortization requirements (if any)
    - 3. Asbestos and environmental reserve increases
    - 4. Reserve increases or decreases for principal or runoff lines
    - 5. FASB/NAIC accounting initiatives (changes to rules and regulations)
  - E. Level of underwriting input into the planning process
  - F. State strategy
    - 1. Growth or lack thereof
    - 2. Withdrawal
    - 3. Undue CAT concentration (decrease writings)
  - G. Involuntary market
    - 1. Type
      - a. Assigned risk with assignments
      - b. Reinsurance pool
      - c. JUA
    - 2. Size
    - 3. Rate adequacy or size of burden (impact on voluntary prices and results)
    - 4. Level of exposure by state
    - 5. State programs—For example, take out credits
    - 6. Servicing carrier income offsets
  - H. Potential exit barriers in certain lines/geographic areas

## Pricing/Business Planning

- I. Trends
  - A. Economic
    - 1. Inflation
      - a. Medical
      - b. Legal fees
      - c. Wages
      - d. Specific to line of business (For example, car repair costs, home construction costs, etc.)
      - e. Overall (CPI, etc.)
    - 2. Interest rates
    - 3. Unemployment
    - 4. General economic growth by industry group and state
    - 5. Business failures and formations
  - B. Pure premium
  - C. Frequency (For example, the number of accidents per exposure unit changes because number of miles driven decreases during recessions, highway improvements, number of hours worked, age of workers, level of experience, unemployment, etc.)
  - D. Severity
  - E. Litigation
    - 1. Outcomes of key cases (for relevant states, lines, etc.)
    - 2. Extent of general litigation and general outcomes (pro defendant versus pro litigant)
  - F. Exposure bases (sales, payroll, etc.)
  - G. Policy interpretations (extensions of coverage that are unintended by insurer)
  - H. Social—non-economic
    - 1. Judicial
    - 2. Claim consciousness
    - 3. Court practices
    - 4. Morality
  - I. Demographics (general aging of population may impact medical costs or accident frequency may increase or decrease)
  - J. Public health (mortality and morbidity trends)
  - K. New technology (may change how various services are delivered, claim estimates are made or may impact frequency of accidents and severity of accidents) (For example, airbags, improved braking systems, etc.)
- II. Environmental changes
  - A. Regulatory
  - B. Judicial
  - C. Legislative



- D. Government intervention/involvement
- III. Operational changes
  - A. Underwriting
  - B. Claim handling
  - C. Case reserves
  - D. Marketing
- IV. Field input
  - A. Experience of field and key managers
  - B. Ability to execute successfully (historical track record)
  - C. Adequate staff levels
  - D. Appropriate field compensation plans and incentive plans
- V. Adequacy of MIS
  - A. Monitor results (results = expected results)
  - B. Feedback loop (ability to diagnose and fix problems)
  - C. Adequacy of data items captured
  - D. Real time or significant lag of information
- VI. Capital issues
  - A. RBC and impact of various business strategies on RBC results
  - B. Rating agency formula/perceptions (possible upgrades or downgrades and impact on ability to achieve business plan)
  - C. Ability to raise capital (access to borrow, equity markets, private investors, etc.)
  - D. Dividend requirements to parent or receivable from subsidiaries
  - E. Regulatory perceptions (premium and reserve leverage, IRIS tests, etc.)

**Section II**  
**Reserve Considerations For Dynamic Financial Analysis**

## Reserve Considerations For Dynamic Financial Analysis

The largest liability on an insurer's balance sheet is usually the reserve for losses and loss adjustment expenses. A significant portion of the remainder is often in the unearned premium reserves. These reserves represent provisions an insurer makes to carry out the promise it has made to its insureds to pay for covered losses. As such, the reserves are subject to substantial potential variability due to many causes: random fluctuation, imprecise forecasts, or changes in law or interpretation. Such variability can have a significant impact on the insurer's solidity. In addition, other risk-bearing mechanisms (for example, self-insurance or state pools) will also be affected by variability in reserve estimates.

By its nature, DFA is concerned with a range or distribution of potential outcomes and not merely a point estimate. The notion of range or distribution is particularly significant in evaluating reserves within a DFA framework. The final payout for a book of business is uncertain until all claims are closed and all payments are made. Thus, quantification of a range of potential reserve outcomes arising from a set of specific scenarios or an estimate of the distribution of possible reserve outcomes, with corresponding probability estimates, is critical to any DFA model. For this reason, much of the attached outline is directed toward identifying sources of uncertainty for reserve estimates.

An actuary performing DFA for a risk-bearing enterprise should be aware of the various types of variability and sources of uncertainty in reserve estimates. The types of variability include:

- process (inherent in any random process, even if that process is perfectly known),
- parameter (inherent in the fact that even if models are perfectly known, parameters usually should be estimated), and
- specification (reality may not follow the model selected).

In addition to uncertainty in the overall reserve estimates, the actuary faces additional uncertainty in estimating the timing of the payment of those liabilities.

Most statistical models for estimating loss reserves will recognize process variability. However, for most insurance applications, the "law of large numbers" significantly reduces the influence of process variability on reserves. These statistical models may also provide estimates of the variability inherent in the model parameters. For most insurance applications, parameter uncertainty contributes far more to the variability than process variability and may not be reduced by the "law of large numbers."

The actuary should be familiar with the various methods that can be used for the analysis of reserves. Each of these methods has specific assumptions, strengths and

weaknesses. Selection of a method usually results in a compromise between stability and responsiveness. Thus, the actuary should have knowledge of these various assumptions, given the particular situation under analysis, and exercise appropriate actuarial judgment in the selection of models and in the final estimates used for reserves.

The actuary should be aware, however, that because of the choice of specific models, substantial variability still exists. This last source may be unquantifiable but can be substantial and may explain why ranges implied by various statistical methods may not overlap for a specific situation. Furthermore, the actuary should also be aware of the distribution estimates provided by the model. A significant difference exists between the distribution of the expected reserves and the distribution of reserves. An example may make this distinction clearer. The distribution of the expected outcomes of one throw of a fair die is 3.5 with probability 1 and probability 0 for any other value. However, the distribution for one throw has 1/6 probability assigned to each integer from 1 through 6, and 0 to all other values. The first is concerned with the expected value, while the second is concerned with possible values. Many forecasting models provide an estimate of the former while the latter is of concern for DFA.

Any statistical model used to estimate reserves is based on a specific set of assumptions. The actuary using any such model should be familiar with its inherent assumptions, as well as the extent that actual conditions can influence the forecasts and the resulting estimates of the reserve distribution.

Some events influence specific coverages: Specific judicial decisions, legislative benefit changes, or shifts in marketing emphasis for a particular line of business. Other events can influence different lines of insurance: economic recession or growth, the insurance underwriting cycle, and internal processing changes. Still, others may effect both sides of the balance sheet; for example, an unexpected change in inflation can affect both claims costs and the value of the company's assets. The actuary should be aware of the effects of these influences on reserves and the distribution of potential reserves used in the DFA model.

Accounting considerations can affect the structure of a DFA model. For example, the presence of discounting in the statutory reserves may affect balance sheet entries, but not necessarily the cash flow models used in modeling of reserves in a DFA model (assuming, of course, that the reserves are treated appropriately).

Reinsurance is another significant issue. Although the results should be independent of accounting conventions, the approaches in constructing a DFA model may differ if reinsurance is considered a contra-liability rather than an asset. In the former case, one could concentrate on net reserves, leaving collectability as a separate, asset-related issue; whereas, in the latter situation, the actuary may construct separate but interconnected models for direct and ceded losses.

Although often treated when considering the income side, payments on future claims will also affect the DFA model. The actuary should then consider the effect of the various factors that influence losses, as well as those that influence rates, to address uncertainty in payments on future claims. Variation in such future payments will affect the adequacy of the unearned premium reserve.

The attached outline presents additional details and is intended to be used as a guideline for the actuary addressing the reserve component of a DFA model.

## Reserving Considerations for the Dynamic Financial Analysis

- I. Variability in what?
  - A. Expected ultimate loss (and LAE)?
  - B. Actual ultimate loss (and LAE)?
  - C. Example: If  $X$  is the outcome of the roll of a fair die then  $E(X)=3.5$  with certainty; that is, the expected ultimate loss is known but the actual value can be any integer between 1 and 6 with equal probability and is thus uncertain.
  
