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From The Editor

Welcome back to the *NAIC Research Quarterly*. Does anyone ever read the editor's letter but the editor? Good though-provoking question (and perhaps the subject of a future research project!), but even if you skip over my letter, I hope you won't skip over the articles in this quarter's RQ.

A discussion paper of the NAIC's SERFF (System for Electronic Rate and Forms Filing) project leads off this quarter's issue. Prepared by Senior Regulatory Specialist Eric Nordman and Regulatory Specialist Jack Casper, this article provides insights into the development of the concept and the direction that SERFF is taking.

A discussion of the concept of duration and its applications to financial analysis and to risk-based capital is the next offering. This article provides basic background in (relatively) layman's terms and attempts to point out the pros and cons of using this technique.

Sheila Lawson of the NAIC's Research Library staff presents a primer on research applications on the Internet. With the growing world-wide interest in this venue for sharing information, many of us will be grateful for this introduction to insurance research "out on the web" from a dedicated "net surfer."

In April, Mark Peavy summarized the current state of the debate on life illustrations and gave details on the deliberations that are taking place between the members of the NAIC that are charged with establishing a common set of equitable standards. In this issue, Mark has gathered commentary from several interested parties of varying backgrounds in order to illustrate the richness of the debate.

For those addicted to tables of numbers, two offerings will be sure to please. Brenda Richards explains the effect of aggregation on computed industry statistics and provides examples of the distortions that can occur in the asset and liability pages. There is also an article with a detailed breakdown on the number and type of securities being held by both life and P&C insurers.

In coming editions, we hope to provide more discussion of the use of credit information in underwriting, providing a regulatory perspective. Also, technical articles on IRIS and FAST ratios, RBC results, and the ongoing debate on redlining are also slated to appear.

As always, comments, suggestions, and feedback are welcome. For those who are interested in submitting an article, please contact me at (816) 889-4417 and I'll give you the details on how, where, and when to get it into the next edition.

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The National Association of Insurance Commmissioners (NAIC) is a voluntary organization of the chief insurance regulatory officials of the 50 states, the District of Columbia, American Samoa, Guam, Puerto Rico and the Virgin Islands. The NAIC provides its members with a forum for discussing common interests and for working cooperatively on regulatory matters that transcend the boundaries of their own jurisictions.

The views expressed in these articles do not necessarily represent the views of the NAIC members, individually or collectively.

SERFF

by Eric Nordman and Jack Casper

The National Association of Insurance Commissioners (NAIC) is coordinating efforts by insurance regulators and insurers to investigate the opportunities of electronic rate and form filing. Interest in this topic is a result of discussions that began in the late 1980s. Insurers were interested in standardizing the filing transmittal forms they used to submit rate and form filings to the states. At the December 1987 meetings of the NAIC's Personal Lines—Property and Casualty Insurance (C) Committee and the Commercial Lines—Property and Casualty Insurance (D) Committee, a presentation was made by Bob Lennon of the Society of State Filers on the benefits of standardizing the information presented to the states.[1] The D Committee decided to proceed and appointed an advisory committee to develop standardized transmittal forms. This resulted in the D Committee adopting a generic standardized transmittal form in December 1988.[2]

In April 1989, a survey of the NAIC membership lead to the development of a standardized forms transmittal supplement. In December 1989, a revised filing transmittal form and the forms filing supplement were adopted. Efforts to adopt a rate filing supplement were unsuccessful at that time.

Some added uniformity with respect to rate filings developed in the early 1990s as the NAIC members moved away from full advisory rates filed by the advisory organizations to a loss cost environment. The Loss Cost Implementation Working Group developed loss cost filing procedures and transmittal forms for all property-casualty coverages except workers' compensation. In 1992, separate workers' compensation loss cost filing procedures and transmittal forms were developed. These forms were more widely adopted by NAIC members than were the earlier standard filing transmittal forms and the forms filing supplement. Similar standardization efforts have not been undertaken for the life and health insurers.

In 1992, technological advances further enhanced interest in transmitting rate and form filings electronically. The initial recognition of this possible technological advancement by insurance regulators resulted from a presentation to the Commercial Lines—Property and Casualty Insurance (D) Committee by two credit insurers and a consultant. In March 1992, the NAIC established the Filing Submission Working Group to spearhead the effort to establish a mechanism where insurers and insurance regulators could exchange and review rate and form filings electronically.[3] During 1992, the Filing Submission Working Group reported to the Commercial Lines—Property and Casualty Insurance (D) Committee. It soon was apparent that this technology crossed all lines of insurance. As such, it seemed inappropriate to have the Commercial Lines—Property and Casualty Insurance (D) Committee making decisions that would affect life and health insurers.

A new NAIC committee was formed in 1993 to address the common needs of all information services. The (EX) Special Committee on Information Systems was created to administer all of the data processing needs of the NAIC members. Currently, the Filing Submission Working Group, which reports to this committee, is charged with developing a conceptual framework for electronic submission of rate and form filings. Activities are coordinated with the Life Insurance (A) Committee, the Accident and Health Insurance (B) Committee, the Personal Lines—Property and Casualty Insurance (C) Committee and the Commercial Lines—Property and Casualty Insurance (D) Committee, especially as they relate to the development of uniform filing procedures that coordinate with the NAIC model acts and regulations.

In 1993, the NAIC five-year strategic plan was amended to include initiatives to increase the uniformity in the rate and form filing process. The

Eric Nordman is the Senior Regulatory Specialist and Jack Casper is a Regulatory Specialist at the NAIC. Both serve as primary staff support for the SERFF Project.

efforts of the working group resulted in a vision statement, published in December 1993, which outlined a conceptual framework for a nationwide electronic filing system.[4] In April 1994, the project was officially entitled the System for Electronic Rate and Forms Filing (SERFF). As envisioned, SERFF will enable insurers to submit rate and form filings electronically and allow regulators to receive, store, track, analyze and communicate on filings in the same manner.

Regulator and insurer interest in the SERFF project has been widespread. During 1994, 21 states were actively involved in various SERFF workshops and working group meetings. Twenty-three industry representatives have participated in workshop sessions and hundreds more have attended working group meetings and/or received working group materials. Regulators, insurers and NAIC staff have expended more than 6,000 hours in a series of intensive modeling sessions over the past year to determine the business requirements and scope of SERFF.

Conceptual Vision

The long-range plan for SERFF is to encourage standardization, enhance the efficiency of the rate/forms filing process and enable the states to receive filings from insurers electronically. The state insurance regulators would have the capability to manage these filings and store them electronically. Computer assisted review would enable the states to more effectively and efficiently deal with the wide array of rate and form filings received. Uniform filing transmittal headers will lead to increased efficiencies for insurers and regulators.

The SERFF Vision Statement contained a number of basic assumptions that served as the foundation for SERFF development. These assumptions remain valid today. These important assumptions include the following:

1. If the NAIC does not develop and support a uniform system to allow states to receive and manage rate and form filings electronically, the states will independently develop their own systems. If states develop unique systems, complaints among insurers will increase because of the lack of compatibility between the insurers systems and those applied by the states.

2. Approval of rates and forms will remain within the jurisdiction of individual states. The NAIC network will operate only as a clearinghouse.

3. Revenues generated by the states from filing fees will remain unchanged.

4. When designing the system, there should be no additional resource requirements for the states. Preferably, the new system should require fewer state resources to administer.

5. The insurers have greater desire for uniformity than the states. They will support the project financially if they see greater uniformity in filing transmittals, increased efficiency in the approval process and timely review of filings.

6. Participation by states will be voluntary, but they will have an incentive to participate.

These six fundamental assumptions upon which the SERFF system is based have demonstrated, in hindsight, the collective wisdom of the insurance regulators on the Filing Submission Working Group, industry representatives and other interested parties that were involved in the drafting of the Vision Statement. Concerns expressed in the first assumption have come to pass as Florida implemented a requirement that all life and health filings be preceded by an electronic notice that the filing was soon to arrive. The Florida regulation required insurers to use MCI as its carrier of the electronic message, regardless of the insurers current communication arrangements. Recently Florida rescinded its e-mail filing requirement in anticipation of the development of the SERFF system.[5] Wisconsin experimented with use of a diskette filing procedure for transmission of certain property-casualty rating information. These developments have served to increase insurers interest in SERFF as the state specific alternatives seem much more burdensome and costly.

The assumption that states will retain regulatory authority over the review and approval process remains a constant. No plans have been developed or suggested to provide centralized review of filings. Similarly, state filings fees will remain revenue neutral under SERFF. There have been various discussions about the cost to develop

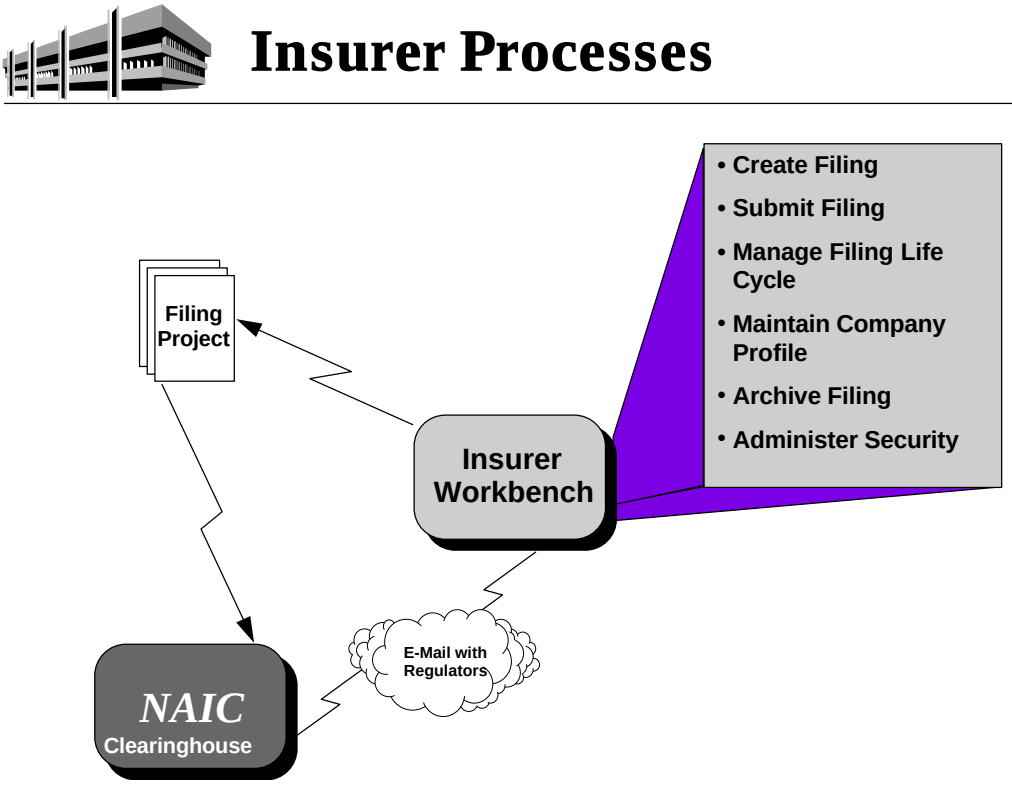
and maintain SERFF and how to equitably distribute those costs to users. Preservation of state resources also has remained a goal of SERFF.

Insurers reactions to the SERFF concept have been much as expected. Insurers stand to benefit more from states adopting measures that increase uniformity than do the states. Discussions with insurers result in identification of reduction of the review and approval time as a key measure of the success of SERFF. The system has been determined to be voluntary as to participation of either states or insurers.

How Will SERFF Work?

The following section provides general information about the features envisioned for the SERFF project. SERFF will provide software for both regulators and filers. State insurance regulators also will be provided with hardware needed to successfully implement the SERFF project in an ergonomically favorable environment.

To submit a rate, form and/or advertising filing, an insurer would access SERFF software to complete a filing transmittal screen(s). This filing transmittal screen(s) would provide uniform descriptive information about the insurer and the filing project. Auto-fill features and insurer-maintained data tables would assist insurers in completing repetitive information. The information contained in the filing transmittal screen(s) and the actual filing components (rules, rates, forms advertising materials and supporting documentation) would be forwarded electronically through the SERFF telecommunications network to those state insurance departments from which the insurer is seeking approval. Additional supporting information could also be attached in various comment fields.



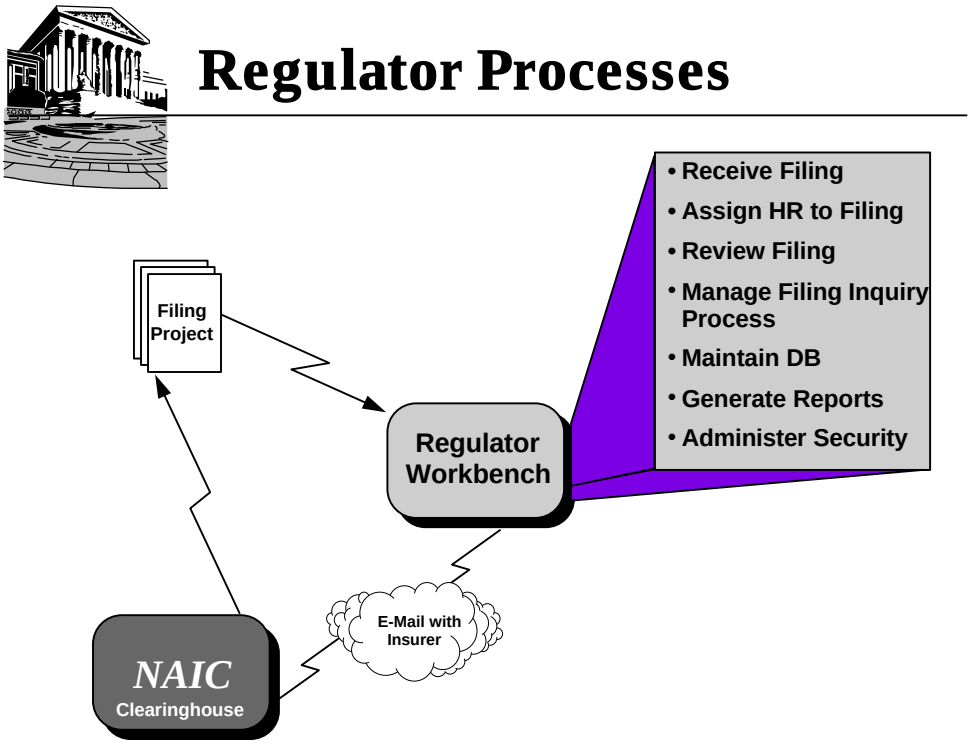
High level processes to be performed at the insurance company are represented in the figure entitled "Insurer Processes." The NAIC will act as the clearinghouse for submitted filings, repackaging and routing the appropriate components to individual states. High level NAIC processes are depicted in the figure on the next page.

The system at the state insurance department would receive the filing and extract certain descriptive information into an information management and tracking system. A manager, or the SERFF system based on state business rules, would assign the filing to an analyst for review. Management reports could be developed to provide information about the filing review process and the responsiveness of insurers.

The rate/form analyst would receive the assignment from the manager, or the system generated assignment, at his or her ergonomically designed workstation. This workstation would consist of a screen that allows review of a full page of information and side-by-side comparison of pages. Computer-assisted review software would be available to the analyst to aid in checking for mandatory policy language and prohibited provisions and allow for side-by-side comparative review. The analyst would be able to extract (but not change) information from a rate filing to perform further actuarial or financial analysis. Other databases/applications could be accessed to check analysis or data contained in the filing.

After review, the analyst would enter information into the system about the disposition of the filing. Notice to the insurer about the disposition of the filing would occur. If correspondence to the insurer was necessary, it could be accomplished electronically through the system. System generated status information will be communicated to the filer at regular intervals to acknowledge any change in filing status.

Carefully controlled access could be established in the insurance departments to allow agents, insurers, attorneys and the general public to view the information placed on file by insurers. Printing facilities at each state would allow interested parties to secure information in hard copy if they wished. All filings would be stored by each state insurance department electronically. High level processes to be performed at the state insurance department are represented in the figure entitled "Regulator Processes."



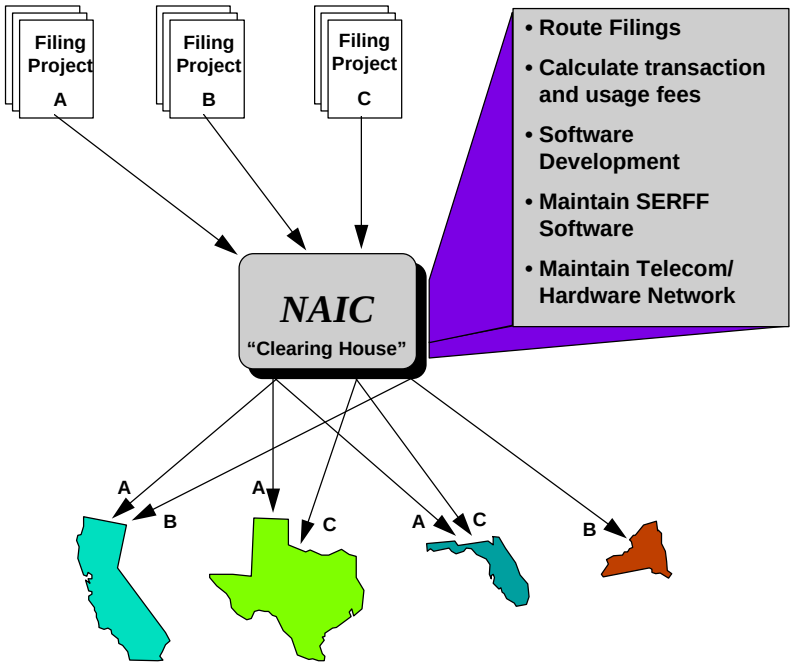
Funding for the necessary NAIC resources to support and maintain SERFF and the hardware needs of the states may come from fees assessed upon insurers choosing to use the system. These could be collected monthly, quarterly or annually, using the NAIC gatekeeper as a mechanism to count the number of filings submitted. This would eliminate some of the states' concerns over the source of revenues needed to establish ergonomically sound workstations for its employees. Analysis of the amount of revenue needed to support SERFF is currently under way.

The electronic filing process will be gradually phased in by the states. This would allow insurers the option to file either electronically or by paper copy, at least for the phase-in period. This will also minimize the resource impact on state insurance departments.

To reach the goal of a paperless system that integrates insurers and state insurance regulators and allows them to address all rate and form filings, the Filing Submission Working Group identified several specific steps needed to plan for the future. A series of workshops was held in 1994 to gather and analyze the business needs of insurers and insurance regulators. These workshops led to the development of an extensive data model that captures all of the flows of information both internally and externally for insurers and insurance regulators. The participants quickly came to realize the tremendous potential and ever expanding scope of the project. As cost estimates escalated, it became clear that further definition and analysis of the fiscal viability of SERFF would be necessary. Thus, the NAIC decided that a business partner would be selected to assist in the technical and business analysis of SERFF. An extensive bidding process was undertaken and a business partner was selected.