- II. Sources of uncertainty for loss and loss adjustment expense (LAE) reserves
  - A. For loss and LAE reserves for a single line and single exposure year
    1. Process—uncertainty due to the randomness of the process, even if the process is perfectly known. For example, a single throw of a fair die will come up with an integer between 1 and 6, but which one is unknown. The “Law of Large Numbers” may help to mitigate this source of uncertainty in insurance situations if there is a sufficiently large number of independent events. Some refer to this as “diversifiable” risk.
    2. Parameter—uncertainty that the parameters of the selected model are correct. For example, in the die analogy, what is the certainty that the die itself is a fair die. This risk may not be able to be diversified by use of the “Law of Large Numbers,” though it is possible that, in some situations more data may lead to better estimates of parameters.
    3. Specification—uncertainty that the models used to approximate reality are correct. For example, in the die analogy, are the underlying numbers really generated from another distribution, Poisson for example, rather than from the throw of a die? More significantly, if the actuary is using some overall model fitting to the development patterns, then there is uncertainty that the model selected (regression, Horel curve, etc.) actually reflects the underlying loss emergence process.
    4. Other—uncertainty that the future will not be like the past with legal and possibly other changes. To the extent that reserve estimates are based on past patterns, such changes can affect the applicability of using past patterns to forecast future losses.
    5. Coverage specific issues
      - a. Data quality
      - b. Credibility of the data
      - c. Frequency and severity characteristics of the coverage
      - d. Limits written
      - e. Salvage, subrogation or collateral sources
      - f. Reinsurance
      - g. Catastrophes
      - h. Unique characteristics of the coverage (For example, surety,

- D&O, E&O, financial guarantee, etc.)
- i. Occurrence versus claims made
  - (1) Length in claims made (first year claims made may be different than mature claims made development)
  - (2) Tail coverage
  - (3) Prior acts ("nose") coverage
- j. Unique internal influences
  - (1) Changes in contract or coverage
  - (2) Insurer experience in coverage/market segment, a "neophyte" may fare worse than a seasoned veteran in some markets
  - (3) Unusual growth (or shrinkage) in particular coverage—is new (or lost) business significantly different from remainder?
  - (4) Changes in rate of claims settlement (may impact forecasting methods)
  - (5) Changes in reserving practices (may impact forecasting methods)
  - (6) Changes in claims staffing, significant additions or subtraction to staff can affect both reserving and payment practices
  - (7) Accounting changes
  - (8) Implementation of loss control methods and procedures, of potential significance (though not the only ones) use of utilization review and audits for medical bills or case management can affect costs
  - (9) Changes in the defense philosophy of claim management
  - (10) Claims procedure changes
    - (A) Opening practices
    - (B) Adjuster authorization level
    - (C) Field practices
  - (11) Claim department organization
  - (12) Insurer organization (in the process of centralizing/decentralizing, etc.)
  - (13) Presence of discount in the reserve
- k. Appropriateness of the selection of projection methods used to estimate reserves given the credibility and volatility of the data
- l. "Track Record" of projection methods, if methods have been historically "noisy" or particularly accurate, this should be reflected in the actuary's assessment
- m. External influences unique to coverage
  - (1) Claims inflation

- (2) Local economic conditions
    - (A) Local recession
    - (B) Local expansion
    - (C) Unusually high (or low) demand for services purchased by insurers. For example, scarcity of contractors and building materials after a large property catastrophe.
    - (D) Employment levels
  - (3) Underwriting cycle
  - (4) Unique market characteristics
    - (A) Residual market
    - (B) Behavior of major players in market
    - (C) Management market objectives (growth, profit, etc.)
    - (D) Market position and changes that may affect losses (and LAE)
  - (5) Weather
  - (6) Profitability of coverage
  - (7) Reliability of exposure base in measuring loss potential
  - (8) Legislative changes
    - (A) "Retroactive" liability
    - (B) Fee schedules
    - (C) Changes in statutory benefits
  - (9) Judicial changes
    - (A) Covered but unanticipated damages
    - (B) Reinterpretation of policy language
  - (10) Administrative changes in resolving disputes
  - (11) International considerations (exchange, etc.)
- n. Large or unusual losses can have significant impact on reserves and are likely to have significantly different expected emergence patterns than more "usual" claims. The following are some examples but should not be considered to be exhaustive
- (1) Catastrophes
    - (A) Cost effects of supply and demand shifts after a major catastrophe
    - (B) Moral hazard
    - (C) Additional burden on staff or use of additional outside adjusters with different reserving practices
    - (D) Interpretation of coverage that differs from insurer's interpretation
    - (E) Cost to construct to new, more stringent,



- requirements
        - (2) Structured settlement agreements
        - (3) Continuing trauma/industrial disease
        - (4) Hazardous waste
        - (5) Asbestos
          - (A) Products bodily injury
          - (B) Products property damage
          - (C) Other coverages (?)
        - (6) DES
        - (7) Bendectin
        - (8) Silicon implants (?)
        - (9) Electromagnetic Fields (?)
      - o. Other (Son of asbestos?)
      - p. Do the projections of the various methods make sense? That is, are various diagnostic statistics such as frequency, severity, pure premiums, loss ratios, etc., explainable?
      - q. Actuarial judgment should be exercised throughout the entire process. How does this affect the results?
    - 6. Effects on various reserve categories (if separate analysis is performed and some may be combined in the analysis)
      - a. Case reserves
      - b. Provision for development on known claims
      - c. Reopened claims reserve
      - d. Provision for claims incurred but not reported
      - e. Provision for claims incurred and reported but not recorded
    - 7. Loss adjustment expenses (LAE)
      - a. Presumably allocated treated in conjunction with losses. Same considerations apply along with the possibility that ALAE may be correlated to losses.
      - b. Changes in internal organization that may shift LAE costs between allocated and unallocated
      - c. Changes in reporting requirements may shift costs between allocated and unallocated LAE
      - d. Catastrophes and the need to bring in additional claims processing resources.
      - e. Unallocated
        - (1) Appropriateness of forecasting method
        - (2) Any change in costs due to financial condition of insurer? Will it cost more (or less) to run off a book than to service an on-going book.
      - f. Are case reserves separately set for allocated expenses?
      - g. Relationship of loss expenses to losses
  - B. For an insurer's book (all coverages and all years)

1. Data quality
2. Process
3. Parameter
4. Specification
5. Correlation among lines for a single exposure year
6. Correlation among various exposure years
7. Correlation of reserve amounts with environmental factors:
  - a. Interest rates
    - (1) Risk free rate
    - (2) Risk premium
    - (3) Yield curve
  - b. Economy-wide inflation
  - c. Economy-wide business cycle (depression, recession, economic growth?)
  - d. Employment levels
  - e. Local economies of influence to insurer. For example, if an insurer has significant concentration in one jurisdiction unique characteristics of that jurisdiction's economy may impact results and hence appropriate reserve levels
  - f. Movements in financial markets
  - g. Underwriting cycle
  - h. Tax law changes
  - i. Exchange rate variations (international business)
  - j. Weather
8. Correlation of reserve amounts to the insurer's operational factors
  - a. Changes in rate of claims settlement (may impact forecasting methods)
  - b. Changes in reserving practices (may impact forecasting methods)
  - c. The rate of growth (positive or negative) in business
  - d. Changes in mix of business
  - e. Changes in claims staffing
  - f. Implementation of loss control methods and procedures
  - g. Changes in the defense philosophy of claim management
  - h. Claim department organization
  - i. Claims department staffing
  - j. Insurer organization (in the process of centralizing/decentralizing, etc.)
  - k. Weather
  - l. Current insurer profitability (or lack thereof)
  - m. Insurer's financial strength
9. Pools, associations and residual market
  - a. Adequacy of current reserve share

- b. Variability in reserve share
  - c. Reliance on the work of others?
  - d. Assessability
  - e. Changes in residual market size that may reduce appropriateness of historic data for projecting future results
- III. Impact of reinsurance (retrocessional) coverage on carrier's retained book of loss and LAE reserves
- A. Accounting treatment may dictate where reinsurance is considered in the balance sheet and hence how addressed in the modeling
    - 1. Asset?
    - 2. Contra-liability?
    - 3. Impact of various accounting requirements, for example FAS 113
  - B. Approach to analyzing ceded and retained losses
    - 1. Net/Ceded
    - 2. Direct and assumed/Ceded
    - 3. Direct and assumed/Net
    - 4. Other?
  - C. Characteristics of the coverages
    - 1. Pro rata
      - a. Aggregate maxima/minima
      - b. Ceding commissions
      - c. Loss sensitive rating
      - d. Cash flow impact
      - e. Other
    - 2. Excess (including catastrophe)
      - a. Per claim coverage
      - b. Per risk coverage
      - c. Per occurrence coverage
      - d. Aggregate limits
      - e. Loss sensitive rating
      - f. Ceding commissions
      - g. Reinstatement premiums
      - h. Cash flow impact
      - i. Other
    - 3. Financial
      - a. Impact on ultimate losses
      - b. Cash flow impact
      - c. Degree of risk transfer (accounting treatment)
      - d. Other
    - 4. State reinsurance pools, associations or funds
    - 5. Commutations
    - 6. Other

- D. Solidity of reinsurers/retrocessionaires (if reinsurance is an asset, this belongs in asset considerations, otherwise, in reserve considerations)
  - 1. Exposure years and amounts at risk
  - 2. Calendar years effected (reinsurer may go broke three years from now)
  - 3. Security available from reinsurer
  - 4. Cash flow influences
  - 5. Will offsets against cash outflows to troubled reinsurer provide additional protection?
- IV. Reinsurance assumed
  - A. Most of above considerations also relate to assumed reinsurance
  - B. Nature and effect of retrospective or reinstatement premiums on cash flows
  - C. Catastrophe potential
  - D. Solidity of reinsureds
    - 1. Drop-down potential?
    - 2. Cut-through potential?
    - 3. Offset potential between premiums receivable and losses payable in case of insolvency?
- V. Unearned premium reserves (UEPR)
  - A. Underlying pricing assumptions
  - B. Uncertainties in outcome (see reserving topics above)
    - 1. Process uncertainty
    - 2. Parameter uncertainty
    - 3. Specification uncertainty
    - 4. Other
  - C. Market influences on price adequacy
    - 1. Underwriting cycle
    - 2. Insurer market position
    - 3. Effects of competition
    - 4. Regulatory effects
  - D. Mismatch between UEPR and future obligations
    - 1. Equity in UEPR
      - a. Prepaid acquisition expenses
      - b. Taxes
      - c. Profit (positive or negative) built into rates
      - d. Other
    - 2. Timing differences between loss emergence and premium earning
      - a. Long term coverages (warranties)
      - b. Seasonality in losses
    - 3. Recovery of prepaid expenses

**Section III**  
**Mass Tort Exposure**

## Mass Tort Exposure

Estimation of ultimate liabilities for any significant mass tort exposure can be an actuary's most difficult challenge.

The outline that follows is intended to guide the actuary through various significant considerations that will impact this analysis. Although this outline is applicable to generalized mass tort situations, it mainly focuses on two well-known mass tort exposures: asbestos and environmental liability.

Principally, the actuary will encounter one of three situations when evaluating a company:

1. The company provided coverage that can reasonably be expected to produce material levels of asbestos and/or environmental impairment liability claims activity *and* has experienced material levels of asbestos and/or environmental claims activity to date.
2. The company provided coverage that can reasonably be expected to produce material levels of asbestos and/or environmental impairment liability claims activity *and* has experienced non-material levels of asbestos and/or environmental claims activity to date.
3. The company has *not* provided coverage that could reasonably be expected to produce material levels of asbestos and/or environmental impairment liability claims activity *and* has experienced little or no asbestos and environmental claims activity to date.

For the first two situations above, the actuary may choose to review the relevant language used in the company's 10K (Securities and Exchange Commission [SEC] document for publicly held companies) and possibly the 10K's of other similar companies as a first step to determine the company's reserve practice and philosophy relative to its peers. The actuary of a non-public company may also find it useful to review 10K language filed by public companies. The actuary's review should consider the following items.

First, the actuary should determine whether or not there appears to be a "material" exposure. The following outline enumerates various statistical items to use as a guide when making that determination. This may assist the actuary in determining the appropriate general magnitude of a reasonable range from which to draw scenarios (that is, millions versus billions).

Second, the actuary should gain an understanding of current reserving practices. This item includes the following:

- Identify the aggregate dollar amount of reserves (direct and net) held for this exposure (if possible).
- Identify current payment levels for the most recent three to five years. The ratio of reserves to average annual payments can be used as one indicator of reserve strength relative to peer companies. (The actuary should perform this comparison on both a direct and a net of reinsurance basis. The actuary should also be aware of the nature of the coverage provided [primary versus excess] and shifts in payment activity between coverages.)
- Identify whether the recorded reserves are intended to cover the unpaid portion of the "ultimate" losses and loss adjustment expenses for both reported and unreported claims (or only some subset thereof).
- Identify whether these liabilities are being handled by a dedicated experienced claim/legal unit (an indication of the reliability of the case reserves).
- Identify whether the carried IBNR reserve has been produced by management judgment or by an actuarial estimate.
- Identify management's philosophy concerning these reserves (for example, management asserts no coverage and therefore establishes no reserves). (Even in this situation the actuary may wish to test plausible alternative scenarios.)

Third, the actuary should determine if a reasonable actuarial estimate of IBNR can be made. The outline lists various considerations for the actuary to review to make this determination. Even if the actuary believes that a reasonable estimate of IBNR cannot be made, some modeling of "what if" situations may be appropriate.

If the actuary is using a type of Monte Carlo simulation model, the actuary may randomly draw numbers from a reasonably pre-determined range of possible outcomes, then evaluate the associated strain on the company under each scenario. However, this approach may prove to be somewhat unsatisfactory since the probability of each such outcome may be unknown. Use of a statistical distribution (if known) may be preferable.

Alternatively, the actuary may examine historical average payment streams for these types of claims and run various scenarios where payments for one or more subsequent model years are "shocked" to be 2X, 3X, 4X, etc., of the average historical amount. This approach may increase the "plausibility" of the test and therefore its acceptance by management.

The actuary may also approach testing from a "maximum possible withstandable strain" from this item under various broad business plan scenarios. This approach may best be described as "How much can I afford before I trigger some unpleasant circumstance?"

(For example, the RBC falls below acceptable levels, the rating agency downgrades, there is an inability to pay dividends, or outright insolvency.)

Clearly, a considerable degree of actuarial judgment will be applied in this area. The actuary should emphasize reasonably plausible adverse scenarios and not "doomsday" scenarios.

The fourth critical item to be considered together when modeling the previous item is to gain an understanding of case law and judicial trends in key states relevant to the company, or significant new federal legislation. For example, historical trends may be quite benign, but a relevant new judicial decision can reasonably cause future trends to be considerably more pessimistic (or vice versa). Similarly, passage of significant federal Superfund legislation can materially alter historical payment pattern trends and/or estimates of ultimate liabilities.

The final critical item for the actuary to consider is the availability of reinsurance recoveries on these claims. Reconstruction (or retrieval) of the various ceded reinsurance program information is an integral step in the process. The actuary should also consider modeling time lags in reinsurance collection, the presence of any disputed claims and outright uncollectible reinsurance. Similarly, the actuary should consider inward assumed reinsurance exposures likely to produce these types of claims.

In modeling the business plan, the implications for new business being written should be considered in addition to the potential for adverse reserve development arising from older years. Although a virtual pollution exclusion has been in effect since 1985, voluntary pollution coverage may be offered and similarly may require model consideration.

Furthermore, the actuary should consider generic mass torts the company may have (such as pharmaceuticals, exposure to toxic chemicals or other types of cumulative exposure) in the model. The actuary should review whether policy or underwriting exclusions have been put in place to reduce or eliminate such exposure on newly-written (or future) business and whether rate levels and reserves adequately reflect the cost of these exposures.

In addition to modeling the implications on the business plan, the balance sheet, and the company's cash flows due to liability payouts, the actuary may examine the asset side of the balance sheet to determine whether these liabilities are backed by appropriate assets (quality, duration, liquidity and yield). In particular, the actuary should review liquidity if there is reason to believe that significant cash payments will need to be made in the near future to (for example) effect settlement of a major case. The actuary should also consider the presence of structured settlements in these cases.



## Mass Tort Exposure Outline

**NOTE:** An excellent reference on this topic is the Property Casualty Practice Note 1994-1, Statements of Actuarial Opinion on P+C Loss Reserves as of December 31, 1993, prepared by the Committee on Property and Liability Financial Reporting, American Academy of Actuaries.

- I. Scope of the Exposure
  - A. Determination of materiality
    - 1. Historical claim data
      - a. Claim counts reported to date (Obtain counts by site when possible. Methodology used to count claims should be identified as it can vary materially between companies and adjusters.)
      - b. Dollars paid to date (Loss + ALAE)
      - c. Dollars future potential exposure (Loss + ALAE) - case reserves + IBNR
    - 2. Premium exposure
      - a. Premium derived from lines/sublines/classes which potentially gives rise to exposure
      - b. Market share of lines/subline/class which potentially gives rise to exposure
- II. Current reserving practices
  - A. Who sets reserves?
    - 1. Case Reserves? Level of expertise of adjusters/lawyers in this area?
    - 2. IBNR? Actuary? Management?
  - B. What is intended to be included in reserves?
    - 1. Management asserts no coverage, therefore, sets no reserves?
    - 2. Reported claims only? Loss? ALAE? ULAE?
    - 3. Provision for adverse development? Loss? ALAE? ULAE?
    - 4. Provision for unreported claims? Loss? ALAE? ULAE?
  - C. Historical development (runoff) of reserves
    - 1. Generally adequate?
    - 2. Generally inadequate?
    - 3. Review report year analysis of case reserves?
- III. Can a reasonably reliable actuarial estimate of IBNR be made for the company?
  - A. Adequacy of data base?
  - B. Adequacy of actuarial methodology?
  - C. Degree of variability of possible outcomes? Shape of outcome distribution?
  - D. Dependency on (consideration of) exogenous variables? (Federal legislation, judicial outcomes, general economics, technology, "how clean is clean," etc.?)