Because of the significant scope, complexity and resources required to implement SERFF, the NAIC engaged Deloitte & Touche LLP as its business partner for the SERFF development project. The NAIC believes that a partnership of this nature provides the optimal combination of project management expertise and technical resources, while allowing the NAIC to continue to focus on regulatory needs and priorities. The NAIC also believes that engaging a business partner will provide additional resources at peak need times where adding staff would be cumbersome and

NAIC Processes



unnecessary.

Proof of Concept Introduction

Prior to the full development and roll-out of the SERFF system, the project team will complete a Proof of Concept phase. SERFF is introducing new services never before provided to the insurance industry, and as such, the functionality and scope of the project must be fully analyzed and understood. The Proof of Concept will allow the NAIC to make the most informed and intelligent decisions regarding further SERFF development before investing the time and resources required for complete development. Completing the Proof of Concept before full-scale system development also will provide the NAIC the opportunity to validate the business needs surrounding electronic filing and the technical feasibility of the SERFF system. The Proof of Concept will provide an objective assessment of both regulatory and insurance industry support for SERFF.

The primary objective of the Proof of Concept phase is to further validate the SERFF concept before committing the significant resources required for complete system development. The Proof of Concept began on April 3, 1995, and is estimated to take 26 to 30 weeks. The NAIC will present the results of the Proof of Concept at the NAIC Winter National Meeting in December of this year. At that time, NAIC members will be asked to determine if complete system development should continue. NAIC members will be provided with the results of business case analysis and cost/benefit analysis of the anticipated system to assist them in their determination of the fiscal viability and interest of regulators and the insurance industry in SERFF.

During the Proof of Concept, the SERFF project team will:

- Develop a prototype of the SERFF system to demonstrate to interested insurers and regulators. The prototype will help users visualize the capabilities of SERFF and more accurately identify the benefits and potential cost savings associated with SERFF. The prototype also will provide valuable insight surrounding the technical feasibility of the project.

- Perform research to assess more accurately the true value of SERFF for both the insurance industry and regulators. The project team will solicit the insight and support of industry and regulator constituents as it assesses the nature of the business need surrounding electronic filing.

- Develop a business plan to further validate the economic feasibility of SERFF. Organizational alternatives for implementing and supporting the SERFF system will be researched, along with in-depth analysis of system costs and potential pricing structures.

- Communicate the "SERFF vision" via presentations and publications. Project objectives, potential system capabilities, potential benefits and cost information will be presented in media articles and a SERFF prototype demonstration to be conducted at state insurance departments, industry trade organizations, industry conferences and insurer sites.

Team Structure

The SERFF Development Team is organized into five subteams, each having responsibility for certain aspects of the Proof of Concept effort. These five teams are (a) the Business Case Team, (b) the Market Assessment Team, (c) the Technical Analysis Team, (d) the Regulator Prototype Team and (e) the Industry Prototype Team.

The Business Case Team is responsible for researching the economic feasibility and organizational impact of SERFF development. This group will identify organizational structure alternatives for the ongoing administration of the SERFF system. Such particulars as software development, enhancement and maintenance strategies, as well as the most appropriate support and training alternatives will be considered.

Additionally, the Business Case Team will investigate costs and potential pricing structures for the system and develop implementation plans for the proposed organization.

The Market Assessment Team is responsible for accurate evaluation of the business needs surrounding electronic filing and for coordinating all SERFF communication. This team will also be responsible for resolution of regulator and industry questions and issues. A SERFF newsletter will be published monthly, providing a recap of recent happenings to interested parties. In conjunction with members of the two prototype development teams, this team will also coordinate and conduct prototype demonstration sessions.

The Technical Analysis Team is responsible for hardware and software selection and for the technical integration of all system components. This team will assess telecommunications, network and database design issues as well as design the SERFF architectural infrastructure. The opportunity to purchase functionality through the integration of packaged software will be considered in conjunction with the prototype development effort.

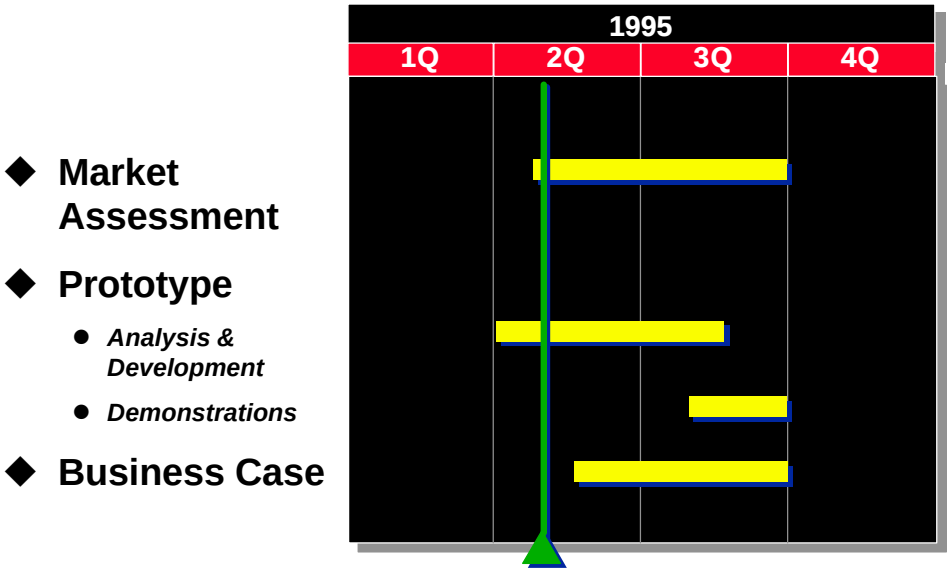
The Regulator Prototype Team is responsible for development and testing of SERFF prototype functionality to be used at the state insurance regulator's office. Building on the workshop efforts undertaken before inception of the Proof of Concept, this team will plan and conduct workshops with participants from the regulator community to further refine the functionality of the SERFF system. This team also will conduct prototype demonstration sessions.

The Industry Prototype Team is responsible for development and testing of SERFF prototype functionality to be used at the insurance company. This team will plan and conduct workshops with insurance industry professionals to provide opportunities for continued involvement in the prototype development. This team also will conduct prototype demonstration sessions.

Activities To Date

During the week of April 24, 1995 the SERFF development team facilitated two separate two-day workshops, one involving regulators and the other involving industry representatives. The intent of the workshops was to develop a common understanding of the Proof of Concept phase, to gain consensus on SERFF Proof of Concept prototype functionality, and to begin development of the SERFF graphical user interface. Half-day

POC Timeline



design workshops resulted in preliminary development of SERFF menus and screens. The SERFF development then began the process of constructing functional screens to correspond to the Proof of Concept processes identified during the workshops.

Participants also reviewed and discussed critical success factors for the Proof of Concept phase. Participants from the regulator community identified the following factors relating to quality, efficiency and cost:

Quality

- Improve the quality of filing review
- Improve communication with the insurance industry
- Identify "best practices" concepts
- Improve the quality of the filing before it reaches the state

Efficiency

- Must not increase workload
- Reduce paperwork
- Simplify filing review
- Improve workflow management
- Improve retrieval of historical filings

Cost

- Assure availability of advanced technology
- Mitigate long-term financial requirements to support technology
- Ensure compatibility with current technology infrastructure

In addition to the critical success factors identified above, regulator representatives are looking for the NAIC to provide technical architecture standards in conjunction with SERFF development.

Industry participants identified the following factors relating to time, quality, efficiency and cost.

Time

- Reduce filing turnaround time
- Reduce communication time between regulators and industry

Quality

- Improve regulatory acceptance of initial submission

Efficiency

- Simplify/expedite accounting of filing fees
- Reduce paperwork
- Simplify filing preparation
- Encourage uniformity of filing preparation
- Improve retrieval of historical files

Cost

- Maximize number of states participating
- Ensure compatibility with existing technology infrastructure
- Decrease the overall cost of filing
- Reduce physical storage requirements

The second in the series of workshops took place the week of June 26. Small focus groups involving regulator and industry participants reviewed menu and screen design. These focus groups will continue to be involved in the screen design throughout the development of the system.

Members of the SERFF Development Team have begun visiting regulators and insurers to gain a more detailed understanding of current filing and review processes. Trips to date include visits to the Kansas, Illinois and Texas Departments of Insurance, and appointments with numerous industry professionals. These information-gathering missions will continue throughout the Proof of Concept phase, providing opportunities for the development team to solidify its understanding of the current environment and for industry and regulator professionals to have continued involvement in the development effort.

Representatives from the SERFF Development Team are also involved in briefings and conferences with professional associations. In addition to the workshops previously mentioned, the NAIC has participated in discussions with the American Council of Life Insurance (ACLI), the National Association of Independent Insurers (NAII), the American Insurance Association (AIA), and the Alliance of American Insurers (AAI).

Future briefings are scheduled for the ACLI, the Society of State Filers, the Contract Technology Group, the Society of State Filers, and the Life & Health Compliance Association.

Planning is under way for the prototype review sessions. The demonstrations will begin August 14 and continue for eight weeks. System functionality will be displayed, and information will be presented regarding the pricing and organizational structure. During these review sessions, the development team will gather information about the level of understanding and commitment on behalf of both insurers and regulators. The prototype also will be displayed at the NAIC Fall National Meeting in Philadelphia September 10-12.

Conclusion

The results of the Proof of Concept will be presented at the NAIC Winter National Meeting in December 1995. However, the opportunity to remain well informed about the SERFF project is ongoing. During the last 18 months, the NAIC, under the direction of the Filing Submissions Working Group, has responded to numerous inquiries from industry and regulatory professionals alike. As a result, a list of 37 "Commonly Asked Questions" relating to SERFF has been compiled. To obtain a current copy of these questions and answers, or receive further information about SERFF, including the monthly newsletter, contact Jack Casper (816-889-4424) and request to be placed on the SERFF list of interested parties.

Endnotes

[1] *National Association of Insurance Commissioner 1987 Vol. I Proceedings*

[2] *National Association of Insurance Commissioner 1988 Vol. I Proceedings*

[3] *National Association of Insurance Commissioner 1992 Vol. II Proceedings*

[4] *National Association of Insurance Commissioner 1993 Fourth Quarter Proceedings*

[5] *Informational Bulletin, 95-005, May 4, 1995, Florida Department of Insurance.*

Using Duration To Evaluate Interest Rate Risk: An Introduction

by Mike Barth

Duration is a financial concept that refers to a measurement of relative price sensitivity, or *price elasticity*, for a given financial instrument following a change in interest rates. Duration is most commonly associated with fixed income securities such as bonds, but actually the market value of all cash flows that occur over time has some sensitivity to interest rate changes. The price elasticity of a cash flow is the percentage change in that cash flow's market value for a given change in interest rates.

Duration often is interpreted as the percent change in market value following a 1 percent change in interest rate. For instance, if a bond's duration is 4.00, that means that the price of the bond will drop approximately 4 percent for every 1 percent increase in the market rate of interest. While the word "duration" conjures up images of maturity or longevity, in the context of financial modeling it is more accurately defined as "the rate of change in market value." It so happens that, all other things being equal, the longer the maturity of a bond (or other financial instrument), the more responsive it is to changes in interest rates because more of the bond's cash flows will be received further out in time.

Again, while duration is commonly calculated for bonds and similar fixed-income investments, all financial instruments with cash flows that occur over time have a duration. This includes stocks and bonds, of course, but the duration concept can also be applied to the liabilities of insurance companies. Therefore, all financial instruments, whether they are corporate bonds or contractual obligations to pay losses arising out of an insurance policy, have a price elasticity with respect to changes in the market rate of interest. That is, the market value shifts as interest rates go up and down.

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Calculating Duration

The calculation of a financial instrument's duration begins with cash flow estimation. The cash flows in each period are then discounted by the current market interest rate, and these discounted cash flows are used as weights that are applied against the maturity of each cash flow to derive the weighted average maturity. The weighted average maturity is the duration. Many computer spreadsheet packages automatically calculate duration, but it is important to know the underlying mathematics to understand both the advantages and disadvantages of applying this technique.

Estimating Cash Flows

The first step in estimating duration is to model the cash flows. For a vanilla coupon-paying bond, this is a rather simple exercise, because the timing of the coupon payments and the return of the face amount are known with relative certainty. Similarly, simple lease agreements or mortgages have fixed, periodic payments that can be plotted over time. However, most cash flow streams are not as predictable. Loss reserves have a somewhat predictable payout pattern but the actual payout is subject to a great deal of fluctuation, such that the true payout cannot be estimated with a high degree of accuracy. Common stock dividends are another example of cash flows that are predictable to some degree but are still highly erratic. In the real world, then, duration is difficult to estimate accurately for most financial instruments because of the difficulty of projecting accurately the actual future cash flows.

Even when the cash flows can be estimated with relative certainty, other practical problems are involved. Duration is the estimated price elasticity of a financial instrument with respect to interest rate changes, *holding all else constant*. This implies that the cash flows are otherwise unaffected by the

change in interest rates. However, while that may be generally true for the simplest fixed-income bonds, that is not usually the case with most financial instruments. For instance, when interest rates decline, the probability of a corporate bond being "called" prior to its stated maturity increases, so that affects the timing of the future cash flows. Declining interest rates can also boost common stock prices as investors perceive that the future cash flows (e.g., dividends and capital gains) associated with a particular common stock will increase over current expectations. Some portion of an insurer's loss reserves will be directly affected by the rate of inflation and by the level of interest rates, so the estimate of the ultimate paid losses will likewise change following a change in the market rate of interest. This means that the true duration of most financial instruments is in constant flux.

Determining the Appropriate Interest Rate

In addition to the difficulty of anticipating future cash flows, it is often difficult to select the appropriate rate of interest to use in the duration calculation. Financial instruments such as U.S. Treasury Bonds are widely traded in open markets, and the interest rate on those cash flows is easily measured and widely known. However, insurer loss reserves are not widely traded, and as such it is difficult to establish the market interest rate for those cash flows. Financial analysts have a variety of methods to establish benchmark estimates of the appropriate rate of interest for any given cash flow, but these are still only estimates.

Frequently, analysts use the interest rate for a financial instrument that has similar cash flow timing and similar risk. Alternatively, when a similar financial instrument is not available, a simple risk loading can be added to the risk-free rate to estimate the appropriate discount rate.

Interest rates are generally decomposed into three components: the base component, termed the *real interest rate*; the *inflation* component; and the *risk* component. The real interest rate is the minimum compensation that a lender requires for giving up the current use of his or her money,

Figure 1
Decomposition of Nominal Interest Rates

	U. S. Treasury Bond	Corporate Bond
Risk Loading	0%	4%
Anticipated Inflation	3%	3%
Risk-Free Interest Rate	2%	2%
	5%	9%

irrespective of the creditworthiness of the borrower. The real interest rate fluctuates over time, but has historically been assumed to fall between 1 percent and 3 percent.

The inflation component is the average anticipated inflation rate during the borrowing period, and like the real interest rate, this component is independent of any credit risk associated with a particular borrower. The inflation component simply makes up the difference between the current value of the money to be lent and its future value.

The third component is the risk component, which is the loading for the credit risk of a particular borrower. Some borrowers have much higher risk component loadings than others; the interest rates differ significantly among various financial instruments. U.S. government securities carry a "risk-free" rate of interest that includes both the real interest rate component and the expected inflation component but no risk component, because U.S. government bonds are assumed to be exempt from the risk of default. The interest rate on a corporate bond will include the same basic loading for the real interest rate and for anticipated inflation, but also will include an additional loading to reflect the risk that the company will default or delay on either the coupon payments or on the repayment of the principal amount when it comes due. Other considerations such as bond covenants, convertibility and liquidity, are also considerations in determining the interest rate for a particular bond, but these are also borrower-specific. Since these factors differ from borrower to borrower and really affect the timing of cash flows, they are included as part of the risk loading. As illustrated in Figure 1, assuming that the anticipated inflation rate is 3 percent, the real interest rate is 2 percent, and the risk load for a corporate bond is 4 percent, a U.S. Treasury Bond will carry an interest rate of 5 percent (3 percent + 2 percent) while a corporate bond will carry an interest rate of 9 percent (3 percent + 2 percent + 4 percent).

The example in Figure 1 assumes that the maturities and cash flows of both bonds are identical. As a general rule, interest rates are higher for longer maturities than for shorter maturities because, all other things being equal, there is more uncertainty associated with events such as changes in anticipated inflation rates that are further distant in time and lenders are being asked to give up the use of their money for a longer period. This applies to U.S. government rates as well as corporate bond rates, but the 20-year interest rate for Treasury securities and the one-year interest rate for Treasury securities are still both considered "risk-free" interest rates. Some financial analysts insist on using short-term Treasury rates such as the 90-day T-bill rate as a proxy for the risk-free interest rate, while others insist on using a longer term measure such as the 30-year T-bond rate. A common compromise is a weighted average of intermediate-term rates.

The risk loading of a given financial instrument can be estimated by subtracting the rate for a U.S. Treasury bond of comparable maturity and cash flow from the nominal interest rate for the risky instrument. Since all interest rates already include a loading for the real interest rate and for the anticipated inflation during the holding period, the excess over the U.S. Treasury rate is the risk specific to that instrument.

When there is no true "market" rate of interest for a financial instrument, as is the case with the loss reserves of insurance companies, financial analysts commonly add an estimated risk load to the risk-free interest rate to account for specific risk. This estimated risk load may be objectively determined or subjectively determined, or derived through some combination of objective and subjective analysis. It is also common practice to simply discount the cash flows by an intermediate-term U.S. Treasury rate or an average of such rates. While the selection of a particular interest rate does affect the calculation somewhat, given all of the other estimations that are incorporated in this form of financial modeling, some simplification is usually justifiable.