- E. Range of outcomes? Reasonableness of range?
  - F. Select low end, midpoint or other point(s) within range?
  - G. Modeling feasibility? (Actuarial estimation model? Monte Carlo simulation? multiple of current cash flows, etc.?)
- IV. Understanding case law, judicial and legislative trends
- A. Key historical judicial decisions (often state by state, owned versus non-owned sites, definition of occurrence, joint and several liability, etc.)
  - B. Current judicial decisions
  - C. Trends in such decisions
  - D. Differences in jurisdictions
  - E. Implications of such trends
  - F. Federal legislation (Superfund reform, impact of such reform on non-NPL sites, etc.)
- V. Reinsurance
- A. Ability to cede to reinsurers? Schematic of cession program? Disputed claims? Uncollectible reinsurance? Delays in collection? Commutations?
  - B. Potential in assumed reinsurance book? Schematic of assumed program? Attachment points? Limits? Layers of coverage?
- VI. Implications for new business being written
- A. Policy exclusions?
  - B. Underwriting exclusions?
  - C. Rate levels reflect exposure?
  - D. Reserves on new business reflect exposure?
- VII. Implications on business plan if material adverse future reserve development is reasonably possible (Ability to meet profit goals, pay dividends, maintain ratings, etc.?)
- VIII. Implications for cash flow testing under various selected scenarios within range (Ability to meet organization cash flow needs, define need to borrow or otherwise raise cash, etc.)
- IX. Implications for investment portfolio—Selection of appropriate assets, durations, liquidity to back mass tort liability portfolio
- X. Implications for reserve opinion (Can the actuary give clean opinion? If not, how does this impact ratings, business plan, ongoing operational ability of company, etc.?)

**Section IV**  
**Reinsurance Considerations for Dynamic Financial Analysis**

## Reinsurance Considerations for Dynamic Financial Analysis

Insurance companies purchase reinsurance for many reasons, such as to

1. stabilize calendar year results,
2. provide large line capacity,
3. finance growth, and
4. provide catastrophe protection.

A properly structured reinsurance program placed with a set of financially strong, stable reinsurers should successfully meet all of the above needs, thus enhancing the financial position of the reinsured. Alternatively, many risks are associated with reinsurance that can impair the financial results of even the strongest reinsured, such as

1. insolvency of a significant reinsurer ("significant" relative to the reinsured's ceded book),
2. inadequate catastrophe protection,
3. inadequate casualty clash protection, and
4. over-reliance on proportional reinsurance for financing.

In the context of DFA, the actuary should construct scenarios that not only test the adequacy of the current and future (as contemplated in the company's business plan) reinsurance programs, but also scenarios that test the adequacy of the reinsurance programs purchased historically.

In reviewing the financial condition of a property/casualty insurance company, the actuary should note the historical benefit that has been derived from reinsurance, while at the same time review the efficiency and effectiveness of the prospective reinsurance strategies. With respect to the historical reinsurance programs, the actuary should review the ceded loss and loss adjustment expense reserve calculations using standard actuarial techniques. This review should, if possible, be conducted on a contract-by-contract basis. Beyond simply reviewing the accuracy of, and potential volatility associated with, the ceded loss reserve calculation, three other questions should be answered for each treaty:

1. Does the treaty provide adequate reinsurance protection for the underlying risks written by the reinsured, or is there a possibility that the reinsured will be forced to retain losses net following the exhaustion of its reinsurance treaty

limits?

2. What is the uncollectible reinsurance exposure on each treaty? Given that reinsurance recoverables can be generated from some very old accident years, and involve treaties on which scores of reinsurers participated, the probability of having some amount of uncollectible reinsurance is high. The actuary should confirm that the reinsurance recoverable assumption has been confined to the collectible portion only and does not include any unrealistically optimistic assumptions regarding recoveries from impaired, or insolvent, reinsurers. In the scenarios constructed for DFA, these two items represent an exposure to the financial strength of a company.
3. Does the treaty contain any loss-sensitive provisions, such that a change in ceded losses may be at least partially offset by a change in ceded premiums and/or ceding commissions? Examples of loss-sensitive contracts include retrospectively-rated (swing-rated) non-proportional covers and proportional covers with sliding scale ceding commissions. For each contract containing such provisions, premium and/or ceding commission accruals should be established at a level consistent with ceded losses to accurately estimate the net benefit derived from the reinsurance.

The questions posed above also apply to testing the company's future operations under the various selected DFA scenarios as well as reviewing its current position. The actuary should test the reinsurance program to confirm that it provides a proper level of protection for the company, assuming everything is fully collectible. Furthermore, various assumptions regarding the percent of reinsurance that will ultimately become uncollectible should be included in the actuary's tests.

These three questions are not confined to the casualty lines of business, but are considerations for property catastrophe treaties as well. To be certain that an adequate amount of catastrophe protection has been purchased, a company should collect detailed risk information by zip code (or its foreign equivalents) for each of its catastrophe-exposed areas, and model the full range of possible results to estimate the loss potential contained within the book of business. Many such models are commercially available, if the "in-house" development of such models is not feasible. Once a company's loss potential has been established, the actuary should confirm the availability and affordability of a sufficient amount of catastrophe reinsurance protection. Furthermore, even if a sufficient amount of reinsurance is purchased, an uncollectible reinsurance exposure remains, emanating from any single reinsurer that may have assumed too large an aggregate level of exposure across all of its catastrophe treaties, thereby creating an insolvency situation once the catastrophe occurs.

Reinsurance is an area that is not easily subjected to standard actuarial techniques, but

the following outline serves as a guideline for the actuary concerning the many reinsurance considerations incorporated into a DFA model. While one company's reinsurance purchasing strategy may be very straightforward and easily testable, another company's reinsurance program may include exotic and complicated treaties. It is important that the actuary fully understand not only the protections provided by these coverages, but also the factors that might "stress" these protections, thereby jeopardizing the financial position of the company. In constructing the various scenarios for DFA, the actuary should incorporate a portion of the potential reinsurance risk into the model.

## Reinsurance Considerations for Dynamic Financial Analysis

- I. Types of reinsurance
  - A. Facultative
    1. How often is it used?
    2. What is the split between property cessions and casualty cessions?
  - B. Treaty
    1. Proportional
      - a. Quota share
        - (1) What is the impact on surplus due to the existence of the Q/S?
        - (2) Does the Q/S treaty contain :
          - (A) occurrence caps
          - (B) Loss corridor deductibles, or
          - (C) Sliding scale commissions that serve to increase the ceding company's retained loss/risk?
      - b. Surplus share
    2. Non-proportional
      - a. Per risk excess
        - (1) Does the risk excess program cover the maximum policy limits?
      - b. Per occurrence excess
        - (1) Are clash layers purchased?
        - (2) What are the retentions/limits/lines of business covered by the treaties?
        - (3) What is excluded from coverage?
        - (4) What is the treatment of extra contractual obligations and/or excess of policy limit exposures?
        - (5) Has the company ever had a large loss that it had to retain due to treaty wording?
      - c. Aggregate excess
        - (1) Have results ever been worse than the limit of the aggregate excess treaty?
        - (2) What is the net loss ratio impact due to a
          - (A) Single large risk loss
          - (B) Property catastrophe loss
          - (C) Casualty clash loss
        - (3) How volatile is the company's net loss ratio?
  - C. Non-traditional/Finite risk/Financial
    1. Loss portfolio transfers
    2. Financial quota shares
    3. Funded catastrophe covers

4. General considerations:
    - a. Do these treaties pass the risk transfer tests of FAS 113?
    - b. Has the company properly accrued for any additional premiums payable or profit commissions receivable?
    - c. Have the historical net loss results been impacted at all by the presence of a loss portfolio transfer?
  - D. Non-reinsurance alternatives
    1. Chicago Board of Trade Catastrophe Insurance Futures/Options
    2. Other derivative products
    3. Lines of credit (for example, surplus notes)
    4. Other pure financing alternatives
    5. General considerations:
      - a. Have any of these alternatives ever been utilized?
      - b. If so, how is it accounted for?
      - c. To what degree have the actual price movements in these products offset the company's actual property catastrophe loss?
- II. Functions of Reinsurance
- A. Financing
    1. How much would surplus decrease by if all quota share treaties were cancelled?
  - B. Capacity
    1. Are maximum policy limits covered by either facultative or treaty excess protections?
    2. Is the clash protection sufficient to guard against a large casualty clash claim?
  - C. Stabilization
    1. Does the distribution of net underwriting results display less volatility than the distribution of gross underwriting results?
  - D. Catastrophe protection
    1. Are the limits of the property catastrophe treaty sufficient to cover the company's worst-case catastrophe loss? If not, how many areas of the country expose the company to a catastrophe loss in excess of treaty limits?
- III. Considerations for ceded claims liabilities
- In reviewing the potential variability associated with the reinsurance recoverables posted as either an asset or a reduction to liabilities on the company's books, the impact from all of the following items need to be considered.
- A. Homogeneity
    1. Type of reinsurance
      - a. Facultative versus treaty
      - b. Proportional versus non-proportional



2. Statutory line of business
  3. Layer
    - a. Primary
    - b. Working
    - c. High excess
    - d. Clash
  4. Type of cedent
  5. Contract terms
    - a. Flat-rated versus retro-rated  
For loss-sensitive contracts, a change in ceded losses may be at least partially offset by a change in ceded premiums and/or ceding commissions. If premium and/or commission accruals are not established on a basis that is consistent with the ceded loss reserves under these contracts, a mismatch of income and outgo will result.
    - b. Claims-made versus occurrence
    - c. Method of handling ALAE
    - d. Risks-attaching versus losses-occurring
  6. Type of reinsurer
    - a. Broker market
    - b. Direct writer
- B. Credibility of historical results
- C. Emergence patterns
- D. Settlement patterns  
A commonly used source for reinsurance industry loss development information is the biannual study produced by the Reinsurance Association of America.
- E. Frequency/Severity of claims
- F. Reopened claims potential
- G. Sunset clause provisions  
A sunset clause provides that the reinsurance treaty only covers claims reported to the company during a fixed time period (either from the inception date of the treaty, or from the policy expiration date). Thus, the treaty with a sunset clause is providing less coverage than a treaty without a sunset clause, and the company's net results will be subject to more volatility as the reinsurance coverage "sunsetts."
- H. Aggregate limits
- I. Reserving techniques/Methods and assumptions
  1. Appropriateness of techniques for long/medium/short tailed business
  2. Sensitivity of results due to changes in assumptions
  3. Provision for adverse deviations
- J. Salvage/Subrogation/Other recoveries
- K. Uncollectible reinsurance exposure

1. Coverage disputes
    - a. Non-uniform contract wording might be susceptible to differing interpretations by the various parties to the transaction
  2. Actual insolvencies
  3. Potential insolvencies
    - a. The financial strength and commitment of each current reinsurer should be assessed, with the extent (level of detail and frequency) of the analysis depending on the amount of reinsurance recoverable from the reinsurer. For unauthorized reinsurers, the amount of collateral held by the company should be sufficient to meet all future obligations.
  4. Right of offset  
Allows the reinsured (or the reinsurer) to offset balances due from one party to the other
- L. Impact of commutations  
Be aware of treaties with automatic commutation provisions. The cedant should establish reserves for any liabilities re-assumed as part of the commutation.
- M. External influences (For example, changes in tort law)
- N. Operational changes (For example, changes in the reinsurance program)
- O. Historical exposure to "Mass Tort" losses  
In order to assess whether sufficient reinsurance coverage has been purchased historically to cover these types of claims, it is necessary to evaluate the reasonableness of current gross reserve estimates for each class of claims. Also, there may be disputes between the company and its reinsurers over how the treaties were meant to respond to certain classes of claims. These disputes may lead to much less historical reinsurance protection being available to protect the company against these "mass tort" claims than had previously been assumed.
1. Asbestos
  2. Pollution
  3. Others
- P. Impact of partial placements and/or co-insurance clauses  
Some treaties provide only a portion of the intended protection, due to less than 100 percent participation by reinsurers. Other treaties mandate that the ceding company should maintain a partial participation within the reinsured layers. In either instance, the ceding company's retained liabilities should be accounted for in their net reserves.
- IV. Pricing/Coverage considerations
- A. Method of handling ALAE
1. Shared in the same proportion as loss, and not limited by the reinsurance treaty limit

2. ALAE added to loss, with this sum being subject to the reinsurance treaty limit
  3. Within or outside reinsurance treaty limits?
  - B. Occurrence versus claims-made coverage
  - C. Reinstatement provisions
    1. Number of reinstatements
      - a. Is there a possibility that coverage may be exhausted due to limited reinstatements?
    2. Cost of reinstatements
  - D. Additional coverages
    1. Sunrise cover on prior years
      - a. Sunrise cover reinstates coverage that was eliminated from prior treaties via the sunset clause. If current treaties contain sunrise covers for prior treaty years, then one potential source of volatility has been removed.
    2. Excess of policy limits coverage
    3. Extra-contractual obligations coverage
  - E. Coverage restrictions
    1. Sunset clause provisions
    2. Treaty exclusions
    3. Limited reinstatements
  - F. Other provisions
    1. Per occurrence loss limits
    2. Corridor deductibles
    3. Overall ceded loss ratio cap
    4. Sensitivity of treaty cost to ceded losses
      - a. Sliding scale ceding commission
      - b. Profit/Contingent commission
      - c. Swing-rated treaties
      - d. Reinstatement premium provisions
- V. Solvency considerations
- A. Adequacy of current reinsurance program
    1. Property per risk treaty
      - a. Comparison of attachment point/limit of treaty to the ceding company's distribution of risks by policy limits
      - b. Presence of facultative reinsurance on risks that are larger than the treaty limit
      - c. Number of reinstatements provided
      - d. Presence of a per occurrence limitation or an aggregate loss ratio cap
    2. Property catastrophe treaty
      - a. Adequacy of the reinsurance limit provided relative to the

company's catastrophe probable maximum loss (PML)

- (1) Detailed exposure information by zip code (or its foreign equivalents) should be collected by the ceding company
- (2) In order to accurately estimate a catastrophe PML and assess the adequacy of the reinsurance limit purchased, the ceding company should either create or purchase a catastrophe loss modeling system, which uses the exposure information by zip code (or its foreign equivalents) as an input
  - b. Number of reinstatements provided, and their cost
  - c. Other means of financing, to be used in the event of a catastrophe loss that exceeds the limits of the treaty, or the insolvency of a major catastrophe treaty reinsurer.
    - (1) Chicago Board of Trade Catastrophe Insurance Futures/Options
    - (2) Lines of credit
- 3. Casualty excess of loss treaty
  - a. Number of reinstatements provided, and their cost
  - b. Sunset clause impact/sunrise cover exposures
  - c. Adequacy of clash cover protection
- B. Adequacy of historical reinsurance program
  - 1. Responsiveness to mass tort claims
  - 2. Responsiveness to changing tort law
  - 3. Uncollectible reinsurance exposure
- C. Ceding company insolvency—Issues from the reinsurer's perspective
  - 1. Insolvency clause  
Required to be present in all reinsurance treaties, the insolvency clause obligates the reinsurer to reimburse an insolvent reinsured company in full, even though the reinsured may not be able to pay its claimants in full.
  - 2. Offset clause  
Allows the reinsured (or the reinsurer) to offset balances due from one party to the other. The handling of multiple (across) treaty offsets may differ from the handling of single (within) treaty offsets.
  - 3. Consistency of claims handling  
The liquidator will be handling claims settlements for the insolvent company, and historical claims settlement practices of the ceding company may not be followed.

VI. Accounting issues

- A. Presence of risk transfer—FAS 113
  - A transaction cannot be accounted for as reinsurance unless an adequate

- amount of risk transfer can be demonstrated.
- B. Accrual of future benefits/Obligations—EITF 93-6  
FASB's Emerging Issues Task Force issued EITF 93-6 in the third quarter of 1993. The purpose of EITF 93-6 is to ensure that multiple-year retrospectively rated reinsurance contracts containing provisions which create future rights and/or obligations as a result of past events are appropriately accounted for.
- C. New or upcoming issues—FAS 115  
The actuary needs to stay abreast of any emerging accounting issues. For example, the "mark-to-market" aspect of the newly-adopted FAS 115 may result in GAAP surplus decreases for some companies. If this ultimately leads to a company holding a different asset mix than what it held historically, the potential impact on future solvency should be assessed.

**Section V**  
**Invested Asset Issues for the Appointed Actuary**

## Invested Asset Issues for the Appointed Actuary

Historically, actuaries have been responsible predominantly for the liability side of the balance sheet. The actuary's focus has included reserves for losses, loss adjustment expenses, retrospective premiums, dividends, and other loss sensitive reserves. There has been minimal actuarial involvement on the asset side of the balance sheet.

Recently, however, actuarial responsibilities have been expanding to include asset-related issues. These expanded responsibilities include duration studies (such as asset/liability matching studies) and investment decision-making. The DFA concept ultimately requires actuaries to examine assets as well as liabilities, thereby requiring that actuaries have detailed knowledge on the asset side. Since the actuarial syllabus did not generally include investment or finance topics until about 1990, the asset side is most likely an underdeveloped area for many practicing casualty actuaries.

The risk associated with investment activities has been emphasized recently by the bankruptcies of Orange County, California, and Barings Bank in the United Kingdom (due to investment losses) and by the large losses on derivatives incurred by several major corporations such as Proctor & Gamble and Dell Computer. These problems appear to have been at least partially driven by either over-reliance on the expertise of outside advisors, inadequate internal audit controls, or both. Given the size of the bankrupt entities and the estimated costs of the bankruptcies, it is clear that investment activities can financially impair almost any entity if sufficient care and diligence is not exercised in performing necessary investment activities.