Discounted Cash Flow and Interest Rate Changes

Once an appropriate interest rate is determined, the market value of each cash flow is determined by discounting the cash flows using that interest rate. The sum of all of the discounted values is the current market value of that cash flow. For example, consider a two-year bond with a face value of $1,000 and an annual coupon rate of 10 percent that is priced to yield an interest rate of 5 percent. This bond will pay coupon payments of $100 at the end of year 1 and $100 at the end of year 2 as well

as return the face value of the bond, $1,000, at the end of year 2. This bond has a current (discounted) market value of $1,093, computed as:

$$\$1{,}093 = \frac{\$100}{1.05^1} + \frac{\$100}{1.05^2} + \frac{\$1{,}000}{1.05^2} = \$95.24 + \$90.70 + \$907.03$$

If the market interest rate for this type of financial instrument increased from 5 percent to 6 percent, then the market value of the bond would decrease from $1,093 to $1,073, computed as:

$$\$1{,}073 = \frac{\$100}{1.06^1} + \frac{\$100}{1.06^2} + \frac{\$1{,}000}{1.06^2} = \$94.34 + \$89.00 + \$890.00$$

The change in the market value of the bond is minus 1.80 percent:

$$\frac{\$1{,}073 - \$1{,}093}{\$1{,}093} = -0.0180$$

The change in the interest rate is 0.95 percent.

$$\frac{1.06 - 1.05}{1.05} = 0.0095$$

The percentage change in the market value of the bond
(-1.80 percent) is 1.88 times the percentage change in the interest rate (0.95 percent). The *price elasticity* of the market value of the bond with respect to a 1 percent change in the interest rate is then about 1.9, meaning that for a 1 percent change in the discount rate, the market value of this bond changes by approximately 1.9 percent.

Calculating Duration

Duration is calculated by weighting the maturity period of each cash flow by the percent of the total current value that cash flow's discounted value represents. In the bond example above, the duration of the two-year, 10 percent bond that has a market interest rate of 5 percent is calculated as:

$$\begin{aligned} \textit{Duration} &= \frac{\left(\frac{\$100}{1.05^1}\right)(1) + \left(\frac{\$100}{1.05^2}\right)(2) + \left(\frac{\$1{,}000}{1.05^2}\right)(2)}{\left(\frac{\$100}{1.05^1}\right) + \left(\frac{\$100}{1.05^2}\right) + \left(\frac{\$1{,}000}{1.05^2}\right)} \\ &= \frac{95.24(1) + 90.70(2) + 907.03(2)}{95.24 + 90.70 + 907.03} \\ &= .087(1) + .083(2) + .830(2) \\ &= 1.91 \end{aligned}$$

The first coupon payment, due in one year, is 8.7 percent of the total market value; the second coupon payment, due in two years, is 8.3 percent of the total current value; and the return of principal at the end of the second year is 83 percent of the total value. Duration, then, is the market value-weighted maturity of the combined cash flows. Note that the calculated duration, 1.9, is the same as the calculated elasticity of 1.9 except for rounding differences. While this example is applied to a relatively short duration bond, it can easily be applied to any future cash flow, given a cash flow schedule and an appropriate interest rate. The duration of common or preferred stock or insurer loss reserves can be estimated by projecting all the future discounted cash flows and then weighting the stated maturity periods by the discounted cash flows. Some cash flows, such as the coupons for preferred and common stocks or workers' compensation paid claims, have very long tails and require estimation of cash flows 30, 40 and 50 years into the future. However, as the cash flows are discounted over these long periods, the weights become very small indeed. As a practical matter, many analysts use some arbitrary cutoff point, such as 25 years or 50 years, to estimate these durations.

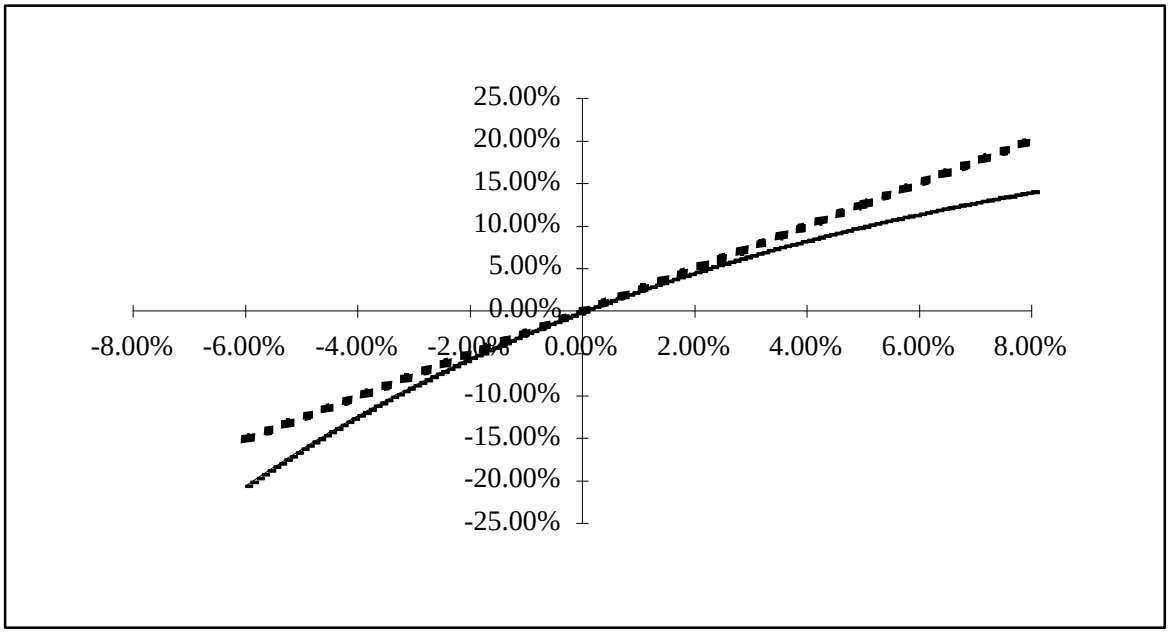
Problem Areas With Duration Modeling

Predictably, several caveats must accompany the use of duration analysis or any other measure of price elasticity. First of all, these calculations are sensitive to the interest rate selected as the "appropriate" discount rate. An inappropriate interest rate will produce inappropriate answers.

Secondly, the timing of the cash flows is only an estimate, as the true cash flows are subject to change over time. For instance, most corporate bonds carry a call provision which gives the issuer the right to buy back the bond at a specified price at some point in the future. Therefore, a bond with a maturity of 10 years that carries a call provision that allows it to be called in five years has a shorter duration than an otherwise comparable 10-year bond with no call provision. A common practice among financial analysts, then, is to use the call date as the maturity date when evaluating those securities.

A third caution is that, while all cash flows that occur in the future have a duration that can be

Figure 2
Actual vs. Expected Change in Equity Ratio



measured, changes in interest rates often cause changes to those future cash flows that are not reflected in the elasticity measurement. For instance, the cash flows from common stock can be expected to rise when interest rates are low because the company issuing the common stock will sell more of its products to consumers, and so will generate more profits to its shareholders. Therefore, while the duration can measure the change in current market value for the current expected cash flow stream, those cash flow projections will usually change concurrent with a change in market interest rates. For bonds and other fixed income securities, this is less of a problem, but more and more bonds are carrying provisions that cause the expected cash flows to change following changes in market interest rates. For instance, collateralized mortgage obligations have a tendency to dramatically increase prepayments when mortgage interest rates drop by two percentage points or more, which drastically changes the expected cash flows from such instruments. A number of simulation modeling techniques have been introduced to address that specific problem, but those are well outside the scope of this article.

A fourth caution is that duration is used to measure the elasticity of price changes when interest rate changes are very small, but as interest rate changes grow larger, the accuracy of the estimate diminishes rapidly. For example, the duration of a 30-year U.S. Treasury bond with a coupon rate of 5 percent and a market rate of 7 percent has a duration of 14.9 and a present value of $1,321. According to the duration formula, a 1 percent increase in the market rate of interest should cause a 14.9 percent decrease in the value of the bond to $1,124. However, the actual percentage change in market value is about 12.8 percent in this instance, and the actual percentage change differs depending on the level of the beginning interest rates as well.

Figure 2 shows the relationship between the percentage change in the value of a set of cash flows predicted by the basic duration model (the dotted line) and the actual percentage change (the solid curved line) calculated for a given set of interest rates. The variation from the straight-line duration estimate grows larger as the size of the interest rate change increases and is also directly affected by the starting point. That is, if you begin making incremental 1 percent changes to a beginning interest rate of 15 percent, the difference between the actual price change and the expected price change will be greater than if you start at 7 percent.

Some rather simple adjustments can be made to the duration model to pick up the convexity caused by trying to force a linear solution to a curvilinear relationship (i.e., square peg into round hole), but for minor interest rate changes (e.g., 10 basis points), the error in the duration model is negligible. This inaccuracy of the calculation somewhat limits the usefulness of the duration measure, but as long as the analyst is aware that this limitation exists then potential pitfalls can be avoided.

Finally, duration can be used to measure the price or market value elasticity of a set of cash flows, but the current market value of the cash flows does not necessarily affect the future value of the cash flows. In the bond example shown above, the 10 percent coupon bond's discounted cash flows are $95.25, $90.70 and $907.03; however, assuming the bond's owner holds the bond to maturity, the realized cash flows would still be $100 received at the end of the first year, $100 received at the end of the second year, and the return of the $1,000 of principle at the end of the second year. Therefore, while the present value of the future cash flows is subject to change following a change in market interest rates, the bond's cash flows are fixed. So while some instruments' cash flows are affected by changes in market interest rates, other instruments' cash flows are not, and although the current market value may change, the future cash flows may not be affected at all.

Obviously, duration is not a perfect measure of relative market value elasticity or of interest rate risk. There is no perfect measure. However, duration can still be used to measure the relative vulnerability of the market value of cash inflows and outflows to changing interest rate environments and can still be used to estimate an insurance company's relative risk exposure.

Duration Gap Modeling

Duration gap, commonly abbreviated as DGAP, is a measure of the duration of the market value of equity, measured as the gap between the duration of assets and the duration of liabilities. Historically, regulatory attention has been focused on statutory assets and surplus rather than market value measures, so immediately there are limits on the usefulness of the duration measure in that it is inapplicable to statutory accounting values. Still, it is becoming increasingly common for regulators and financial analysts to look to market value measures when evaluating the solvency risk posed by a company, and DGAP modeling can be a useful tool in that regard.

DGAP modeling measures the percentage change in the market value of equity given a percentage change in the interest rate. To accomplish this, the DGAP model first measures the price change of the assets and the liabilities. The market value of equity, which is defined as the difference between the market value of assets and the market value of liabilities, changes as the assets and liabilities change. If, for a given change in interest rates, assets and liabilities both increase at the same rate, then the relative amount of equity (the equity-to-assets ratio) is unchanged, although the absolute value will increase as shown in Table 1. If the rate of change is different for liabilities and assets, then the percentage of equity either increases or decreases, depending on the direction of the interest rate change and the relative rates of price change for the assets and liabilities. Since duration measures the elasticity of the change in assets and liabilities with respect to a change in the interest rate, where the elasticity is the rate of change in value, then setting the duration of assets exactly equal to the duration of liabilities will result in equal rates of change for both assets and liabilities. If the rate of change in the value of assets and liabilities is identical, then the relative value of equity (that is, equity as a percentage of assets) will remain unchanged following a change in interest rates. When this situation occurs, the assets and liabilities are said to be *immunized*. For insurance companies, this situation occurs when the duration of the company's liabilities (basically, its insurance obligations) equal the duration of its asset portfolio.

Of course, if DGAP modeling were really this simple and easy, everyone would already be using DGAP analysis and modeling in the financial management and regulation of insurers. Some insurers *are* using DGAP modeling or some variation of DGAP modeling in managing their asset and liability portfolios, and regulators are exploring the application of these concepts in establishing minimum risk-based capital standards. Research has shown that effective asset/liability management enhances the relative value of an insurance company, which implies that it makes a company

relatively less risky. Therefore, theoretically there ought to be some recognition of these concepts when setting minimum capital standards, although a host of practical problems must be overcome before that can actually occur.

One of the fundamental problems with DGAP modeling is that, to do it accurately, a huge amount of information on cash flows, interest rates, default rates and a host of other issues is required. Even when an analyst can gather all that information for every type of financial instrument involved, the analyst is then required to forecast the future. All of the information-gathering is expensive and much of the information is at least partially subjective. Therefore, as with most financial modeling techniques, there has to be a trade-off between accuracy and simplicity in constructing DGAP models and in evaluating results. The level of expertise required to "do it right" is formidable and, consequently, practitioners usually wind up with a large set of subjective assumptions when constructing DGAP models, and this lowers the efficiency of the technique. Still, it is one way of measuring an insurer's susceptibility to interest rate risk and also has the added advantage of being *relatively* easy to understand.

Effects of Duration Mismatching

Table 1 shows some simple examples of the effect of duration mismatching. If a company has a high

Table 1
The Effect of Interest Rate Changes on Market Values

Market Value of Assets and Liabilities Change at the Same Rate

	Assets	Liabilities	Equity	Equity to Assets
Initial Assets/Liab's	10,000	7,500	2,500	25.00%
Both Increase 10%	11,000	8,250	2,750	25.00%
Both Decrease 10%	9,000	6,750	2,250	25.00%

Market Value of Assets and Liabilities Change at Different Rates

	Assets	Liabilities	Equity	Equity to Assets
Beginning Assets & Liabilities	10,000	7,500	2,500	25.00%
Assets Increase 10% Liabilities Increase 8%	11,000	8,100	2,900	26.36%
Assets Increase 8% Liabilities Increase 10%	10,800	8,250	2,550	23.61%
Assets Decrease 10% Liabilities Decrease 8%	9,000	6,900	2,100	23.33%
Assets Decrease 8% Liabilities Decrease 10%	9,200	6,750	2,450	26.63%

asset duration coupled with a low liability duration, then the market value of its asset will change at a faster rate than the market value of its liabilities. If interest rates drop, the asset values increase faster than the liabilities and the company will enjoy a windfall. If interest rates increase, then the company's assets decrease in value faster than its liabilities and its equity-to-assets ratio declines. If a company has relatively low duration assets coupled with high duration liabilities, then the opposite is true: asset values change at a slower rate than liability values. With this type of mismatch, a decrease in interest rates causes liabilities to grow at a faster rate than assets, so the company's equity-to-assets ratio goes down and the insolvency risk increases. However, if interest rates increase, the liabilities decline in value faster than the assets, so the company's equity-to-assets ratio improves.

The effect of interest rate changes on the relative market value of equity (the equity-to-asset ratio) can be stated mathematically as:

$$\frac{\Delta \text{Market Value of Equity}}{\text{Market Value of Assets}} \cong -DGAP\left[\frac{\Delta i}{1+i}\right]$$

$$\cong -\left[D_{assets} - D_{liabilities} * \left(\frac{Liabilities}{Assets}\right)\right]\left[\frac{\Delta i}{1+i}\right]$$

DGAP is the difference between the duration of assets and the duration of liabilities weighted by the liabilities-to-assets ratio. If you multiply both sides of the equation by the total market value of assets, the equation reduces to:

$$\Delta \text{Market Value of Equity} = [D_{assets} * Assets - D_{liabilities} * Liabilities] * \left[\frac{\Delta i}{1+i}\right]$$

$$= D_{equity}\left[\frac{\Delta i}{1+i}\right]$$

When the DGAP variable is multiplied by the change in interest rates, the result is the approximate change in the equity-to-assets ratio, stated on a market value basis. The sign in front of DGAP is negative because increases in interest rates cause decreases in market values, holding all other things constant. A decrease in interest rates can cause the market price of some bonds, such as collateralized mortgage obligations or other structured securities, to decrease as well because buyers expect the number of prepayments to rise significantly. However, if the level of prepayments is held constant (i.e., the estimated cash flows remain unchanged), the market price of these securities would also increase following a decrease in market interest rates.

Scope of Changes in Historic Interest Rates

Given an appropriate beginning interest rate, it becomes necessary to choose an appropriate change in that beginning interest rate to effectively model interest rate risk. Table 2 shows some historical change in the average annual interest rates for short-term U.S. Treasury securities (T-RATE), long-term Treasuries (T-BOND), high grade corporate bonds (Aaa), and the lowest of the investment grade corporate bonds (Baa). Assuming that the yearly change in interest rates is normally distributed, one can expect that annual interest changes of more than 200 basis points are to be expected 5 percent of the time. The susceptibility of an insurer to interest rate swings will differ with the degree of change in the interest rate as well as with the beginning interest rate level.

Also, this table illustrates the problem of selecting a single "appropriate" interest rate, or even a set of "appropriate" interest rates. All financial assets have their own internal discount rate. The market value change associated with a 1 percent change in the market rate of interest will be different for an asset that is actually earning at a 5 percent rate than for an asset earning at a 10 percent rate of interest. Also, the effect will differ between long-term assets/liabilities and short-term assets/liabilities (20-year bonds compared to one-year bonds or medical malpractice reserves compared to auto physical damage reserves) because long-term cash flows are more uncertain than the short-term cash flows. This at least partially explains the reason that 20-year bonds have a higher interest rate than one-year bonds; there is much more uncertainty during a 20-year span of time than during a one-year span. Therefore, although the use of a single interest rate to discount all assets and liabilities is appealing from a simplicity standpoint, using a single rate can materially misstate the effect of interest rate changes for some assets and liabilities. Again, there are trade-offs and subjective choices that must be made when using DGAP modeling, and these affect the accuracy and efficacy of this technique. Bottom line, though, is it is important to pick the best

Table 2
Annual Interest Rate Changes, 1950 to 1989

Basis Point Change	T-Rate	T-Bond	Aaa	Baa
More than -300	1	0	0	0
-200 to -300	3	1	1	2
-100 to -200	3	2	2	1
0 to -100	8	10	11	10
0 to 100	15	23	21	20
100 to 200	6	1	2	4
200 to 300	3	2	2	2
Average	0.18%	0.16%	0.17%	0.18%
Standard Deviation	1.42%	0.82%	0.86%	1.02%

representative interest rate or rates when measuring the duration of assets and liabilities.

A Practical Application of Duration Modeling

Table 3 shows the hypothetical cash outflows from claims and cash inflows from investments for an insurance company over the next 10 years, assuming no new business is added to the books. The company uses a 7 percent discount rate for both assets and liabilities, which are almost perfectly matched with respect to present value. However, the company wishes to evaluate the effect of potential changes in the interest rate environment on these present value assumptions. The second part of the table shows the company's discounted cash flows using a 5 percent interest rate (e.g., a 200 basis point decline in market interest rates) and using a 9 percent discount rate (a 200 basis point increase in market interest rates). If interest rates decrease, the company foresees no solvency problems, as the market value of the liabilities increases from $5,507,071 to $5,671,423 (a 3 percent increase) while the market value of assets climbs from $6,941,084 to $7,567,168 (a 9 percent increase). Equity increases from 20.7 percent of assets to more than 25 percent of assets.

However, if interest rates increase, the market value of the liabilities drops only 2.8 percent to $5,351,971, while the market value of the assets drops 7.7 percent to $6,407,597 and the equity drops to 16 percent of assets, increasing the insolvency risk of the company. As an alternative to plugging various interest rates into a spreadsheet program to determine "what if," the company could simply calculate the duration of the assets and liabilities as shown in Table 3 and use the DGAP formula.

Table 3 shows a significant duration mismatch between assets and liabilities. The asset cash flows are concentrated further out in time, which means that the market value of the assets is more responsive to changes in interest rates than the market value of the liabilities. If interest rates change by 1 percent, the market value of the assets changes by 4.455 percent while the market value of the liabilities changes by only 1.550 percent. The difference between the market value of the assets and the market value of the liabilities is the market value of equity. If the change in interest rates is negative, the assets will appreciate in value at a faster rate than the liabilities and the market value of equity will increase. If the change in interest rates is positive, though, the asset values will decline at a faster rate than the liabilities, and that

could lead to negative market values of equity—that is, the company might become bankrupt.

Recall that the DGAP model is:

$$\frac{\Delta\text{Market Value of Equity}}{\text{Market Value of Assets}} \cong -\left[D_{assets} - D_{liabilities} * \left(\frac{Liabilities}{Assets}\right)\right]\left[\frac{\Delta i}{1+i}\right]$$

$$= -\left[4.455 - 1.550 * \left(\frac{5{,}507{,}071}{5{,}552{,}867}\right)\right]\left[\frac{\Delta i}{1+i}\right]$$

$$= -2.92\left[\frac{\Delta i}{1+i}\right]$$

By looking at this model, it appears that the company has two basic options to decrease its susceptibility to interest rate risk. It can still shorten the duration of its asset portfolio, or alternatively it can reduce its equity position to increase the leverage on the liability duration, or use some combination of these two options. An insurance company could simply liquidate some of its long-term assets and distribute the proceeds as dividends to its shareholders (or policyholders if a mutual company) and thus simultaneously lower its asset duration and increase the liability duration leverage component (the liabilities-to-assets ratio). This would lower the susceptibility of the equity to changes in value brought on by changes in interest rates, but it would not necessarily lower the risk of the company.

From a solvency perspective, an incentive to reduce surplus is counter-intuitive. However, such results can all too easily be produced by misapplication of DGAP modeling concepts. In this case, it may be that the insurance company holds low-risk, high-quality bonds with cash inflows that exactly match the expected cash outflows of its insurance obligations and hold its entire surplus in long-term assets, consistent with the long-term nature of surplus. Since the company has a relatively high level of surplus to begin with, any change in interest rates is going to result in a relatively larger change in the market value of its surplus. Also, consider the result when a company holds no liabilities at all: the change in the market value of the company's equity is identical to the change in the market value of assets. With simple DGAP modeling, there is no matching of assets with the liabilities and surplus, so sometimes misleading conclusions are obtained through misinterpretation of the results. This situation can be exacerbated when the DGAP model assumes that an insurer is in a runoff situation rather than operating as a going concern.

Cash Flow Mismatching, Permanent Working Capital, and Liquidity Issues

The basic DGAP model assumes that a company is in runoff, meaning that there are no new cash inflows (assets) and no new cash outflows (liabilities) over time. By looking at the insurance company on a runoff basis rather than as a going concern, the effect of a change in interest rates on the market value of equity is distorted. For insurance companies that have a large turnover of premiums every year relative to their liquidity needs, the change in the market value of assets and liabilities may have little real economic impact because the duration of both assets and liabilities is in a constant state of change. A company that writes only fire insurance may have significant cash outflows throughout the year that could require that company to hold a very liquid portfolio under a runoff scenario. However, if new money (i.e., premiums) is coming in at a regular, predictable rate, then the liquidity needs can be satisfied by using the new money cash inflows to satisfy cash outflow obligations while the investment portfolio is concentrated in longer-term, higher-earning assets. There is less of a mismatch of assets and liabilities since the cash outflows and inflows are relatively stable and predictable, and the timing mismatch between inflows and outflows creates semi-permanent working capital that might be considered "long-term" because it will only change if there is a significant change in the premium volume or in the rate of claims payments. Variations in DGAP analysis also allow for the influx of new money and the outflow of liabilities during a relatively short time horizon, typically one year or less. These variations allow companies to model their cash flows on a continuous time basis rather than on a runoff basis, which is more consistent with economic reality.

Cash flow modeling on a going concern basis should address the possibility and/or probability that the company will have to actually cash in its stocks or bonds to pay losses or other expenses that arise in the normal course of operations. One method used to evaluate companies on a going concern basis is to model all projected cash inflows against all projected cash outflows and to look for gaps over the life of the obligations. There can be a

mismatching of cash flows even when asset and liability durations are equal, as shown in Table 4. In this example, the cash inflows in early years are insufficient to meet the cash outflow requirements, even though the durations of both assets and liabilities are virtually identical. There is a serious risk that the asset portfolio will have to be sold to pay claims, further eroding the company's ability to meet its obligations. If interest rates increase, the duration matching causes the equity-to-assets rate to remain constant, but the company's risk is increased all the same. This risk should be recognized in the course of interest rate risk assessment.

Portfolio liquidity is also a consideration in duration modeling. Assume that Company A and Company B both have exactly the same loss payment obligations (and thus identical liability durations) but different investment strategies. Company A invests 75 percent of its portfolio in common stocks and 25 percent in cash while Company B invests solely in zero coupon Treasuries that are duration-matched to its liability portfolio. Company B now is immunized from interest rate risk, while Company A has a large mismatch as a result of its relatively large asset duration because of its investment in common stocks. If a catastrophe were to strike the industry, Company A has 25 percent of its assets in liquid form to pay claims plus the investment income from stock dividends, on top of any new money that it would receive from new premiums. Company B, on the other hand, while perfectly matched by duration, would have to liquidate at least part of its portfolio to pay claims. The market value of the zero coupon bonds in the asset portfolio could be lower than normal because interest rates have increased, and the company might experience a loss. Alternatively, market rates might have dropped, allowing Company B to sell its bonds and pocket the capital gains.

This is similar to the situation many companies faced following Hurricane Andrew in 1992. Interest rate declines in 1992 caused the market value of bond portfolios to increase, so the liquidity needs of that catastrophe were at least partially satisfied by capturing capital gains in investment portfolios. Consider the effect on companies if Andrew had struck during 1993 or 1994 or some other period when interest rates were steadily increasing. Some insurance companies might then have been faced with liquidity problems (and potentially with solvency problems) caused by having to sell bonds at depressed prices.

Summary

While duration and DGAP modeling are useful tools when evaluating the susceptibility of insurance companies to interest rate risk, these tools must be used with caution. Duration modeling requires a great deal of information to be used accurately, but also requires a number of simplifying assumptions to be used practically. These tradeoffs between accuracy and practicality must be fully understood by the analyst. The selection of the appropriate discount rate, the estimation of the future cash inflows and outflows, and the selection of an appropriate time horizon are also important elements when constructing models. Additionally, an important choice must be made between modeling the insurance company on either a runoff basis or as a going concern, and this choice will materially affect the outcome of the analysis. Still, with all its flaws, duration modeling can be a valuable tool when used with appropriate discretion.

Table 3
Asset and Liability Duration Calculation Example

Duration Mismatching and Solvency

Asset Duration Calculation
Market Rate is 7.00%

Year	Actual Cash Inflow	Discounted Cash Inflow	Weight	Maturity	Weighted Maturity
1995	$3,125,000	$2,920,561	42.08%	1	0.42
1996	$625,000	$545,899	7.86%	2	0.16
1997	$312,500	$255,093	3.68%	3	0.11
1998	$312,500	$238,405	3.43%	4	0.14
1999	$625,000	$445,616	6.42%	5	0.32
2000	$312,500	$208,232	3.00%	6	0.18
2001	$312,500	$194,609	2.80%	7	0.20
2002	$312,500	$181,878	2.62%	8	0.21
2003	$1,250,000	$679,917	9.80%	9	0.88
2004	$2,500,000	$1,270,873	18.31%	10	1.83
Total	$9,687,500	$6,941,084	100.00%		4.445

Liability Duration Calculation
Market Rate is 7.00%

Year	Actual Cash Outflow	Discounted Cash Outflow	Weight	Maturity	Weighted Maturity
1995	$3,800,000	$3,551,402	64.49%	1	0.64
1996	$1,444,000	$1,261,246	22.90%	2	0.46
1997	$548,720	$447,919	8.13%	3	0.24
1998	$208,514	$159,074	2.89%	4	0.12
1999	$79,235	$56,494	1.03%	5	0.05
2000	$30,109	$20,063	0.36%	6	0.02
2001	$11,442	$7,125	0.13%	7	0.01
2002	$4,348	$2,530	0.05%	8	0.00
2003	$1,652	$899	0.02%	9	0.00
2004	$628	$319	0.01%	10	0.00
Total	$6,128,647	$5,507,071	100.00%		1.550

Market Value of Equity: $6,941,084-$5,507,071 = $1,434,013
Equity to Assets Ratio: 20.660%

Asset Duration Calculation
Market Rate is 5.00%

Year	Actual Cash Inflow	Discounted Cash Inflow	Weight	Maturity	Weighted Maturity
1995	$3,125,000	$2,976,190	39.33%	1	0.39
1996	$625,000	$566,893	7.49%	2	0.15
1997	$312,500	$269,949	3.57%	3	0.11
1998	$312,500	$257,095	3.40%	4	0.14
1999	$625,000	$489,704	6.47%	5	0.32
2000	$312,500	$233,192	3.08%	6	0.18
2001	$312,500	$222,088	2.93%	7	0.21
2002	$312,500	$211,512	2.80%	8	0.22
2003	$1,250,000	$805,761	10.65%	9	0.96
2004	$2,500,000	$1,534,783	20.28%	10	2.03
Total	$9,687,500	$7,567,168	100.00%		4.710

Liability Duration Calculation
Market Rate is 5.00%

Year	Actual Cash Outflow	Discounted Cash Outflow	Weight	Maturity	Weighted Maturity
1995	$3,800,000	$3,619,048	63.81%	1	0.64
1996	$1,444,000	$1,309,751	23.09%	2	0.46
1997	$548,720	$474,005	8.36%	3	0.25
1998	$208,514	$171,545	3.02%	4	0.12
1999	$79,235	$62,083	1.09%	5	0.05
2000	$30,109	$22,468	0.40%	6	0.02
2001	$11,442	$8,131	0.14%	7	0.01
2002	$4,348	$2,943	0.05%	8	0.00
2003	$1,652	$1,065	0.02%	9	0.00
2004	$628	$385	0.01%	10	0.00
Total	$6,128,647	$5,671,423	100.00%		1.567

Market Value of Equity: $7,567,168-$5,671,423 = $1,895,745
Equity to Assets Ratio: 25.052%

Asset Duration Calculation
Market Rate is 9.00%

Year	Actual Cash Inflow	Discounted Cash Inflow	Weight	Maturity	Weighted Maturity
1995	$3,125,000	$2,866,972	44.74%	1	0.45
1996	$625,000	$526,050	8.21%	2	0.16
1997	$312,500	$241,307	3.77%	3	0.11
1998	$312,500	$221,383	3.46%	4	0.14
1999	$625,000	$406,207	6.34%	5	0.32
2000	$312,500	$186,334	2.91%	6	0.17
2001	$312,500	$170,948	2.67%	7	0.19
2002	$312,500	$156,833	2.45%	8	0.20
2003	$1,250,000	$575,535	8.98%	9	0.81
2004	$2,500,000	$1,056,027	16.48%	10	1.65
Total	$9,687,500	$6,407,597	100.00%		4.193

Liability Duration Calculation
Market Rate is 9.00%

Year	Actual Cash Outflow	Discounted Cash Outflow	Weight	Maturity	Weighted Maturity
1995	$3,800,000	$3,486,239	65.14%	1	0.65
1996	$1,444,000	$1,215,386	22.71%	2	0.45
1997	$548,720	$423,713	7.92%	3	0.24
1998	$208,514	$147,716	2.76%	4	0.11
1999	$79,235	$51,497	0.96%	5	0.05
2000	$30,109	$17,953	0.34%	6	0.02
2001	$11,442	$6,259	0.12%	7	0.01
2002	$4,348	$2,182	0.04%	8	0.00
2003	$1,652	$761	0.01%	9	0.00
2004	$628	$265	0.00%	10	0.00
Total	$6,128,647	$5,351,971	100.00%		1.535

Market Value of Equity: $6,407,597-$5,351,971 = $1,055,626
Equity to Assets Ratio: 16.475%

Table 4
Mismatched Cash Flows of Equal Duration

Before Change in Interest Rate

Year	Liability Cash Outflow	Market Value @ 10%	Asset Cash Inflow	Market Value @ 10%	Liability Duration	Asset Duration
1	$3,500	$3,337	$4,000	$3,814	0.17	0.18
2	$8,000	$6,934	$5,500	$4,767	0.70	0.45
3	$2,500	$1,970	$4,500	$3,546	0.30	0.50
4	$2,200	$1,576	$3,600	$2,579	0.32	0.49
5	$2,000	$1,302	$3,000	$1,954	0.33	0.46
6	$1,900	$1,125	$2,550	$1,510	0.34	0.43
7	$1,900	$1,023	$2,000	$1,076	0.36	0.36
8	$1,900	$930	$1,800	$881	0.38	0.33
9	$1,900	$845	$1,400	$623	0.38	0.26
10	$1,900	$768	$1,050	$425	0.39	0.20
Total	$27,700	$19,810	$29,400	$21,174	3.6630	3.6630

Market Value of Equity: $1,363
Equity/Assets: 6.44%

After Change in Interest Rate

Year	Liability Cash Outflow	Market Value @ 9%	Asset Cash Inflow	Market Value @ 9%	Liability Duration	Asset Duration
1	$3,500	$3,352	$4,000	$3,831	0.16	0.18
2	$8,000	$7,030	$5,500	$4,833	0.69	0.44
3	$2,500	$2,015	$4,500	$3,628	0.30	0.50
4	$2,200	$1,627	$3,600	$2,663	0.32	0.49
5	$2,000	$1,357	$3,000	$2,036	0.33	0.47
6	$1,900	$1,183	$2,550	$1,587	0.35	0.44
7	$1,900	$1,085	$2,000	$1,142	0.37	0.37
8	$1,900	$996	$1,800	$943	0.39	0.35
9	$1,900	$913	$1,400	$673	0.40	0.28
10	$1,900	$838	$1,050	$463	0.41	0.21
Total	$27,700	$20,397	$29,400	$21,799	3.7265	3.7140

Market Value of Equity: $1,403
Equity/Assets: 6.43%

Researching Insurance Using the Internet

by Sheila Lawson

The NAIC Research Library has used many on-line databases for years to research insurance issues for the state insurance departments as well as support staff. During the past year the Internet has become an important addition to these databases in our search strategies. The Internet is a vast worldwide network of computers connected by telephone lines. The World Wide Web is a new way of organizing documents on the Internet. The World Wide Web links documents of similar subject matter from different locations by using hypertext buttons in a Windows environment.

The advent of the World Wide Web and the invention of new and improved software browsers to navigate the web have made the Internet much easier to use and also increased traffic over the network exponentially. Matrix Information and Directory Services and Texas Internet Consulting conducted a joint survey and estimated that as of October 1994, 13.5 million users had access to the interactive services of the World Wide Web and that even more people, perhaps 27.5 million users, were able to use the electronic mail functions of the Internet.[1] Whether analyzing the rate of growth in the numbers of domains, networks, hosts, users, or the amount of information transmitted, Internet growth has been exponential for the past five years. It is probably not wrong to say the Internet is doubling in size annually, or growing at 100 percent a year.[2] The numbers of persons "cruising" the Internet either looking for or offering information are astounding and increasing daily.

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When researching any topic it is important to remember the structure of the Internet and to be willing to try some nontraditional techniques. Research problems can be solved using the communication modes of the Internet, directly traveling to locations, and enlisting the help of powerful search engines.

Communicating over the Internet

The Internet grew out of a network created to facilitate military communications between the east and west coasts in case of nuclear war. Communication is still the best use of the Internet and e-mail the reason most people seek access. It is possible to use e-mail to converse with others around the world without incurring long distance fees. Many business cards are providing e-mail addresses and those who give them out expect to communicate in this fashion. Some research questions can best be answered by an "expert" in a field, and it is surprising how responsive they are to e-mail when telephone messages remain unanswered.

Discussion lists are an outgrowth of e-mail. Also called listservs, electronic forums, mailing lists or electronic conferences, they provide a way for people sharing common interests to discuss a topic or ask questions. There is no charge to join a discussion list and there are thousands on the Internet devoted to just as many topics. Members report the benefits of accessing a wealth of informal information, linking to colleagues, growing ideas quickly, sharing an idea all over the world in a manner of minutes, finding new colleagues and learning who is pursuing the same interests in other disciplines.[3] The Research Library uses a discussion list created for business librarians and one covering risk and insurance issues. BusLib has provided an opportunity to compare research strategies and products and has answered questions that would have remained unanswered. It can be compared to having a staff of research librarians on call 24 hours a day. There are many directories and reference books listing addresses and the content of discussion lists by subject area. These print sources should be considered just the tip of the iceberg because groups are added daily by those wanting to network.

A discussion list dedicated to risk and insurance issues is RISKNet operated by Professor James R.

Garven at the University of Texas in Austin. You can subscribe by sending an e-mail message to the address:

listproc@mcfeeley.cc.utexas.edu

and in the body of the message write:

subscribe RISKNet <your name>.

Leave the subject area in the heading blank. Or you could contact Professor Garven at CBA 6.222, Graduate School of Business, University of Texas, Austin TX 78712 if you have further questions. It is strongly recommended that after joining a discussion list, you observe how the other members of the list ask questions and what topics are approached. There is a strong bias against promoting commercial interests over most discussion lists. It usually causes a great uproar among the other members when a commercial has been posted to a discussion list. The sender of the message can be "flamed" by receiving thousands of angry protests. It is advisable to learn the etiquette or "Netiquette" of your group before submitting questions or making comments.

Electronic journals also can be sent directly to e-mail addresses. Many are abstract services in which articles are gathered from many print or electronic sources and condensed. This can be a real time-saver for the reader who then can go directly to any articles of interest to read them full text. The Research Library subscribes to such a service called "Current Cites." It provides articles for librarians who are particularly interested in technological advances and using the Internet. Other journals contain full text articles just as their hardcopy counterparts. The procedure for subscribing to these journals is much the same as joining a discussion list, and there are resource directories providing descriptions and addresses.

Traveling from Place to Place

Just as everyone on the Internet has an e-mail address, so does every network and every document made available. If you have an Internet connection that allows you to do more than simply communicate, you may be able to use a menu-driven system called "Gopher" to travel to those networks. A Gopher server will allow you to go to a certain address, or to choose from a menu of addresses grouped under subject headings. The beauty of using a Gopher is that you can travel from site to site using subject headings without knowing the complex Internet addresses. Once you arrive at a site, the network's Gopher server will allow you to see what information it provides. For example, the Insurance Information Institute provides a Gopher menu allowing searchers to download their catalog and consumer brochures, and place orders for publications.