To participate in the evaluation of assets and/or investment policy, the actuary should understand the objectives of an insurer's investment policy. The primary goals are generally to preserve the insurer's claims-paying ability and to earn favorable risk-adjusted returns on an after-tax basis. In other words, the preservation of asset values while earning an attractive rate of return is the ultimate goal. With current knowledge of the insurer's liabilities, the actuary should add value to the investment results of an insurer.

The following outline provides a basic listing of issues related to investments on the asset side of an insurer's balance sheet. To adequately understand the issues associated with assets, the actuary should be familiar with numerous other issues that are discussed in the many volumes of published research. Additionally, the actuary should review appropriate tax publications or consult with appropriate tax experts to understand the company's tax obligations and potential associated strategies.

In the following outline, the first section focuses on the general risk factors of assets. These items are not necessarily specific to any particular type of asset, but deal with either the overall financial structure of the insurer or with systematic risk in general. The financial structure of the insurer includes leverage of the insurer, the distribution of assets across both

type and quality of the asset, and other items. Systematic risk refers to risks that are inherent to the process of investing, such as the spread of issuers of the assets, the economic environment, and other items.

The second section, which deals with types of assets, lists various categories of each specific asset, descriptive features of certain assets issued by a particular type of entity, and risk factors associated with each type of asset. Each type of asset is described as to various issuers (such as various issuers of bonds) and, if applicable, the various investment objectives that the particular investment may satisfy (such as the growth or income-producing aspects of common stocks). The descriptions include characteristics that may differentiate one asset from another within an asset type (such as a callability provision of a preferred stock or the risk measurement of a common stock). Finally, each type of asset may have risk factors especially pertinent to the particular asset (such as interest rate movement for bonds, or economic growth for real estate). The outline also lists risk factors specific to each type of asset.

The investment background information section reviews factors specific to each insurer that impact investment decisions and, therefore, the analysis of assets. These factors include historical investment performance, the propensity of the insurer to incur large or catastrophic losses, and the impact on the risk based capital calculation.

The management controls section describes management involvement and responsibilities in the investment function. Issues included in this section are management information systems, management oversight, and audit controls, which all impact management's ability to ensure that adequate controls exist to mitigate the risks associated with the investment function.

The actuary should be aware of the numerous interactions between cash inflows due to new premium inflows and cash streams produced from various investments (bond coupons, stock dividends, sales, and redemptions), and the various payment outflows due to claims, expenses, or dividends. DFA models involving numerous cash flow scenarios under diverse sets of interest rate environments should generally be reviewed to understand the portfolio risks of significant unanticipated cash requirements that may arise under various "stressed" scenarios. Additionally, changes in investment strategies that involve changes in asset allocation mix, tax minimization strategies, etc., should also be reviewed.

The portfolio should be reviewed for over-concentration of assets (lack of diversification) that may render the portfolio unusually susceptible to downturns in particular economic or geographic sectors, or unusually susceptible to the economic conditions of a particular issuer. Over-concentration should also include consideration of large receivables, such as large retrospective rating premium balances, as well as equities and bonds emanating from a single issuer.



The actuary should be alert to the presence of assets that may be poorly understood, or highly complex (such as derivatives), that may react with unusual volatility under certain conditions (usually linked to changes in interest rates).

Finally, the actuary should review management's investment policy, information systems, and degree of control over significant investment decisions to ascertain that reasonable controls have been established. The actuary should consider review of these issues with the company's independent auditors.

## Invested Asset Issues for the Appointed Actuary

- I. General risk factors of assets
  - A. Financial leverage—Ratios of “assets to surplus” and “premiums to surplus” reflect the financial leverage of insurers. Higher ratios indicate higher levels of leverage and generally warrant a more conservative investment portfolio.
  - B. Investment quality—The quality of investments can range from investment grade to “junk”. The quality of bonds and equities are evaluated by various organizations including the Security Valuation Office of the NAIC, Standard and Poor’s, and Moody’s. Real estate and private placements are generally not evaluated on a qualitative basis by rating organizations.
  - C. Distribution of assets
    1. Asset allocation—Different assets (short-term investments, bonds, stocks, etc.) have different historic average returns and a wide variance from the average return. As a result, different portfolio distributions of bonds, stocks, and other assets will experience different levels of volatility. Further, the variables that affect the value of the investment portfolio will have different impacts on different companies, depending on the asset allocation.
    2. Asset/Liability/Surplus proportions—It would be prudent to invest a portion of total assets relating to recorded liabilities so that the likelihood of loss of principal or investment income is minimized.
    3. Amount of risky investments—Risky investments include “junk” bonds, certain real estate, and volatile common stocks. The amount of any risky investments should not be excessive given the insurer’s obligations and other assets.
  - D. Duration of assets, liabilities and surplus—Duration measures the weighted average of the present value of a particular cash flow. It is used to measure the sensitivity of an asset or liability to changes in interest rates. The cash flow can be either incoming (such as an investment portfolio or a particular investment) or outgoing (such as for a liability or a particular claim). A gap can result if the incoming asset duration differs substantially from the outgoing liability duration. This gap can be measured by the duration of surplus, which is an indicator of the sensitivity of surplus to changes in interest rates.
  - E. Liquidity—Several types of assets do not have liquid markets for acquiring and disposing of assets. These include real estate, certain foreign stocks and debt, private placements and certain “junk” bonds. If the need arises to liquidate assets, the lack of liquidity of these assets may translate into either a longer time period to divest at the desired price or selling at a less desirable price.
  - F. Public versus private placements—Private placements have limited or no markets for buying and selling equity interests or debt of the issuer. Large amounts of assets acquired through private placement might create liquidity

concerns.

- G. Volatility of asset values—The volatility of asset values may be measured by the beta of an individual stock, the variance of returns on a portfolio of stocks, both the term and coupon rate of bonds, and both the economic conditions and vacancy rate for real estate.
  - H. Spread of assets—The spread is a reflection of the concentration or diversification of the investment portfolio across either industries, issuers or geographic regions. A more concentrated portfolio increases the reliance on the conditions within the segmentation that is owned (namely the particular industry, the issuer of the debt or equity, or the geographic region). A more diversified portfolio reduces reliance on the individual segmentation.
  - I. Economic environment—The direction of the economy has a direct impact on the value of assets, although the impact varies for different assets. Economic factors that affect asset values include interest rates, direction of interest rates, inflation level, growth in GNP (which is a measure of recession and health of the economy), corporate profits, and many other factors.
  - J. Potential inaccuracies in cash flow assumptions—Cash flow models (which are also referred to as stress tests) are used to assess the differences between cash inflows derived from investments and cash outflows to satisfy liabilities. Either cash flow stream can be inaccurately modeled, especially the cash outflow stream. Greater risk of a material inaccuracy should translate into a more conservative investment philosophy.
- II. Types of assets
- A. Cash—United States cash is the safest investment. Foreign currency may not be as safe since two additional risks (currency exchange risk and, to a lesser degree, political risk) are present. However, foreign currencies that are used to fund liabilities in the same foreign currency can be considered as reducing currency exchange risk.
  - B. Short-term investments—Defined as non-cash assets with a maturity of one year or less
    1. U.S. Government Treasury Bills are debt of the U.S. government.
    2. Certificates of Deposit (CD's) are interest-bearing short-term debt issued by banks, either domestic or foreign.
    3. Commercial paper represents the unsecured short-term promissory notes of corporations that can be either interest bearing or sold at a discount.
    4. Banker's acceptances are issued by banks to support demands for money of the bank's customers. The demands should first be accepted by the bank.
    5. Repurchase agreements (repos) are the transfer of a security, generally a U.S. Treasury security, where the seller agrees to repurchase the security on a certain date at a specified price. Repos are similar to secured borrowing and lending of funds generally at lower-than-market

- interest rates. They can also be sold as reverse repos, whereby the investor assumes the credit risk of the other party.
6. Money market funds are funds that invest in short-term instruments and are operated by mutual funds, banks or insurance companies.
  7. Eurodollars are dollar-denominated deposits at foreign banks or foreign branches of U.S. banks, both of which are not regulated by the Federal Reserve Board.
- C. Bonds—The principal investment of insurers providing higher yields and higher risk than short-term investments and lower risks and lower long-term returns than equities.
1. Types of bonds
    - a. U.S. Government issued bonds include treasury notes (which have maturities of between two and ten years) and treasury bonds (which have maturities of between ten and thirty years). These bonds include both coupon-bearing bonds and non-interest bearing (zero coupon) bonds (referred to as STRIPS or CATS).
    - b. U.S. Government agencies issue debt to allow them to carry out their function. The debt is not guaranteed by the U.S. government, but by the agency. This debt is considered to be very low risk.
      - (1) Government sponsored enterprises—Six in total including Tennessee Valley Authority and the Export/Import Bank.
      - (2) Government agencies—Twenty-four including Government National Mortgage Association (GNMA) and Federal Home Loan Bank (FHLB).
    - c. Municipal bonds receive favorable tax treatment and include the following two types of bonds issued by states and political subdivisions of states.
      - (1) General obligation bonds are backed by the full faith and credit of the issuer.
      - (2) Revenue bonds are backed by revenues from a specific project, such as a toll road.
    - d. Corporate bonds are debt obligations of the issuer.
    - e. Foreign bonds include those issued by governments and corporations. They are valued in the currency of the issuer and are, therefore, subject to currency exchange risk.
  2. Major risk factors of bonds
    - a. Interest rate risk refers to the price movement in the value of the bond due to changes in interest rates. The price movement will vary based on the term to maturity, the coupon rate and the quality of the bond.