A searcher may choose to cruise from one site to another using Gopher menu-driven choices, but there is a search engine designed to help the person who wants to find particular information. This search engine is called VERONICA and will be described in the next section.

An easier way to travel the Internet is to use the World Wide Web. The World Wide Web is actually the newest way of organizing similar information on the Internet using hypertext links. Hypertext allows separate documents to be connected or linked by using highlighted words. When chosen or "clicked on" the highlighted words will take the searcher automatically to the related documents. A good example of hypertext links is in the "Help" documentation used in the Microsoft Word program. When a highlighted word is chosen in the table of contents, you are taken directly to the explanatory text. Documents stored on one WWW server may have hypertext links to other documents stored at that site or other servers anywhere on the Web.[4] The software programs that navigate this system are called browsers. Mosaic is probably the best known browser and has an improved offspring named Netscape which is now offered commercially.

There are three main differences between the Gopher server system and WWW browsers. First of all, a network's Gopher server can only offer information from that one particular network's computer system. Using the World Wide Web, that same network could offer information from many other locations. This is done by providing links between sites containing information on similar subject areas. Secondly, the browsers are built in a Windows environment with point and click access. They are much easier to use than Gopher servers. Thirdly, the World Wide Web offers multimedia capabilities. The searcher can download graphics, photographs, audio and video clips in addition to text. The downside to using the World Wide Web is

that it requires a direct connection to the Internet and, therefore, the connection fee is probably going to be more expensive. There are hundreds of providers that can supply the SLIP (Serial Line Internet Protocol) or PPP (Point to Point Protocol) connections, which actually place your computer on the Internet and allow use of the World Wide Web. Some vendors provide just local Internet access and others such as CompuServe and America On-Line have additional databases available.

Search Engines

Chances are that most Internet users have access to Gopher servers, if not the World Wide Web. What do you do when you are looking for sites that have insurance information and you don't have reliable print directories or sources? You can use a searching tool called VERONICA, which stands for Very Easy Rodent-Oriented Net-wide Index to Computerized Archives, and was developed at the University of Nevada.[5] There are two components to any search engine: indexing and retrieval.

The VERONICA server located at the University of Nevada examines every publicly accessible Gopher directory and the corresponding directory items and indexes this information on a database. Most Gopher servers provide an option to do VERONICA searching in the menu list. The searcher can enter a query, in this case for "insurance," and after it is processed the results are sent to the client. The searcher is presented with a list of sites that have information containing the word "insurance." The addresses of the sites are hidden behind the actual names of the locations. Therefore, the searcher can choose a title or name of the most likely location and go directly there without needing to know that location's address. This is a time saver. VERONICA supports advanced searching techniques including Boolean searching and right truncation, and can limit by Gopher type and number of items retrieved. If the Gopher server you use does not provide a VERONICA capability, two addresses of Gopher servers that can provide this service are:

veronica.scs.unr.edu
and
empire.nysernet.org:2347/7-t1

The World Wide Web can be searched through indexes and using programs similar to VERONICA. One of the best places to see what the WWW has to offer in subject categories is at the Yahoo Web server. This index was designed by two graduate students, David Filo and Jerry Yang, and is located at the address:

http://www.yahoo.com.

This directory won both the Outstanding Service Award and the Best of the Internet Award presented by the Internet World Industry Awards this past April. A searcher can either look for information under categories or use a search engine included with the index. For example, there is a listing of 22 sites that offer insurance information under the category of Business and subcategories of: Corporations, Financial Services, Insurance. If the searcher would like to make sure all the "insurance" information has been found that might be lurking in other categories, the search engine can be used. By placing the word "insurance" in the search window, several other categories appear that also contain insurance information sites. These categories include but are not limited to insurance companies that are selling insurance over the Internet, vendors for software and other services for insurance companies, associations providing consumer information, and sites that provide ratings for insurance companies. The Yahoo server acts as an index for the great World Wide Web encyclopedia. Again, once the searcher has the list of sites, it is not necessary to know the address; just point and click on the link and you are sent directly to the site.

Most WWW browsers, such as Netscape, have built in links to search engines. Some of these are Lycos, Infoseek Search, Webcrawler and CUSI. Lycos indexes document titles, headings, links and keywords from documents on the WWW. It is very easy to use. The search word or phrase is typed in a window provided and Lycos returns with a list of locations that have that keyword. The address for Lycos is:

http://lycos.cs.cmu.edu

Another new search engine is Infoseek Search located at:

http://www.infoseek.com

and one of the oldest is Webcrawler, whose address is:

http://WebCrawler/WebQuery.html

CUSI is a unified search interface using fill-in-the-blank boxes, buttons and pull-down menus and allows you to search all of the above information indexes as well as many others. It is provided at many locations; one address is:

http://www.qdeck.com/cusi.html

There is one problem with these "web spiders" or "information robots" even though they are easy to use. As they are used more frequently and as traffic on the Internet increases, it may be difficult to access them. In other words, you may receive a busy signal when you try to use them. Don't depend upon one search engine. Some cover vast areas of information; others are more specialized and quicker to run. If one site is busy, have another ready to try.[6]

Cost Considerations of Using Internet

One of the myths concerning the Internet is that it is free. The Internet is a community of linked networks and has always promoted the sharing of information. This has led to an expectation that some information should be provided free by every site for the good of the Net. However, many sites that contain information in databases do charge for downloading material. There is also usually a charge to connect to the Internet, depending upon the vendor providing access. This charge may be transparent to the user if the connection is made by a network, such as a university. Even though some commercial sites do charge for their material, many locations on the Internet provide unusual and valuable information either for free or a minimal cost.

Where you go to find information depends on what it is you need to know. Vendors, such as Lexis/Nexis, Dialog and Dow Jones, have been providing on-line information for a fee for many years. Sometimes it is easier for the researcher to go directly to a vendor that provides directions and proof that the needed document is available, rather than browsing through the thousands of databases on the Internet with questionable success. For example, case law is held by Lexis or Westlaw. Dow Jones and Nexis have hundreds of newspapers and journals that can be searched simultaneously and Dun & Bradstreet provides top of the line financial data. Each of these vendors charge for their services. These charges may be subscription fees, on-line time charges, or fees related to the amount of material downloaded. The NAIC Research Library will continue to use these databases provided through vendors such as Lexis, Dow Jones and Dun & Bradstreet as appropriate in addition to using the Internet.

Insurance on the Internet

Insurance information is readily available on the Internet. Insurance companies such as ITT Life and PMI Mortgage Insurance Co. already have homepages, which are the introductory documents offered by entities and are similar to the title page and table of contents of a book. Insurance agencies, such as the Legacy Group of New York and the Insurance Research Network of Pennsylvania, have Web servers. Mutual fund companies, stock brokerage firms, commercial banks and investment banks are all located on the WWW. It is being used for direct marketing as well as document delivery.[7]

The state departments of insurance are also present on the WWW. As of June 1995, 38 state governments have Internet homepages or Gophers where business and consumers can find information. One of the best directories for state government locations is a hypertext map of the United States. Developed by the Maine State Government, the map highlights the states with Internet access and provides links to the appropriate sites. This document is found at:

http://www.state.me.us/states.htm

Conclusion

The Internet is a very helpful research tool. E-mail and discussion lists can provide timely information person to person. Documents can be downloaded from archives or current files using Gopher systems or the World Wide Web. Search engines are available to help narrow searches and point the way to likely repositories of information.

However, it is far from perfect. It is important for the researcher to have a high threshold for frustration and a good sense of humor when cruising the Internet. Systems can crash and networks move without leaving forwarding

addresses. It may be a cliché, but it is true, at this time the much hyped information highway is more like a two lane road with many potholes. However, those who know how to navigate it will find sites with timely information, other people that share their interests, and a way to travel around the world without leaving their desk.

Recommended resource books providing directories of discussion lists, electronic journals, and addresses of information providers on the Internet:

Directory of Electronic Journals, Newsletters and Academic Lists, 4th Edition, Washington, DC: Association of Research Libraries, Office of Scientific and Academic Publishing, 1994.

The Federal Internet Source. Levin, Jayne. Washington, DC: National Journal, Inc: Netweek,Inc: 1994.

The Internet Complete Reference. Hahn, Harley, and Stout, Rick. New York: Osborne McGraw-Hill, 1994.

The Internet Yellow Pages. Hahn, Harley, and Stout, Rick. New York: Osborne McGraw-Hill, 1995.

More Internet for Dummies, Levine, John R. and Levine Young, Margaret. San Mateo, CA: 1994.

On Internet 95. edited by Abbott, Tony. Westport CT: Mecklermedia, 1995.

Endnotes

[1]MIDS Press Release: New Data on the Size of the Internet and the Matrix, located on the web at http://www.tic.com/mids/pressbig.html.

[2]John S. Quarterman and Gretchen Phillips, "Internet Growth," *Matrix News*, Vol 3 No. 12 (Dec. 1993).

[3]A. Okerson, "The Electronic Journal: What, Whence and When?", *The Public Access Computer Systems Review*, 2(1991):5-24

[4]Jean C. Gora, "Cruising the Internet," *Resource*, (March 1994): 24.

[5]Eric Morgan, *WAIS and Gopher Servers*. (Wesport, CT: Mecklermedia, 1994).

[6]Gareth Branwyn, *Mosaic Quick Tour*. (Chapel Hill, NC: Ventana Press, 1994).

[7]Gora (1995), 24.

Comparing Aggregate and Combined Industry Totals

by Brenda Richards

Industry data compiled from the annual statements filed with the NAIC are usually combined using either of two methods: aggregation or combination. *Combined data* is compiled by summing the data from all insurance group annual statements with the data from those stand-alone companies that do not otherwise report in a combined filing. Aggregate data, on the other hand, is compiled by summing together the annual statement data for each individual company code in the NAIC database.

These two methods of compiling data can produce large differences in the final results because of the accounting treatment of a combined statement. Individual company statements are adjusted so that reciprocal ownership between affiliates is netted out of their statements, but other affiliated transactions are not adjusted. As a result the value of an affiliate may appear in multiple statements. For instance, if Parent A wholly owns Parent B who in turn wholly owns Subsidiary C, then the value of Subsidiary C is included in the reported assets in the annual statements of both Parent A and Parent B. Using the aggregation technique to present industry data then leads to a double-counting of assets.

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Combined statements submitted by insurance groups present data in an adjusted form that is net of all affiliated inter-company investments and transactions. In this example, the value of Subsidiary C will be included in the combined statement for the group only once. Obviously, any account that includes affiliated transactions will tend to be inflated when comparing aggregate industry data with combined industry data.

When analyzing the insurance industry as a whole, the use of combined data is more appropriate because aggregation tends to overstate assets and equity. For instance, property-casualty industry assets for 1994 are $809 billion using the aggregate method, but are only $734 billion using the combined approach. This difference of $75 billion is largely attributable to affiliated company investments, but at least half of this divergence is attributable to the accounting statements of a single entity, Travelers Insurance Company (Accident Department), NAIC company code 39357. The annual statement for this company includes assets from its life insurance department that significantly skew the aggregate results. This company reports approximately $30 billion of "Aggregate write-ins for other-than-invested assets" on its assets page and another $30 billion of "Aggregate write-ins for liabilities" on its liability page. These offsetting entries inflate the simple aggregate industry assets by about $30 billion. However, since the increase in liabilities offsets the increase in assets, there is little practical effect on the aggregated surplus. As a practical matter, company code 39357 is usually omitted from aggregate data to alleviate the effect of this aberration on industry aggregates.

Tables 1 and 2 reproduce the property-casualty industry assets and liabilities pages using both the aggregate method (with company code 39357 omitted) and the combination method. The major difference between the aggregate method and the combination method is the amount of common stock shown on the assets page: $143 billion under the aggregate method as compared to $102 billion under the combined method. This $41 billion dollar difference is attributable to affiliated common stocks that are being double-counted under the aggregate method. Smaller differences also can be found in preferred stock, bonds, other invested assets, aggregate write-ins, reinsurance receivables and receivables from affiliates. Usually differences appear in any annual statement account that

includes affiliated investments, but the major difference is attributable to affiliated common stock.

Restating industry assets using combined data leads to a reduction in industry assets of $43 billion, a 6 percent decrease. On the liability side, most of this overstatement of assets under the aggregate method finds its way into the capital and surplus account. Using combined data, policyholders surplus drops from $240 billion to $202 billion, a decrease of 16 percent.

Under the aggregate method, then, surplus is increased by roughly the value of this difference in the valuation of affiliated common stocks. If an analyst was intent on making inferences about the common stock position of the insurance industry, the use of aggregates would prove misleading, because there is a significant amount of double counting of affiliated investments. However, in other applications such as the analysis of the industry's risk-based capital exposure, aggregate data is more appropriate than combined data. Risk-based capital calculations are applied to individual companies and include specific treatment for investments in affiliated common stock. Therefore, the aggregate total of affiliated common stock is a more appropriate number to use when analyzing the industry's affiliated common stock exposure. However, this is very much the exception rather than the rule when working with industry data.

Similarly, aggregate and combined differences show up in life insurance industry composites as well. Tables 3 and 4 present the aggregate and combined assets and liabilities pages for life companies, and as with the property-casualty industry figures, the major differences revolve around affiliate transactions. Common stock assets are $72 billion under the aggregate total but only $46 billion under the combined, a reduction of $26 billion. All in all, the combined method reduces life industry assets by about 2 percent, or $31 billion dollars. Life industry liabilities are reduced by roughly $5 billion, and industry capital and surplus is reduced by $26 billion.

Combined and aggregate data for the U.S. market is published by the NAIC annually in the *Statistical Compilation of Annual Statement Information for Property/Casualty Insurance Companies.* The 1994 edition will be available in the next few weeks. The life insurance version, the *Statistical Compilation of Annual Statement Information for Life Insurance Companies,* will include combined data for the first time. The 1994 annual statement year was the first that submission of combined group statements for life insurance groups was required.

Table 1
P&C Insurance Industry Asset Page Comparison
Aggregate Basis and Combined Basis

ASSETS	(1) AGGREGATE BASIS	(2) COMBINED BASIS	(3) REDUCTION (2) / (1) -1
Bonds	465,010,217,737	466,427,694,000	0%
Preferred Stocks	11,909,342,648	11,897,130,000	0%
Common Stocks	142,543,444,229	101,855,256,000	-29%
Mortgage Loans	3,813,936,426	3,829,080,000	0%
Company Occupied Real Estate	7,417,238,067	7,447,131,000	0%
Other Real Estate	2,031,165,868	2,021,322,000	0%
Collateral Loans	421,585,841	416,786,000	-1%
Cash	5,582,248,189	5,630,367,000	1%
Short-Term Investments	31,033,080,253	30,845,979,000	-1%
Other Invested Assets	9,845,596,512	8,878,233,000	-10%
Aggregate Write-Ins For Invested Assets	(690,918,156)	(622,666,000)	-10%
Subtotal Invested Assets	678,916,937,620	638,626,313,000	-6%
Premium And Agents' Balances In Course Of Collectio	15,692,030,425	15,763,945,000	0%
Deferred Premium And Agents' Balances	30,876,901,810	30,863,401,000	0%
Accrued Restrospective Premiums	6,352,387,613	6,485,951,000	2%
Funds Held By Or Deposited With Reinsurers	3,739,733,798	2,344,365,000	-37%
Bills Receivable, Taken For Premiums	1,117,652,700	1,137,281,000	2%
Reinsurance Recoverables On Loss & Lae	10,836,425,299	10,132,810,000	-6%
Federal Income Tax Recoverable	1,534,656,003	1,152,366,000	-25%
EDP Equipment	2,122,088,366	2,125,768,000	0%
Interest, Dividends And Real Estate Income Accrued	8,765,326,463	8,757,637,000	0%
Receivable From Affiliates	5,538,834,356	2,879,099,000	-48%
Equities And Deposits In Pools And Associations	2,676,940,814	2,680,996,000	0%
Amounts Receivable Relating To Uninsured A&H	59,223,119	59,223,000	0%
Aggregate Write-Ins For Other Than Invested Assets	9,492,462,910	11,413,253,000	20%
Totals	777,721,601,250	734,422,407,000	-6%

Note: COCODE 39357 omitted

Table 2
P&C Insurance Industry Liability Page Comparison
Aggregate Basis and Combined Basis

LIABILITIES	(1) AGGREGATE BASIS	(2) COMBINED BASIS	(3) REDUCTION (2) / (1) -1
Losses	308,199,007,564	309,206,778,000	0%
Reinsurance Payable On Paid Losses	2,531,525,719	1,850,104,000	-27%
Loss Adjustment Expenses	60,491,772,853	60,614,212,000	0%
Contingent Commissions	2,040,081,079	2,029,869,000	-1%
Other Expenses	5,490,061,980	5,488,556,000	0%
Taxes, Licenses And Fees	2,444,408,266	2,460,057,000	1%
Federal And Foreign Income Taxes	1,739,910,171	1,366,876,000	-21%
Borrowed Money	1,779,017,797	1,776,792,000	0%
Interest	45,825,554	45,404,000	-1%
Unearned Premiums	101,205,927,094	101,747,894,000	1%
Stockholder Dividends Declared And Unpaid	371,243,451	341,775,000	-8%
Policyholder Dividends Declared And Unpaid	1,794,280,528	1,795,633,000	0%
Funds Held From Reinsurers	8,313,290,369	6,788,956,000	-18%
Amounts Withheld Or Retained For Others Account	4,487,611,534	4,030,761,000	-10%
Provision For Reinsurance	3,448,249,757	3,490,514,000	1%
Excess Statutory Reserves	1,360,237,849	1,343,570,000	-1%
Foreign Exchange Rate Adjustments	736,246,146	716,468,000	-3%
Drafts Outstanding	4,734,825,924	4,861,511,000	3%
Payable To Affiliates	3,897,919,237	1,277,561,000	-67%
Payable For Securities	1,367,986,705	1,218,248,000	-11%
Liability For Uninsured A&H Plans	28,926,445	28,926,000	0%
Aggregate Write-Ins For Liabilites	20,837,999,121	20,238,878,000	-3%
Total Liabilities	537,346,355,159	532,719,345,000	-1%
Aggregate Write-Ins For Special Surplus Funds	14,782,464,476	11,620,782,000	-21%
Common Capital Stock	7,127,612,494	5,115,605,000	-28%
Preferred Capital Stock	1,703,165,967	1,625,260,000	-5%
Aggregate Write-Ins For Other Than Special Surplu	328,002,431	479,974,000	46%
Suprlus Notes	2,999,463,373	2,592,599,000	-14%
Gross Paid In And Contributed Surplus	80,298,694,051	57,990,547,000	-28%
Unassigned Funds (Surplus)	133,541,704,579	124,658,138,000	-7%
Shares Of Common Treasury Stock	380,979,500	192,875,000	-49%
Shares Of Preferred Treasury Stock	24,881,118	19,881,000	-20%
Policyholders Surplus	240,375,246,761	201,703,062,000	-16%
Totals	777,721,601,911	734,422,407,000	-6%