- b. Liquidity risk refers to the cost of having to liquidate assets. The asset liquidation may be completed due to the cash flow needs of the insurer or due to the financial condition of the bond issuer.
  - c. Inflation risk involves the erosion of the value of future coupon receipts and the principal repayment by inflation.
  - d. Credit risk is reflected by the potential non-payment of principal and interest by the bond issuer due to financial impairment. Diversification reduces credit risk by reducing reliance on the financial health of one issuer. The quality of the bond holdings further impacts the credit risk, since it relates to the likelihood of financial impairment.
  - e. Call risk represents the risk that bonds may be called by the issuer before they mature. Bond calls usually occur when interest rates are low since the issuer can place debt at lower interest rates. Conversely, the bondholder should reinvest at lower interest rates.
  - f. Event risk refers to the impact that an event can have on bond values. Events that can impact bond values include mergers, nuclear power plant accidents, product tampering, and class action litigation brought against the bond issuer.
- D. Preferred stocks—Represent equity interests in a corporation, similar to common stock, that pays a dividend that is generally fixed, similar to the interest payment on a bond. In a corporate liquidation, preferred equity interests are subordinated to debt issues (bonds) but receive preference over common stock.
- 1. Preferred stock features
    - a. Callability refers to the company's option to repurchase the preferred stock at a certain price that may decrease over time. Callability is more important for preferred stock issuers as compared to bond issuers since bonds have a natural maturity date that retires the debt. The only way, other than calling the preferred issue, to retire preferred stock is through open market repurchases.
    - b. Dividend yield represents the dividend payment as a percentage of the stock price.
    - c. Cumulative dividends indicate that any preferred dividend payments that the company has missed should be paid prior to paying common stock dividends.
    - d. Convertibility indicates that the preferred stock is convertible into common stock at the option of the stockholder for a certain price during a specified time period.
  - 2. Risk factors of preferred stocks

- a. Interest rate risk refers to the price movement in the value of the preferred stock due to changes in interest rates. Preferred stock prices tend to reflect interest rate movement more than common stocks with the price reflecting dividend yield, convertibility provisions, and the credit-worthiness of the company.
  - b. Liquidity risk refers to the cost of having to liquidate assets, similar to bond liquidity issues.
  - c. Credit risk is reflected by potential non-payment of preferred dividends and sinking fund obligations.
  - d. Call risk represents the risk that the preferred stock may unexpectedly be called by the issuer. Preferred stock calls are not as frequent as bond calls and usually occur to retire a source of financing.
  - e. Event risk refers to the impact that an event can have on stock values, similar to the potential impact on bond values.
- E. Common stocks—Represent equity interests in corporations. These common equity interests are subordinated to both debt issues (bonds) and preferred stocks in a corporate liquidation.
1. Common stock features
    - a. Types of stock
      - (1) Growth stocks
      - (2) Cyclical stocks tend to grow and contract depending on the phase of the economic cycle.
      - (3) Income-producing stocks are frequently purchased based on dividend yield and, to a lesser degree, growth prospects.
    - b. Sector/Industry
    - c. Risk level
      - (1) Price-to-earnings (PE) ratio of individual stocks equals the ratio of the stock price to the earnings per share of the company. Weighted average PE ratios can be calculated for a portfolio of stocks. The PE ratio is generally an indication of the public perception of the growth prospects and riskiness of both the company and the industry of the company. The size of the PE ratio also tends to be negatively correlated (the higher the PE, the larger the price decrease) with the price impact of unanticipated unfavorable news. The impact of unanticipated favorable news tends to be positively correlated (the higher the PE, the larger the price increase) but not as strongly as

the unfavorable news correlation.

- (2) Beta of a stock is a measure of the sensitivity of the stock price to price movements of the overall stock market. It is calculated as:

$$\frac{\text{Cov (return of the asset, return of the market)}}{\text{Var (return of the market)}}$$

- (3) Variance of the returns of a stock portfolio measures the consistency of the investment returns. Riskier portfolios with heavier weights to growth stocks, high PE stocks or high beta stocks tend to have higher variances.

- d. Dividend yields tend to indicate the level of risk of a stock. Non-dividend paying stocks tend to be companies in a growth mode that frequently have higher risk. High dividend paying companies are frequently more stable companies (including utilities).
- e. Country of origin has become more prevalent as foreign stocks have gained in popularity. The strength and political stability of the country and currency fluctuation become additional concerns when investing in foreign stocks.

2. Major risk factors of common stock

- a. Market risk is considered a systematic risk (risks that are dependent on macro factors, such as the national economy). It refers to the impact of the performance of the stock market and its impact on any individual stock or a portfolio of stocks.
- b. Interest rate risk is also a systematic risk that relates asset values to the movement of interest rates. The correlation to interest rates of common stock prices is lower than the correlation to bonds and preferred stocks.
- c. Credit or company risk refers to the financial strength and future prospects of the company. In addition, the business risk (or the risk inherent in the business) impacts the risk of the company.
- d. Sector/industry risk refers to the risks of a particular industry or sector of the economy. These risks tend to affect all companies in the particular industry or sector.

F. Mortgages

- 1. Insured mortgages (those insured by the Federal Housing

- Authority [FHA] or the Veterans Administration [VA]) reduce the credit risk of investing in mortgages.
- a. Payment status indicates if the mortgage payments are current, late or in default.
  - b. The location and type of property is an indicator of the quality of the collateral.
  - c. The level of equity of the property owner is significant to ensure that the owner has a vested financial interest in the condition and financial health of the property.
2. Collateralized mortgage obligations (CMO's) are securities backed by payments of mortgagees of principal and interest. They are created as trusts and have numerous major variations, two of which are discussed below:
- a. Payment stream variations of CMO's
    - (1) Interest only (IO) CMO's are the purchase of only the interest payments on the mortgages. They are priced based on the anticipated (and uncertain) interest payment stream, which reflect likely pre-payments of mortgages due to either refinancing or home sales. If interest rates decline, pre-payments typically increase, thereby eliminating expected interest receipts and creating a loss for IO owners. Conversely, increasing interest rates tend to decrease pre-payments, thereby providing additional, unanticipated interest receipts and added value for IO owners. Interest rate movements provide the greatest risk to IO values. Reinvestment risk and credit risk provide additional risk.
    - (2) Principal only (PO) CMO's are the purchase of only the principal repayment on mortgages. The price is based on the anticipated (and uncertain) repayment of the principal due to refinancing or sale of the property. If interest rates decline, the balance of the principal is typically paid sooner than expected, thus producing an unanticipated gain (since the pricing of the PO CMO was based on a lower interest rate than was actually realized). Reinvestment risk is also evident, however, in that the repaid principal should be reinvested at the lower interest rate. If interest rates increase, principal repayment typically slows down, thereby delaying receipt by the



investor. The initial pricing of the PO CMO would, therefore, have been based on too high an interest rate.

- b. PAC's refer to planned amortization classes. They can be viewed as a scheduled sinking fund mechanism that provides nearly certain payments over a predetermined time frame, thereby reducing the risk of other CMO products. The near certainty is achieved since PAC holders have priority over other CMO holders in the receipt of payment.

G. Real estate

- 1. Owner-occupied reduces the risk of vacancy of the building and deterioration in the condition of the building.
- 2. The geographic location and type of property is an indicator of the likely price appreciation or price depreciation of the property. Given the wide variation in return by geographic location, the degree of concentration/diversification becomes a major factor in real estate.

H. Other invested assets

- 1. Derivatives are financial instruments whose price relies on the price movement of a different security index, interest rate, commodity, or other financial instrument. The risk level of derivatives ranges from risk-reducing to extremely high.
  - a. Types of derivatives
    - (1) Forwards are obligations to complete a transaction at a future date for a specified price. Forwards are generally used to reduce risk by hedging currency risk or commodity risk, although certain speculative forwards can be high risk.
    - (2) Futures are similar to forwards except that they are regulated and trade on exchanges. They are frequently used to hedge risks such as interest rates and commodity prices.
    - (3) Options give the investor the right, not the obligation, to buy (call) or sell (put) a specified asset at a given price (called the strike price) before a certain date. They are frequently used to protect against adverse changes in either a stock price, a commodity price, an interest rate, or a foreign currency exchange rate. An owner of an asset can:

- (A) Sell a call that gives another investor the right to purchase the asset at a stipulated price on or before a certain date.
- (B) Purchase a put that gives the owner the right to sell the asset at a stipulated price on or before a certain date.

An investor who does not own the particular asset can:

- (A) Purchase a call, which gives the investor the right to purchase the asset at the stipulated price on or before a certain date.
- (B) Sell a put that gives another investor the right to sell the asset at the stipulated price on or before a certain date.

Options are also used speculatively and are very high risk when written as "naked options" (selling call options to buy an asset that is not owned by the option writer). The risk of loss in selling "naked options" is unlimited for the option writer.

- (4) Swaps are used to exchange certain financial instruments, such as interest rates, principal denominated in different currencies, or any other payment stream. The major risks are of movement in the financial instrument in the unanticipated direction (such as interest rates increasing when the purchased swap anticipates a decrease) and of default by the other party. The risk can be mitigated through the purchase of caps (an upper limit on an interest rate), collars (an upper and a lower limit on an interest rate) and floors (a lower limit on an interest rate).
2. Asset-backed securities represent the repackaging of certain pooled assets of an issuer into collateralized securities. These pooled assets may be mortgages, bank loans or other debt. The investor is exposed to pre-payment risk and credit risk.
  3. Stripped securities are securities created by investment firms by separating the bond principal and the coupons, similar to CMO's discussed above. The new securities are also called "interest-only" (IO) or "principal-only" (PO) securities and are sold to produce a reasonable yield-to-maturity. The major risks

are pre-payment risk and interest rate risk (especially for PO's, which generally have both long durations and long weighted average maturities).

### III. Investment background information

- A. Relative return on investments—The historical return of the investment portfolio and the variability of these returns, relative to appropriate indices, can be an indicator of the acumen of the investment management team.
- B. Experience with current types of investments—Management should have a clear understanding of the characteristics, risks and features of each type of asset that is being included in the investment portfolio. The greater the risk of the asset, the greater the knowledge that management should have. Management should be aware of any high risk investments (such as derivatives and “junk” bonds) that have been made and the risks associated with each investment.
- C. Recent actual large losses and exposure to large losses—Large losses can necessitate the unanticipated liquidation of assets in certain situations. Variables that affect the likelihood of needed liquidation include degree of concentration of insured values, the reinsurance program (including catastrophe reinsurance), amount of upcoming cash receipts, and other anticipated cash outflows.
- D. Impact on the risk based capital (RBC) calculation—The impact of the investment portfolio on the RBC calculation should be assessed. If the insurer's RBC result is clearly above the minimum acceptable level, the impact may be immaterial. If the RBC result is marginal or unacceptable, the insurer might consider modifying the investment portfolio to improve the result.

### IV. Management controls

- A. Adequacy of management information systems—Inadequate or inaccurate management information systems may impair management's investment decision-making and may impede management's ability to uncover problems in the investment area.
- B. Management oversight of investment activities—Management is ultimately responsible for the investment function. This responsibility includes establishing an investment philosophy (regarding types of investments, acceptable risk level, and other factors), reviewing the investment performance, monitoring the level of risk in the portfolio, and, in general, ensuring that the investment philosophy is properly implemented. The amount of oversight depends on how the investment function is handled. There are three common ways to handle the function:
  - 1. An in-house investment department performs the investment activities and maintains responsibility for the investment philosophy and performance. Management oversight is naturally maintained.

2. An in-house investment department establishes an investment philosophy and retains an investment advisor to provide investment selection services. Management oversight is necessary to ensure that the advisor is providing the needed services at an acceptable level of risk.
  3. An in-house department (perhaps comptrollers or financial) retains an external investment advisor to provide more complete investment services. Substantial oversight is required to ensure that management is aware of the performance and risks of the investment portfolio.
- C. Adequacy of the auditing function—The auditing of the investment function, as performed by both internal auditors and the independent auditors, can determine if the investment portfolio is excessively risky, uncover “hidden” or “problem” transactions, protect against the physical disappearance of assets by either theft or destruction, and assess the overall integrity of the investment function.

**Section VI**  
**Other Assets and Other Liabilities**

## Other Assets and Other Liabilities

The previous sections of this *Handbook* deal with risks associated with pricing/business planning, reserving, mass torts, reinsurance and invested assets. While the so-called "Other Assets" and "Other Liabilities" typically present relatively minor issues, they can be quite significant for certain companies.

A key attribute of any model is to accurately portray the *interrelationship between the various balance sheet accounts* for a given issue. For example, an unexpected increase in the loss ratio experience of a company above planned levels may also trigger an increase in accruable retrospective premium, a decrease in accrued policyholder dividends, an increase in reinsurance recoverables, a decrease in the liability for contingent commissions to agents, and an increase in reinsurance payables under sliding scale commission contracts. The actuary should be aware of such interactions between the various balance sheet accounts since they can act to either minimize or magnify the impact of the tested scenario.

Similarly, the actuary should be aware of capital and debt related items and transactions between affiliates. For example, a company that raises capital through a preferred stock offering should adequately recognize the related dividend payouts in the model. A company that issues debt should accurately reflect the future stream of debt service charges incurred. A subsidiary that is expected to contribute capital to a parent via dividends should also be modeled appropriately.

Other expenses, taxes, licenses and fees, and federal and foreign income taxes should be appropriately considered in the model.

In addition to considering the amounts of such items and interactions between the various balance sheet accounts, the model should consider cash flow issues related to the timing of receipts for items recorded in the various receivable accounts, and the timing of payouts for items recorded in the various payable accounts.

The actuary should be aware of any significant off-balance sheet liabilities; for example, guaranty fund assessments (that can be significant if a major company became insolvent or an unusual amount of mass tort liabilities were put into the guaranty fund), special assessments (such as second injury funds), guarantees relating to the sale of a subsidiary, shareholder suits, or bad faith claims. Finally, the actuary should be aware of likely short-term future events such as material changes in accounting pronouncements that may have a material impact on the company.

## Other Assets and Other Liabilities

### I. Other assets

- A. Premium receivables
  - 1. Agent's balances or premiums in course of collection (agent's credit-worthiness, disputes, aging of accounts, reasonable default provisions)
  - 2. Booked but deferred and not yet due (typically installment payments—same considerations as item 1 above)
  - 3. Accrued retrospective premium (accuracy of reserve estimate relative to plan parameters, credit-worthiness of insured, security held such as LOC's, etc.)
  - 4. Any other loss sensitive premium or dividend receivable (same considerations as item 3 above)
- B. Reinsurance related
  - 1. Funds held by or deposited with reinsured companies (credit-worthiness of reinsured, funds escrowed, ability to offset)
  - 2. Reinsurance recoverables on paid losses and LAE (credit-worthiness of reinsurers, security held [if any], presence of disputes, aging of accounts, ability to offset, etc.)
- C. Other receivables
  - 1. Bills receivable taken for premium (at times done with credit impaired risks)
  - 2. Federal income tax recoverable (accuracy of estimate, strength of position advocated, etc.)
  - 3. Interest, dividends and real estate income due and accrued (look through to quality of underlying invested asset, credit-worthiness, reasonable default provision, collateral)
  - 4. Receivable from parent, sub or affiliate (credit-worthiness of affiliate, etc.)
  - 5. Other receivables (usually write-ins)

### II. Other liabilities

- 1. Contingent commissions (agents' commissions, sliding scale reinsurance contracts, etc., accuracy of reserve estimate relative to plan parameters)
- 2. Other expenses (accuracy and completeness of estimate)
- 3. Taxes, licenses and fees (same as item 2 above)
- 4. Federal and foreign income tax (same as item 2 above)
- 5. Borrowed money (understand debt obligations of company and parent company, look through on debt structure to determine if subsidiaries, etc., have sufficient cash flows to meet parent's obligations)
- 6. Interest on borrowed money (same as item 5 above)
- 7. Unearned premium (accuracy of estimate)
- 8. Dividends declared but unpaid (accuracy of estimate)

- (a) Stockholders (also look through to long-term capital needs including dividend capacity and debt service obligations, consider preferred and common stock, market reactions to dividend reduction or cessation, etc.)
    - (b) Policyholders (also consider undeclared but due under filed dividend plans and accuracy of estimate relative to plan parameters)
  - 9. Funds held by company under reinsurance treaties (adequacy of estimate)
  - 10. Amounts withheld or retained by company for account of others (generally payroll tax and other withholdings)
  - 11. Foreign exchange adjustments (exposure to currency fluctuations, materiality, hedging used to mitigate swings, etc.)
  - 12. Drafts outstanding
  - 13. Payable to parent, subs and affiliates
  - 14. Payable for securities
- III. Contingent Liabilities—Off-balance sheet
- 1. Review contingency footnotes in GAAP and Stat statements for particular items noted.
  - 2. General considerations would include items such as: guaranty fund assessments, bad faith claims, special assessments such as for second injury funds, rate rollback potential, guaranty of loss reserves (or other) for a previously sold subsidiary, general litigation, shareholder suits, etc.
- IV. Other
- 1. New accounting pronouncements that may materially impact the company (within the next calendar year, for example).