Note: COCODE 39357 omitted

Table 3
Life Insurance Industry Asset Page Comparison
Aggregate Basis and Combined Basis

ASSETS	(1) AGGREGATE BASIS	(2) COMBINED BASIS	(3) REDUCTION (2) / (1) -1
Bonds	1,062,657,377,659	1,061,478,031,000	0%
Preferred Stocks	10,294,502,644	9,962,048,000	-3%
Common Stocks	72,334,933,634	45,919,364,000	-37%
Mortgages	215,589,297,581	215,584,867,000	0%
Company Occupied Real Estate	6,330,994,023	6,334,138,000	0%
Real Estate Acquired to Settle Debt	10,283,340,669	10,286,841,000	0%
Investment Real Estate	26,690,131,723	26,686,918,000	0%
Policy Loans	87,045,658,895	87,035,708,000	0%
Premium Notes	42,031,070	42,031,000	0%
Collateral Loans	312,920,579	298,827,000	-5%
Cash	5,215,861,699	5,161,857,000	-1%
Short-Term Invesments	46,363,733,415	46,258,379,000	0%
Other Invested Assets	21,763,994,162	21,634,066,000	-1%
Aggregate Write Ins for Invested Assets	1,465,383,635	1,423,269,000	-3%
Subtotals of Invested Assets	1,566,390,161,428	1,538,106,344,000	-2%
Reinsurance Recoverable from Reinsurers	1,147,824,309	1,034,928,000	-10%
Reinsurance Commissions & Expenses Due	943,294,061	453,063,000	-52%
Reinsurance Experience Refunds Due	559,314,378	551,421,000	-1%
EDP Equipment	1,544,884,419	1,544,491,000	0%
Federal Income Tax Recoverable	1,240,070,262	1,152,545,000	-7%
Life Insurance Premium/Annuity Due and Unpaid	12,564,546,073	12,600,775,000	0%
Accident and Health Premium Unpaid	5,286,003,247	5,282,466,000	0%
Investment Income Due and Accrued	23,089,129,048	22,995,712,000	0%
Net Adjustment Due to Exchange Rates	44,161,100	43,779,000	-1%
Receivable From Affiliates	2,896,107,188	2,299,576,000	-21%
Amounts Receivable for Uninsured A&H Plans	622,354,635	622,107,000	0%
Aggregate Writeins for Other Than Invested Assets	11,743,903,650	10,543,193,000	-10%
Total Assets Before Separate Accounts	1,628,070,474,749	1,597,230,399,000	-2%
Separate Accounts	351,005,035,589	350,910,753,000	0%
Total Assets	1,979,076,789,421	1,948,141,152,000	-2%

Table 4
Life Insurance Industry Liability Page Comparison
Aggregate Basis and Combined Basis

LIABILITIES	(1) AGGREGATE BASIS	(2) COMBINED BASIS	(3) REDUCTION (2) / (1) -1
Aggregate Reserve for Life Policies	1,039,317,623,958	1,038,393,526,000	0%
Aggregate Reserve for A&H Policies	57,889,484,618	57,893,188,000	0%
Supplementary Contracts w/o Life Contingencies	12,655,095,240	12,634,769,000	0%
Life Claims	8,012,793,723	7,977,701,000	0%
A&H Claims	15,541,665,157	15,486,561,000	0%
Policyholders Dividend and Coupon Accumulations	20,067,942,604	20,067,932,000	0%
Policyholders Dividend and Coupon Due & Unpaid	417,606,740	417,607,000	0%
Dividends Apportioned for Payment	12,671,117,519	12,671,085,000	0%
Dividends Not Yet Apportioned	361,456,866	361,454,000	0%
Coupons and Similar Benefits	5,917,162	5,917,000	0%
Amounts Provisionally Held for Defer Div Policies	1,938,583	1,939,000	0%
Advance Premiums and Annuity Considerations	2,022,935,781	2,019,545,000	0%
Liability for Policyholder Premiums	5,653,363,284	5,653,052,000	0%
Liability for GICs	122,463,873,106	122,463,873,000	0%
Liability for Other Contract Deposit Funds	87,679,074,712	87,679,069,000	0%
Surrender Values on Cancelled Policies	337,807,318	328,411,000	-3%
Provision for Experience Rating Refund	2,412,097,805	2,402,714,000	0%
Other Amounts Payable on Reinsurance Assumed	234,733,779	223,034,000	-5%
Interest Maintenance Reserve	6,862,257,149	6,844,251,000	0%
Commissions to Agents Due & Accrued	1,180,072,208	1,178,418,000	0%
Commission and Expense Payable on Reinsurance Payable	897,186,131	400,917,000	-55%
General Expenses Due or Accrued	5,220,993,980	5,174,273,000	-1%
Transfers to Sep Accts Due or Accrued	(3,443,941,558)	(3,443,311,000)	0%
Taxes, Licenses, Fees Due or Accrued	1,806,199,990	1,801,241,000	0%
Federal Income Taxes Due or Accrued	4,314,209,438	4,361,817,000	1%
Cost of Collection on Uncollectable Premiums	364,514,061	364,488,000	0%
Unearned Investment Income	737,403,477	737,395,000	0%
Amounts Withheld As Agent or Trustee	2,128,737,930	2,128,902,000	0%
Amounts Held for Agents' Accounts	579,471,397	578,979,000	0%
Remittances and Items Not Allocated	4,766,644,273	4,785,093,000	0%
Net Adjustments in Assets and Liabilities Due	604,746,310	604,354,000	0%
Liability for Benefits for Agents and Employees	1,605,334,026	1,605,269,000	0%
Borrowed Money	5,193,202,792	5,257,076,000	1%
Dividends to Stockholders Declared and Unpaid	240,827,557	210,983,000	-12%
Asset Valuation reserve	25,227,136,890	25,198,334,000	0%
Reinsurance in Unauthorized Companies	251,667,588	250,899,000	0%
Funds Held Under Reinsurance Treaties w/Unauth Reins	3,377,325,430	3,362,482,000	0%
Payable to Affiliates	1,940,207,515	1,194,991,000	-38%
Drafts Outstanding	1,281,516,700	1,311,861,000	2%
Liability for Uninsured A&H Plans	172,689,615	172,690,000	0%
Aggregate Write-Ins for Liabilities	35,627,173,207	33,399,934,000	-6%
Total Liabilities Excluding Separate Accounts	1,488,682,104,053	1,484,162,714,000	0%
Separate Accounts	347,757,368,185	347,663,086,000	0%
Total Liabilities	1,836,438,394,706	1,831,825,800,000	0%
Common Capital Stock	3,192,022,803	2,232,132,000	-30%
Preferred Capital Stock	775,784,808	567,451,000	-27%
Aggregate Write-Ins for other than Special Surplus Funds	1,514,095,305	1,335,761,000	-12%
Surplus Notes	6,593,898,720	5,985,595,000	-9%
Gross Paid-In and Contributed Surplus	47,101,741,822	30,229,269,000	-36%
Aggregate Write-Ins for Special Surplus Funds	10,279,911,192	9,951,348,000	-3%
Unassigned Funds	73,622,981,770	72,413,687,000	-2%
Less Common Treasury Stock	418,008,198	410,098,000	-2%
Less Preferred Treasury Stock	25,111,101	4,198,000	-83%
Surplus	138,669,519,566	113,515,770,000	-18%
Capital and Surplus	142,637,317,174	116,315,352,000	-18%
Total Liabilities and Capital and Surplus	1,979,076,789,428	1,948,141,152,000	-2%

Commentary on Life Insurance Illustrations

by Mark Peavy

An article in the April 1995 *NAIC Research Quarterly* entitled "Life Insurance Illustrations" described some aspects of the debate affecting the NAIC's development of a new model on life insurance illustrations. There is obviously a wide diversity of opinion on this topic. In particular, the issue of whether to permit the illustration of non-guaranteed policy values has generated much discussion. Brief statements on this topic were solicited from individuals who are knowledgeable in this area. Each person who was approached was very helpful in agreeing to contribute to this article, and their comments are reproduced on the following pages. It is important to note that the purpose in soliciting these comments was not to champion any particular approach or in any way imply that a particular position is either appropriate or inappropriate. Rather, the intent was simply to provide a forum for the presentation of a diversity of views on this fundamental aspect of life insurance illustrations.

The first essay is by J. Robert. Hunter, Director of Insurance, Consumer Federation of America:

> Cash value life insurance is in trouble. If you buy it, you are likely to be churned. If your insurer fails, the guarantee associations will not respond in a timely fashion.
>
> How do you decide if you are buying a decent product? Assuming that the agent does not mislead you into thinking that you are buying something else and does not unilaterally amend the computerized illustration, then you have to try to understand the NAIC illustration the agent hands you.
>
> You can't compare a whole life policy to a universal life policy using the NAIC illustration. You don't know what your yield will really be because the expense charges are not clearly set forth. This makes comparison shopping almost impossible.
>
> In short, the life insurance industry has built a mammoth insurance sales force trained to obfuscate and the NAIC has provided the tool, the illustration, to enhance obfuscation.
>
> The life insurance industry is in trouble because the public is awakening to these abuses and is putting its money in more transparent, honest investment vehicles.
>
> A key ingredient in making the illustration more honest – besides full disclosure of the insurance charge, commissions, overhead, etc. – is displaying only the guaranteed, not the invented, cash values.
>
> Guaranteed values would not perpetuate the outrageous practice of promising the consumer remarkable things, such as disappearing premiums, which are not delivered.
>
> If insurers are worried that guarantees only will slow sales, I can assure them that nothing will slow sales as much as continued deception of the insurance buyers.
>
> The guarantee only illustration could be accompanied by an historic chart of the actual cash buildups of the product and compared to the levels that were guaranteed by the insurer. A further comparison could be provided to an index of all insurer actual results (or some reasonable proxy for such results).
>
> I cannot, in good conscience, recommend that consumers buy cash value life insurance under today's intolerable conditions. The industry has a duty to clean up these murky

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> waters and stop resisting the NAIC efforts to clarify and simplify the illustration consumers receive from life insurance companies.

The next essay is by Robert B. Likins, Vice President and Associate Actuary, Prudential Insurance Company of America:

> A life insurance illustration's primary purpose is to explain – to disclose – how a policy works.
>
> If a policy has guaranteed values only, then the display of guaranteed premiums, death benefits and cash values would explain how the policy would work and the values that would be paid.
>
> But what if the policy with guaranteed benefits also provided additional benefits that were not guaranteed? And further, what if, year in and year out, in good times and bad, policyowners received substantial amounts of non-guaranteed benefits? (For example, in 1993, policyowners of The Prudential received $3 billion in ordinary individual life insurance death benefits and cash values and more than 40 percent of that was non-guaranteed.) If buyers were denied illustrations that showed non-guaranteed and guaranteed benefits, could they make informed buying decisions? And would that present life insurance, and what it might accomplish, fairly versus competing illustrations from other financial media? Of course not. It's only part of the story.
>
> To adequately explain the policy and how it might serve the buyer's needs, we need to illustrate its potential for generating additional benefits.
>
> The NAIC is developing a regulation that will add discipline to this illustration process, enforced through regulatory sanctions. The values companies illustrate will not exceed those that would be produced if the insurer's most recent performance were continued. For comparison, insurers will also have to show values substantially below those amounts.
>
> Insurance buyers must receive complete information to make informed decisions. Half of the story is not the full story. Partial disclosure is not full disclosure and full disclosure means clearly illustrating both guaranteed and non-guaranteed values. Doing otherwise would be fair to no one.

This next essay was submitted by Ted Becker, Chief Life Actuary, Texas Department of Insurance:

> Some people say that they enjoy studying mathematics because an answer is either right or wrong. However, there are areas to which mathematics is applied where there is no single right or wrong answer. One of these areas is the recommended handling of life insurance illustrations. Actuaries and others who are well qualified in mathematics disagree as to exactly what information should be required in illustrations and what additional information should be permitted on an optional basis.
>
> If only guarantees are illustrated in the sale of new policies, then the argument can be made that policyholders may not understand how their policy would operate. On the other hand, if non-guarantees are illustrated in the sale of new policies, it is possible that the illustrations can be used to exaggerate the probable benefits. Let us consider the past history of policies that have contractually described only-guarantees in their contract wording. Very few of these policies have provided only the guaranteed benefits. However, there have been many cases in the past where policyholders have been disappointed in the level of non-guaranteed benefits that actually were credited. In some cases, this disappointment was because of the illustrations of the non-guaranteed benefits that were provided at the time of the sale.
>
> One possible "middle-of-the-road" approach would be to require the illustration of guarantees and to clearly label them as guarantees, but also to allow non-guarantees to be illustrated for a limited period of time such as 10 years in the future. All life insurance companies also could be required to use a single interest rate, such as 6 percent, for any period more than five years in the

future. There is nothing magic about the choice of 10-year and five-year periods, and these periods could be somewhat shortened or lengthened without affecting the basic approach. These two limitations would respond to the increasingly nebulous character of non-guarantees for periods of time farther ahead in the future. The limitations also would restrict illustrations of what has been called the "magic of compound interest."

The final essay was submitted by Judy Faucett, Principal, Coopers &Lybrand LLP:

Many policies offered today provide for non-guaranteed elements: indeterminate premiums, dividends, excess interest, current expense and mortality charges. To illustrate the operation of the policy without reference to the non-guaranteed elements is analogous to describing an adjustable rate mortgage only by reference to its maximum interest rate. Such a description answers the question "What is the most it can cost?" It does not answer the questions "How much can it cost?" or "How does the cost change as interest rates (or other factors) change?" Both of these questions are important to the buyer's understanding of the financial instrument being purchased, its uses and the need for periodic review.

Future projections are not used in the sale of other financial instruments. It is fairly simple to project a mutual fund value year-by-year based on a hypothetical interest rate. The fund grows annually at the assumed rate. However, because of the interplay of interest, mortality, expense and other factors, the benefits and values of an insurance policy grow at a different rate each year. An illustration is the best tool available to demonstrate the incidence of values.

There have been problems with illustrations. In a survey of carriers conducted by the Society of Actuaries, the carriers indicated that:

- consumers didn't understand which values are guaranteed,
- companies have to much discretion in illustrating non-guaranteed elements
- consumers can't evaluate the reasonability of the underlying assumptions, and
- consumers do not always review the important footnotes and narrative.

The draft regulation addresses these problems. Consumers will still have access to much-needed information on non-guaranteed elements, but that information will now be available in a more consistent format. The regulation imposes a discipline on the maximum values that may be illustrated, as well as requiring a sensitivity analysis.

Non-guaranteed elements can be illustrated on a rational basis that will inform and educate the consumer about the operation of the policy, which is critical to making the decision to purchase, and to keep, that policy.

Summary

It is clear from the preceding comments that there is a wide range of opinion regarding the presentation of non-guaranteed policy values in life insurance illustrations. As with all of the issues pertaining to illustrations, there is sure to be a continuing debate regarding the best ways to communicate the various aspects of a policy to the consumer.

The Relation Between Investment Portfolio Mix, Leverage and Profitability

by Mike Barth

Investors typically hold a mixture of assets in their investment portfolios to diversify their risk. One of the fundamentals of financial theory is that investors are able to achieve some level of diversification with relatively few alternative securities, as long as the returns for those securities are less than perfectly correlated. Diversification techniques include holding more than one kind of like assets (e.g., several different issues of common stock from unrelated firms) and by holding more than one kind of asset in the portfolio (e.g., stocks, bonds and mortgages). Diversification of the investment portfolio lowers risk because while some investments are going sour, other investments are doing extremely well, and others are simply producing returns as expected. In a well-diversified portfolio, the fluctuations of the various classes of securities and among the individual securities within each class tend to cancel one another out. In a well-diversified portfolio, there is a better chance of achieving the expected long-run average return because there is less variation around the mean expected return.

Insurance companies are large investors in the bond and equities markets, but the investment patterns differ among individual insurers as well as between life and p-c companies. Those insurers with long duration, predictable liabilities tend to invest in long duration securities, such as common stocks or long-term corporate bonds. Companies with a need for liquidity, on the other hand, tend to invest more heavily in short-term U.S. government securities.

As an investment portfolio increases in size, there is more of an opportunity to take on higher-risk assets. A well-known series of investment return studies by Roger Ibbotson and Rex Sinquefield have clearly shown that, over the long term, riskier assets such as common stocks outperform safer assets such as bonds, but that over the short-term there can be serious value fluctuations. There is more risk in that a company is exposed to significant losses should it have to liquidate some or all of its portfolio when market prices are depressed. On the other hand, as long as cash flows are reasonably predictable, a company can earn a greater return over the long run and thus offer its products at a lower price.

The purpose of this research is to review the diversification trends by examining the distribution of bond and equity investments that insurance companies tend to invest in, along with analyzing the typical spread of risk that companies employ. To do this, aggregate totals from Schedule D were produced for all property-casualty and life insurers that submitted a 1994 annual statement to the NAIC. The bond statement values were taken from Schedule D Part 1, the preferred stock from Schedule D Part 2 Section 1, and the common stock from Schedule D Part 2 Section 2. Mortgage loan figures from Schedule B Part 1 Section 1 also were developed for life companies. The number of issues of each type of security was determined by counting all of the non-zero, non-summary lines with positive statement values in Schedule D Parts 1 and 2. Mortgage counts are published in Schedule B Part 1 Section 1.

Counting the number of lines reported in the annual statement gives a count of the number of issues, but not the number of issuers. This can be important when evaluating spread of risk through diversification, because having 10 bonds issues from a single company does not give the same degree of diversification that having a single bond issue from 10 independent companies would. Still, even multiple issues from a single issuer provide some level of diversification, because even in the event of a default by the issuer, there is often a different default loss on the separate bond issues from a single issuer. For instance, bond covenants included in one issue might make those bonds senior to other

bonds issued by the organization, so that those bondholders are paid before other creditors. Other bond features, such as convertibility or callability, can make the market risks of two separate bonds issued by the same corporation considerably different. Therefore, while the number of issues is an imperfect measure of diversification, the number of issuers has its drawbacks as well. The number of issues has a distinct advantage in that it is easily calculated, and for that reason it is included in this analysis.

Insurers were subdivided into seven groups on the basis of total assets (assets before separate accounts for life companies). Those breakdowns are: companies with assets of (a) less than $10 million, (b) $10 million to $50 million, (c) $50 million to $100 million, (d) $100 million to $250 million, (e) $250 million to $500 million, (f) $500 million to $1 billion, and (g) greater than $1 billion. These breakdowns give a better sense of the size-related differences among insurers. Generally speaking, a smaller insurer has less opportunity to achieve a high level of diversification because it has fewer assets to spread among individual securities or among classes of securities.

P/C Insurers

Table 1 shows the aggregate investment by each size group for the p-c insurers reporting to the NAIC. Several things become apparent from a quick perusal of Table 1. First, the percentage of invested assets held in stocks and bonds increases as insurers get larger. Frequently, smaller insurers tend to hold a large amount of their invested assets in either cash or short-term securities for liquidity. Also, a relatively large share of invested assets can result when smaller insurers own their home office buildings. Second, the mix of the investments becomes riskier as insurers grow larger. That is, the percentage of equity investments increases, especially affiliated equity investments.

Table 2 shows the number of insurers in each of these size groups that reported holdings in bonds or equities. For example, of the 867 insurers in the "less than $10 million" category, 734 (84.7 percent) reported bond holdings, 161 (18.6 percent) reported preferred stock holdings, and 359 (41.4 percent) reported common stock holdings. Bonds are held by virtually all insurers, while the percentage of companies holding equity investments is positively correlated with asset size.

Bonds

Table 3 gives the percentage breakdowns of bonds by type for each of the size groups. Typically, smaller insurers have a higher proportion of their bond portfolio in the government bond classification, which is those bonds that are guaranteed and direct obligations of federal governments. About 96 percent of those bonds are U.S. government securities, and these are about the safest and most liquid investment that an insurer can make. As an insurer's size increases, there is a growing proportion of bonds held in the Special Revenue and Special Assessment Obligations category, which are predominantly revenue bonds issued by state and local governments and other government-issued bonds that are not backed by the full faith and credit of the taxing authority. While these bonds are somewhat higher risk than those carried in the Government category, they are still relatively low in default risk. There is also a slightly higher proportion of unaffiliated industrial bonds in the portfolios of larger companies, also indicative of slightly higher risk.

In addition to the types of bonds being carried, the spread of bonds being carried is also of interest. A large, diversified portfolio of even high-risk bonds can produce a relatively stable return, and indeed a diversified portfolio of higher-risk bonds can actually be less risky than an undiversified portfolio of lower-risk bonds.[1] Table 4 shows the median number of bond issues in each category of bonds for each size range. The number of issues was developed by counting the number of separate lines (excluding summary lines) reported in Schedule D Part 1 by each company in each category, and then taking the median value of that number. Only companies that actually reported issuers were included, so companies with no bonds in a particular category were not included in that category. As expected, larger insurers tend to have more of a spread of risk because they hold more diversified portfolios. Some of the smallest companies tend to have poorly diversified bond portfolios, but they also tend to expiate that tendency by holding more U.S. government bonds to offset this increased risk. The proportion of total bonds that are U.S. government issues is higher for this smallest group, but drops as the total number of issuers grows.

More diversification through multiple issuers also means that larger insurers are able to include more risky investments in their portfolios. But there is another aspect to this, and that is the degree of market power that larger insurers may exercise. Table 5 gives the average issue size for each of the categories of bonds by class size. The larger companies do buy a more varied bundle of issues, which diversifies their risk, and they also tend to buy more of each particular issue. The increased diversification from holding multiple issues is somewhat offset by having more wealth concentrated in those issues, but the offset is negligible compared to the advantages of buying in bulk. There is an economic benefit to the larger average size of each bond issue in that economies of scale can result when purchasing larger amounts of the same security at the same time.

In summary, the bond holdings of p-c insurers show that larger companies tend to hold a more diversified, slightly higher risk bond portfolios. The average issue size also increases as the size of the portfolio increases, which can result in cost savings and, to some degree, market power exercised over the bond issuer (as in the case of private placements). Given these facts, larger companies should earn a higher return on their bond portfolios (from the increased risk) than smaller companies that are less able to diversify away the risk of individual bond issues.

Equities

Table 6 shows the aggregate preferred stock, average preferred stock issue size, and median number of issues for the four categories of preferred stock reported in Schedule D Part 2 Section 1. Similar to the process used to count bonds issues, each line of Schedule D Part 2 Section 1 (except summary lines) was treated as a single issuer. Only those issues with a statement value were included, so the median number of issues and the average value of each issue are both based on those companies that actually reported something in the annual statement.

Preferred stock is not a large factor in the investment portfolios of most insurers. However, the patterns that were observed in the bond holdings generally held true in the preferred stock as well, with the number of issues and the average issue size increasing as assets increased.

In Table 7, the percentage of ownership by type of common stocks, the median number of issues, and the average issue sizes are given for each asset size group. Table 7 clearly shows that the percentage of common stock of affiliated investments increases rapidly, averaging about 50 percent of total common stock for those companies with assets of more than $100 million.

Of the other three classifications of unaffiliated common stock (Public Utilities; Banks, Trusts, and Insurance Companies; and Industrial and Miscellaneous), the Industrial and Miscellaneous category is the most influential. Also, the percentage of industrial and miscellaneous stocks among the unaffiliated category increases along with insurer size, implying more risk and, hence, a higher expected return for these investment portfolios.

Table 7 also shows that the median number of issues is fairly small for all but the largest insurers. Studies have shown that 30 to 40 different common stock issues are necessary to achieve a well-diversified portfolio.[2] This required number of issues increases as the correlation among the returns for the individual stocks increases and decreases as the correlation decreases. These statistics suggest that a large number of insurers, including some fairly large companies, hold a poorly diversified portfolio of common stock.

The amount of common stock concentrated in affiliates is partially a liquidity issue, but more so a diversification issue. Some of these affiliated companies are actually non-insurance affiliates that trade on the open market with well-publicized equity prices, but most are closely held with little or no secondary market potential, and this tends to make the estimated market values less certain. Additionally, that means that these stocks are very illiquid because they cannot be easily converted to cash. On the diversification issue, about 85 percent of the common stocks and 30 percent of the preferred stocks are insurance affiliates. There will be more correlation between the returns for these entities than is common among non-insurance common stock issues. Therefore, the number of these affiliates needed to achieve some level of diversification is much higher than the “30 to 40 issues” rule of thumb that is normally used.

Some of this seemingly poor diversification is alleviated by the tendency to hold mutual fund

stocks rather than individual company issues. A mutual fund, through pooling of multiple investors' capital to buy multiple issues of stocks or bonds, is able to improve the level of diversification, although holding just one or two mutual funds leaves an investor open for other types of risk (fraud or poor judgment by the mutual fund manager, for instance).

Financial Leverage

Financial leverage is defined here as the ratio of total assets (what a company owns) to equity (the excess of what it owns over what it owes). Assets must equal liabilities plus equity, so the higher the proportion of liabilities to equity (and thus the higher the ratio of total assets to equity), the higher the percentage of assets that are financed with other people's money. Using other people's money to leverage the returns for investors is often quoted as a goal of certain capital structure models, but leverage also has disadvantages. A higher degree of financial leverage tends to increase investor returns when times are good, but also magnifies investor losses when times are bad. For two otherwise identical corporations, the company with the higher leverage will be the more risky company because variations in operating income have a greater chance of swamping the company's equity and driving it into bankruptcy. By the same token, variations in operating income also have a greater chance of being exceptionally high, resulting in a windfall for investors. Since investors have an unlimited potential for windfall profits, but have finite downside (they can only lose their investment, no matter how deeply the company goes into the tank), there is a natural tendency toward a preference for higher leverage among investors.

If operating income is steady and predictable, it makes good economic sense to use financial leverage to increase the returns to owners, as long as the increased leverage does not exceed the desired risk tolerances. Investors also have a stake in the long-run health of a company, and increasing financial leverage past a certain point tends to lower that long-run health. Some type of balance results from the competing incentives, but that balance can still be high-risk, low-risk or average-risk, depending on the particular company's situation.

Financial leverage is an important component in the computation of return on equity (ROE). ROE is income divided by equity, or more basically the amount of money that investors received per dollar of their investment. Economic returns and market values for equity should be used to measure ROE, but insurance accounting does not provide such figures. Neither SAP nor GAAP adjust for the time value of money embedded in reported reserves (economic returns). SAP also tends to carry assets and liabilities at other-than-market values (e.g., bonds are carried at amortized value rather than market value), and for life companies, the asset valuation reserve (AVR) and certain other voluntary reserves are carried as liabilities when in fact they are a form of surplus. Therefore, the application of ROE analysis to values reported in the annual statement is not strictly applicable. Nonetheless, these return figures are shown here to give some idea of the impact of leverage on insurance industry profits.

The formula for ROE decomposes to return on assets (ROA) times the amount of financial leverage:

$$\frac{Income}{Equity} = \frac{Income}{Assets} x \frac{Assets}{Equity}$$

Return on equity can be increased by increasing the amount of income relative to assets (that is, becoming more productive) or by increasing the amount of assets without increasing the amount of equity (using other people's money).

Table 8 shows the income per dollar of assets for each of the seven asset categories as well as for the aggregate p-c industry. Income is divided into underwriting income, investment income, realized capital gains, and all other income. The last column shows the net income, which is simply the sum of the first four categories. The income figures come from the Underwriting and Investment Exhibit - Statement of Income, Lines 7, 8, 9 and 13. These income figures are divided by the total assets reported on the asset page to measure ROA. While the underwriting ROA (underwriting income divided by assets) tends to decrease slightly with insurer size (that is, underwriting income per dollar of assets goes down), the investment income ROA increases slightly at the same time. The result is that median total ROA is fairly constant for all size groups at between 3 and 4 percent.

Table 9 shows the standard deviation of the five ROA measures for each of the asset size groups, and this shows the other side of the risk-return equation. The standard deviation is a measure of how much that average number can deviate for individual companies. While the average ROA figures are not very different between insurers in the various size groups, the standard deviations are different, becoming progressively smaller as insurer size increases. The standard deviation measures the amount of variability in those returns, and the variability generally declines as asset size increases. This implies that insurers do not necessarily move assets into higher-risk, higher-return assets as they get larger. Rather, the ROAs are fairly constant across size groups, implying that the underlying risk of assets is relatively constant. Because the ROAs are more stable and predictable for the larger companies, though the larger companies enjoy a higher return *per unit of risk* than their smaller counterparts. That is, if Large Company and Small Company both expect to earn 4 percent on their invested assets, Large Company will have less variation around that expected 4 percent figure and might really earn between 3.75 percent and 4.25 percent. Small Company, on the other hand, expects to earn 4 percent but might really earn between 0.5 percent and 7.5 percent over the course of the year. Because its returns are more predictable, Large Company is able to employ more financial leverage to increase its return on equity.

Table 10 shows the median financial leverage (assets divided by equity) and return on surplus (ROS, a proxy for ROE) for these categories. Obviously, the leverage multiplier is the driving force behind the ROS numbers. Leverage increases from a median of 1.32 for the smallest group to 4.05 for the largest insurers. The surplus-to-assets ratio is simply the reciprocal of the leverage multiplier, and for these two groups that ratio is 75 percent and 25 percent, respectively.

The relatively higher amount of leverage means that good results get better and bad results get worse, as demonstrated by the ROE numbers for underwriting returns and investment returns. The leverage causes the underwriting ROE, which are generally negative, to become progressively worse for the larger companies, but that is more than offset by the increased investment returns for those companies.

The stability of underwriting returns and asset returns for the larger companies allows these companies to apply much more financial leverage than would be prudent for a company with more volatility in its results. Of course, simply being large does not in and of itself make the underwriting results or the investment results stable, because even large companies invest poorly or underestimate environmental claims. Still, the stability required to be able to increase the financial leverage to these proportions is largely a function of size and the law of large numbers, and most large insurers take advantage of this by employing relatively high degrees of leverage to augment returns.

Life Insurers

Investment portfolio mix for five major categories of invested assets are shown in Table 11 for both the p-c companies and the life companies. As with the p-c companies, small life companies tend to hold a larger proportion of their assets as cash or short-term investments. One difference noted between life companies and p-c companies is the relatively heavy investment in mortgage loans, especially in larger life companies. Another difference is the "other invested assets" category for life companies is largely policy loans, an asset that does not appear on the p-c balance sheet. Also, for life companies there is less reliance on stocks in the investment portfolio relative to p-c companies, and even then a high proportion of those stocks that are held by life companies are affiliated companies.

Bonds

The life industry bond portfolio in Table 13 shows a similar pattern to the p-c industry pattern that was presented in Table 3. That is, the smaller companies tend to rely more heavily on U.S. government issues for safety and liquidity. Interestingly, the life insurance portfolio mix shows a substantially higher percentage of bonds in the Industrial and Miscellaneous and Public Utilities categories than does the p-c industry mixture. Basically, life companies invest heavily in higher-risk, higher-return corporate bonds while the p-c industry invests more heavily in government or government-guaranteed bonds. At each asset level, p-c companies tend to have between 75 percent and 80 percent of their bond holdings in the first four bond categories (federal, state, local or government-

guaranteed bonds) while for life companies, that percentage is much lower, dropping to less than 33 percent of total bonds in the largest asset category. Some of these differences stem from tax-related issues while others reflect the diverse nature of these two separate subindustries. Life companies, and especially larger life companies, are more similar to investment funds than to p-c insurance companies, and some of these differences show in the asset portfolio mix.

For all the differences, there are also a large number of similarities in the investment philosophies of life and p-c companies. The spread of bond issuers for life companies in Table 14 is very similar to the pattern exhibited by p-c companies in Table 4. The larger companies are better able to diversify their holdings, and the smaller life companies tend to rely on higher-quality issues to make up for the higher risk associated with holding an undiversified portfolio.

Equities

Table 15 provides details on the life insurance industry's investments in preferred stock. The aggregate total by size group, the distribution, and the median number of issues all show very similar patterns to the p-c figures found in Table 6.

Table 16 gives the distribution and spread of risk for common stocks for life companies, similar to the p-c figures that were presented in Table 7. The major difference observed is that the life industry is much more heavily weighted toward affiliated equity investments than p-c companies. In addition to being more heavily weighted by affiliated stocks, there is much less spread for these companies, and the median number of issues is relatively low. Therefore, on average, life insurers do not maintain enough different issues of common stock to achieve a well-diversified portfolio.

Mortgages

Mortgages make up a large proportion of the overall life industry portfolio, but more so in the larger companies than in the smaller companies. Table 17 shows that the investment patterns differ significantly by size, with larger life companies holding mostly commercial mortgages and smaller life companies holding mostly residential mortgages. Table 17 also provides some information on the spread of risk among companies. The number of companies holding less than 10 mortgages, 10 to 50 mortgages, 51 to 100 mortgages, 101 to 1,000 mortgages, and more than 1,000 mortgages are given for each of the asset groups. Additionally, the median number of issues is given at the bottom of the table. While these numbers do indicate a fair amount of risk spreading among the larger companies, they also show that there are a significant number of companies with poor diversification in this area. The NAIC database does not capture enough detailed information on mortgages to test the effectiveness of the number of mortgages on risk diversification, but as a rule of thumb, more is better than less. However, as with bonds, it is assumed that there is a high level of correlation among the returns of individual fixed income securities, more so than for equities, and so the number of issues required to eliminate the unsystematic risk in a mortgage portfolio is assumed to be higher than the requirement for an equity portfolio.

Financial Leverage

The observed portfolio mix differences between p-c and life companies suggest that there should be some measurable differences in the average return on assets for life companies relative to p-c companies. Table 18 presents ROA figures for net investment income (taken from the Summary of Operations page, line 4) and all other income (Summary of Operations page, line 33 minus line 4), and net income (Summary of Operations page, line 33). These income figures are not necessarily appropriate measures for ROA, and they are used solely to make a comparison between the life and the p-c industry.

Comparable to the underwriting and investment income lines in the p-c table (Table 10), the “all other income” line for life companies is generally negative while the net investment income line is generally positive. Also, the difference between the size group ROA measures is very small, especially with respect to the differences in net investment income ROA.

Financial leverage is calculated slightly differently for life companies. The AVR is added back to the capital and surplus and this figure is used in the denominator of the financial leverage calculation. This makes the calculation more similar

to the p-c version of surplus. The leverage multiplier is still generally higher for life companies, even given this modification.

The effect of the leverage multiplier is easily seen on the ROS numbers produced in Table 18. Also, as with the p-c companies, the larger companies rely more heavily on leverage than do the smaller companies. The leverage multiplier for a large life company is typically large, similar to the leverage multiplier for a large commercial bank. This does not imply that large life companies are more risky, though. In fact the opposite is true; larger companies are able to employ more financial leverage because they are less risky.

Summary

Some of the differences in the investment patterns of insurance companies are driven by liquidity needs, while others reflect diversification efforts. For smaller companies in both the life and the p-c industry, bond portfolios are heavily weighted with U.S. government issues, indicating that companies are using relatively low-risk assets rather than diversification to reduce asset portfolio risk.

Equities are an important part of both the life and the p-c industry portfolio, but a large portion of those equities are affiliated insurance companies. The percentage of equities in portfolios is a function of insurer size, as larger companies tend to hold more. As shown by the median number of issuers reported in Schedule D Part 2 Section 2, most insurance companies do not hold what would be termed a well-diversified portfolio of common stocks. This can lead to understatement of overall risk for these companies in many areas, such as in the computation of minimum capital standards under the NAIC's Risk-Based Capital system or in the development of appropriate AVR factors.

Given the minuscule differences in the average ROA among asset groups, it appears that portfolio mix has little effect on average return on assets (although on individual companies, the effect is more easily identifiable). However, the increasing level of diversification, both through spread across classes of securities as well as by spread of securities within a class, allows larger insurers to employ more financial leverage to boost their returns on surplus. Even given the higher level of leverage, though, the returns to surplus among both p-c and life companies are roughly comparable when computed on a weighted average basis. However, the median returns to surplus for both the life and the p-c companies are slightly higher for the larger companies.

Endnotes

[1] *Edward I Altman, editor, The High Yield Debt Market: Investment Performance and Economic Impact.*

[2] *Meir Statman, "How Many Stocks Make a Diversified Portfolio?" Journal of Financial and Quantitative Analysis 22, no. 3 (September 1987): 353-63.*

Table 1
Aggregate Investment in Stocks and Bonds
Property-Casualty Insurers By Asset Size Groups

Range	Total Assets in Size Group	Total Invested Assets in Size Group	Statement Value of Bonds	Statement Value of Pref'd Stock	Statement Value of Common Stock	All Stocks & Bonds
LT $10 million	3,734,966,540	3,301,854,538	2,055,237,295	55,393,406	226,993,361	2,337,624,062
$10 - $50 million	18,767,777,667	16,459,519,608	12,099,510,177	276,414,346	1,296,979,589	13,672,904,112
$50 - $100 million	21,771,004,409	19,359,560,031	15,271,528,385	324,108,297	1,619,166,197	17,214,802,879
$100 - $250 million	49,325,123,006	43,895,578,717	33,392,524,387	925,344,545	5,286,988,629	39,604,857,561
$250 - $500 million	60,730,773,197	53,894,324,212	41,024,326,988	981,417,485	6,799,929,823	48,805,674,296
$500 - $1,000 million	81,217,161,352	71,437,468,155	54,498,831,085	1,300,038,285	9,550,901,683	65,349,771,053
GT $1 billion	572,458,707,713	469,440,084,541	305,320,650,382	8,049,170,141	118,331,715,983	431,701,536,506
Total	808,005,513,884	677,788,389,802	463,662,608,699	11,911,886,505	143,112,675,265	618,687,170,469

Percentage of Invested Assets

Range	Total Assets	Invested Assets	Bonds	Pref'd Stock	Common Stock	Stocks & Bonds
LT $10 million	113.1%	100.0%	62.2%	1.7%	6.9%	70.8%
$10 - $50 million	114.0%	100.0%	73.5%	1.7%	7.9%	83.1%
$50 - $100 million	112.5%	100.0%	78.9%	1.7%	8.4%	88.9%
$100 - $250 million	112.4%	100.0%	76.1%	2.1%	12.0%	90.2%
$250 - $500 million	112.7%	100.0%	76.1%	1.8%	12.6%	90.6%
$500 - $1,000 million	113.7%	100.0%	76.3%	1.8%	13.4%	91.5%
GT $1 billion	121.9%	100.0%	65.0%	1.7%	25.2%	92.0%
Total	119.2%	100.0%	68.4%	1.8%	21.1%	91.3%

Table 2
Number of Companies Reporting Stocks and Bonds
Property-Casualty Insurers By Asset Size Group

Range	Companies in Size Group	Companies in Size Group Reporting Bonds	Companies in Size Group Reporting Pref'd Stock	Companies in Size Group Reporting Common Stock
LT $10 million	867	734	161	359
$10 - $50 million	769	753	241	415
$50 - $100 million	301	301	108	190
$100 - $250 million	311	309	157	241
$250 - $500 million	172	171	80	144
$500 - $1,000 million	112	112	65	94
GT $1 billion	142	142	100	136
Total	2,674	2,522	912	1,579

Range	% of Companies Reporting Bonds	% of Companies Reporting Pref'd Stock	% of Companies Reporting Common Stock
LT $10 million	84.7%	18.6%	41.4%
$10 - $50 million	97.9%	31.3%	54.0%
$50 - $100 million	100.0%	35.9%	63.1%
$100 - $250 million	99.4%	50.5%	77.5%
$250 - $500 million	99.4%	46.5%	83.7%
$500 - $1,000 million	100.0%	58.0%	83.9%
GT $1 billion	100.0%	70.4%	95.8%
Total	94.3%	34.1%	59.1%

Table 3
Percentage of Bonds In Each Schedule D Grouping
Property-Casualty Insurers By Asset Size Group

	Asset Size Group						
Schedule D Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Governments	55.7%	44.9%	41.8%	37.7%	32.0%	37.1%	29.2%
States, Territories and Possessions	7.6%	7.6%	7.0%	8.1%	8.9%	6.5%	7.5%
Political Subdivisions of States, Territories, and Possessions	8.3%	8.5%	6.8%	8.6%	7.7%	8.4%	8.3%
Special Revenue and Special Assessment Obligations	12.9%	18.4%	22.3%	25.1%	25.4%	24.2%	33.1%
Public Utilities (Unaffiliated)	2.5%	3.6%	3.1%	3.1%	4.0%	3.4%	3.9%
Industrial and Miscellaneous (Unaffiliated)	12.9%	16.8%	18.2%	17.1%	22.0%	20.0%	17.6%
Credit Tenant Loans	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Parents, Subsidiaries, and Affiliated Bonds	0.1%	0.2%	0.7%	0.4%	0.0%	0.2%	0.3%
Total Bonds	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4
Median Number of Bond Issues In Each Schedule D Grouping
Property-Casualty Insurers By Asset Size Group

	Asset Size Group						
Schedule D Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Governments	5.0	10.0	15.0	19.0	24.0	36.0	44.0
States, Territories and Possessions	3.0	5.0	6.0	8.0	12.0	19.0	26.0
Political Subdivisions of States, Territories, and Possessions	3.0	7.0	8.5	10.0	14.0	23.0	35.0
Special Revenue and Special Assessment Obligations	3.0	9.0	18.0	28.0	34.0	52.0	135.0
Public Utilities (Unaffiliated)	2.0	3.0	2.0	3.0	5.0	6.5	12.0
Industrial and Miscellaneous (Unaffiliated)	5.0	8.0	13.0	16.0	25.0	32.0	65.0
Credit Tenant Loans	0.0	2.0	6.0	1.0	1.0	1.0	1.0
Parents, Subsidiaries, and Affiliated Bonds	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Bonds	11.0	35.0	60.0	87.0	131.0	197.0	365.0

Table 5
Average Size of Bond Issue In Each Schedule D Grouping
Property-Casualty Insurers By Asset Size Group

	Asset Size Group						
Schedule D Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Governments	217,402	547,400	1,068,056	1,560,989	2,213,435	3,298,761	2,945,126
States, Territories and Possessions	148,580	311,843	566,168	941,302	1,187,185	1,845,053	3,327,102
Political Subdivisions of States, Territories, and Possessions	107,018	217,009	346,343	564,819	923,275	1,132,451	1,379,705
Special Revenue and Special Assessment Obligations	140,711	268,317	594,476	832,389	1,219,402	1,459,787	2,522,842
Public Utilities (Unaffiliated)	85,118	291,363	519,115	811,590	1,360,908	2,119,836	4,524,553
Industrial and Miscellaneous (Unaffiliated)	106,715	286,778	616,221	891,015	1,652,417	2,622,319	4,572,034
Credit Tenant Loans	0	92,167	338,484	883,828	2,075,045	5,533,698	2,036,566
Parents, Subsidiaries, and Affiliated Bonds	135,190	727,965	4,138,004	5,993,650	1,432,037	18,513,235	27,203,445
Total Bonds	159,407	350,426	691,833	989,291	1,484,130	2,079,314	2,773,222

Table 6
Amount, Average Size and Median Number of Issues By Type of Preferred Stock
Property-Casualty Insurers By Asset Size Group

Aggregate Amount of Preferred Stock By Type

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	20,836,356	13,232,752	19,055,385	2,268,913	55,393,406
$10 - $50 million	85,270,752	54,380,018	105,882,559	30,881,017	276,414,346
$50 - $100 million	155,681,567	49,924,405	111,487,841	7,014,484	324,108,297
$100 - $250 million	434,171,158	142,294,069	302,751,348	46,127,970	925,344,545
$250 - $500 million	396,687,021	210,063,199	290,911,231	83,756,034	981,417,485
$500 - $1,000 million	560,358,957	269,740,790	371,250,001	98,688,537	1,300,038,285
GT $1 billion	2,366,922,892	1,912,729,013	2,955,980,229	813,538,007	8,049,170,141

Average Preferred Stock Issue Amount

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	60,925	68,921	65,035	324,130	66,419
$10 - $50 million	136,871	148,579	161,406	1,029,367	165,023
$50 - $100 million	455,209	354,074	389,818	1,002,069	417,665
$100 - $250 million	495,629	578,431	610,386	1,845,119	563,204
$250 - $500 million	747,057	1,207,260	944,517	4,926,826	952,833
$500 - $1,000 million	1,153,002	1,886,299	1,600,216	10,965,393	1,494,297
GT $1 billion	2,128,528	8,003,050	4,216,805	9,459,744	3,764,813

Median Number of Issues of Preferred Stock

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	2.0	2.0	2.0	1.5	3.0
$10 - $50 million	3.0	2.0	2.0	1.0	4.0
$50 - $100 million	3.0	2.0	2.0	1.0	4.0
$100 - $250 million	5.0	2.0	3.0	1.0	4.0
$250 - $500 million	4.0	3.0	4.0	1.0	5.0
$500 - $1,000 million	5.0	3.0	4.0	1.0	5.0
GT $1 billion	9.0	3.0	4.0	2.0	10.5

Table 7
Distribution and Median Number of Issues By Type of Common Stock
Property-Casualty Insurers By Asset Size Group

Distribution of Common Stock By Type

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	10.4%	16.4%	58.5%	14.7%	100.0%
$10 - $50 million	6.5%	10.2%	49.5%	33.9%	100.0%
$50 - $100 million	3.0%	10.1%	42.2%	44.7%	100.0%
$100 - $250 million	4.1%	9.2%	38.0%	48.7%	100.0%
$250 - $500 million	2.4%	8.6%	38.5%	50.5%	100.0%
$500 - $1,000 million	3.3%	4.7%	43.4%	48.6%	100.0%
GT $1 billion	3.1%	6.5%	39.9%	50.6%	100.0%
Total	3.1%	6.6%	40.1%	50.1%	100.0%

Average Common Stock Issue Amount

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	60,925	68,921	65,035	324,130	66,419
$10 - $50 million	136,871	148,579	161,406	1,029,367	165,023
$50 - $100 million	455,209	354,074	389,818	1,002,069	417,665
$100 - $250 million	495,629	578,431	610,386	1,845,119	563,204
$250 - $500 million	747,057	1,207,260	944,517	4,926,826	952,833
$500 - $1,000 million	1,153,002	1,886,299	1,600,216	10,965,393	1,494,297
GT $1 billion	2,128,528	8,003,050	4,216,805	9,459,744	3,764,813

Median Number of Issues of Common Stock

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	5.0	2.0	4.0	1.0	4.0
$10 - $50 million	3.0	3.0	10.0	1.0	6.0
$50 - $100 million	3.5	3.0	13.0	1.0	8.0
$100 - $250 million	4.0	3.0	15.0	1.0	12.0
$250 - $500 million	3.0	4.0	24.5	2.0	15.0
$500 - $1,000 million	6.0	4.0	42.5	3.0	35.0
GT $1 billion	8.0	8.0	55.0	5.0	67.0

Table 8
Return on Assets For Selected Categories of Income
Property-Casualty Insurers By Asset Size Group

Range	Underwriting Income ROA	Investment Income ROA	Realized Capital Gains ROA	Other Income ROA	Net Income ROA
LT $10 million	-3.48%	4.18%	0.20%	0.45%	1.36%
$10 - $50 million	-0.96%	4.60%	0.15%	0.45%	4.24%
$50 - $100 million	-1.48%	4.81%	0.12%	0.24%	3.70%
$100 - $250 million	-2.67%	4.78%	0.28%	0.13%	2.52%
$250 - $500 million	-0.98%	4.84%	0.19%	-0.01%	4.03%
$500 - $1,000 million	-1.62%	4.93%	0.25%	-0.01%	3.56%
GT $1 billion	-2.66%	4.41%	0.22%	-0.02%	1.94%
Total	-2.36%	4.53%	0.22%	0.01%	2.39%

Range	Underwriting Income ROA	Investment Income ROA	Realized Capital Gains ROA	Other Income ROA	Net Income ROA
LT $10 million	-0.66%	4.03%	0.00%	0.00%	3.04%
$10 - $50 million	-0.50%	4.46%	0.00%	0.00%	4.08%
$50 - $100 million	-1.41%	4.87%	0.00%	0.00%	3.28%
$100 - $250 million	-1.61%	4.77%	0.08%	0.00%	3.17%
$250 - $500 million	-1.08%	4.91%	0.08%	0.00%	3.96%
$500 - $1,000 million	-1.68%	5.18%	0.12%	-0.01%	3.44%
GT $1 billion	-1.90%	4.72%	0.17%	-0.02%	2.80%
Total	-1.09%	4.52%	0.00%	0.00%	3.40%

Table 9
Standard Deviation of Return on Assets For Selected Categories of Income
Property-Casualty Insurers By Asset Size Group

Range	Underwriting Income ROA	Investment Income ROA	Realized Capital Gains ROA	Other Income ROA	Net Income ROA
LT $10 million	45.97%	2.35%	3.23%	3.68%	45.28%
$10 - $50 million	7.74%	2.07%	1.53%	1.78%	7.98%
$50 - $100 million	8.09%	1.40%	1.42%	0.86%	8.12%
$100 - $250 million	7.39%	1.48%	1.09%	1.14%	7.57%
$250 - $500 million	5.33%	1.07%	0.82%	0.98%	5.55%
$500 - $1,000 million	3.94%	0.99%	0.98%	0.45%	4.10%
GT $1 billion	6.73%	1.47%	0.77%	0.77%	6.58%
Total	26.85%	1.96%	2.13%	2.38%	26.51%

Table 10
Leverage and Return on Surplus For Selected Categories of Income
Property-Casualty Insurers By Asset Size Group

Weighted Average For Asset Size Group

Range	Leverage	Underwriting Income ROS	Investment Income ROS	Realized Capital Gains ROS	Other Income ROS	Net Income ROS	Net Income ROS
LT $10 million	1.51	-5.3%	6.3%	0.3%	0.7%	2.1%	11.40%
$10 - $50 million	2.20	-2.1%	10.1%	0.3%	1.0%	9.3%	9.62%
$50 - $100 million	2.69	-4.0%	13.0%	0.3%	0.7%	10.0%	13.26%
$100 - $250 million	2.91	-7.8%	13.9%	0.8%	0.4%	7.3%	15.22%
$250 - $500 million	3.01	-3.0%	14.6%	0.6%	0.0%	12.1%	16.49%
$500 - $1,000 million	3.15	-5.1%	15.5%	0.8%	0.0%	11.2%	15.73%
GT $1 billion	3.57	-9.5%	15.8%	0.8%	-0.1%	6.9%	25.49%

Median For Asset Size Group

Range	Leverage	Underwriting Income ROS	Investment Income ROS	Realized Capital Gains ROS	Other Income ROS	Net Income ROS	Net Income ROS
LT $10 million	1.32	-0.9%	5.7%	0.0%	0.0%	4.1%	5.99%
$10 - $50 million	2.42	-1.1%	10.2%	0.0%	0.0%	7.4%	9.42%
$50 - $100 million	2.99	-4.2%	13.7%	0.0%	0.0%	9.7%	12.87%
$100 - $250 million	3.02	-4.7%	14.6%	0.2%	0.0%	9.1%	12.37%
$250 - $500 million	3.23	-3.1%	15.9%	0.2%	0.0%	12.5%	15.80%
$500 - $1,000 million	3.42	-4.8%	17.2%	0.4%	0.0%	11.0%	16.21%
GT $1 billion	4.05	-7.6%	18.6%	0.5%	0.0%	10.9%	20.33%

Table 11
Comparison of Distribution of Major Classes of Invested Assets Between Property Casualty Insurers and Life Insurers By Asset Size Group

Weighted Average Property-Casualty Distribution of Invested Assets

Range	Bonds	Stocks	Cash/Short Term Invest	Mortgages	Other Invested Assets	Invested Assets
LT $10 million	62.8%	8.6%	26.5%	0.3%	1.8%	100.0%
$10 - $50 million	74.3%	9.6%	13.4%	0.3%	2.3%	100.0%
$50 - $100 million	78.9%	9.9%	9.6%	0.2%	1.4%	100.0%
$100 - $250 million	76.1%	14.1%	7.8%	0.3%	1.7%	100.0%
$250 - $500 million	76.5%	14.5%	7.0%	0.2%	1.7%	100.0%
$500 - $1,000 million	76.3%	15.2%	6.5%	0.3%	1.7%	100.0%
GT $1 billion	65.0%	26.8%	4.2%	0.7%	3.3%	100.0%
Total	68.5%	22.8%	5.4%	0.6%	2.8%	100.0%

Weighted Average Life Distribution of Invested Assets

Range	Bonds	Stocks	Cash/Short Term Invest	Mortgages	Other Invested Assets	Invested Assets
LT $10 million	57.5%	5.7%	29.6%	3.0%	4.2%	100.0%
$10 - $50 million	66.1%	11.3%	14.2%	3.5%	4.9%	100.0%
$50 - $100 million	71.8%	7.8%	9.5%	3.9%	7.0%	100.0%
$100 - $250 million	76.0%	8.5%	6.4%	4.1%	5.0%	100.0%
$250 - $500 million	73.2%	10.4%	4.7%	5.7%	6.0%	100.0%
$500 - $1,000 million	73.9%	8.2%	4.6%	6.3%	7.0%	100.0%
GT $1 billion	67.3%	4.9%	3.0%	14.6%	10.2%	100.0%
Total	67.8%	5.3%	3.3%	13.8%	9.8%	100.0%

Table 12
Aggregate Values and Number of Companies Reporting Stocks and Bonds
Life Insurers By Asset Size Group

Range	Total Assets in Size Group	Total Invested Assets in Size Group	Statement Value of Bonds	Statement Value of Pref'd Stock	Statement Value of Common Stock
LT $10 million	2,083,932,451	1,942,363,892	1,111,379,124	23,865,255	88,514,015
$10 - $50 million	8,167,953,504	7,489,042,068	4,956,859,903	141,878,675	709,509,281
$50 - $100 million	8,774,571,717	8,194,758,889	5,885,896,120	74,728,556	560,889,401
$100 - $250 million	23,511,728,404	21,673,942,637	16,246,761,239	396,844,108	1,440,568,422
$250 - $500 million	43,436,722,141	40,547,841,556	29,556,497,580	604,435,201	3,643,290,294
$500 - $1,000 million	64,970,809,312	61,067,946,418	44,534,163,401	662,824,808	4,354,877,793
GT $1 billion	1,477,124,447,983	1,425,474,265,968	950,493,039,145	8,316,707,079	61,222,960,200
Total	1,628,070,165,512	1,566,390,161,428	1,052,784,596,512	10,221,283,682	72,020,609,406

Range	Companies in Size Group	Companies in Size Group Reporting Bonds	Companies in Size Group Reporting Pref'd Stock	Companies in Size Group Reporting Common Stock
LT $10 million	657	463	101	211
$10 - $50 million	343	335	116	193
$50 - $100 million	122	121	52	76
$100 - $250 million	148	147	67	108
$250 - $500 million	121	120	71	99
$500 - $1,000 million	90	89	52	75
GT $1 billion	209	207	158	198
Total	1,690	1,482	617	960

Range	% of Companies Reporting Bonds	% of Companies Reporting Pref'd Stock	% of Companies Reporting Common Stock
LT $10 million	70.5%	15.4%	32.1%
$10 - $50 million	97.7%	33.8%	56.3%
$50 - $100 million	99.2%	42.6%	62.3%
$100 - $250 million	99.3%	45.3%	73.0%
$250 - $500 million	99.2%	58.7%	81.8%
$500 - $1,000 million	98.9%	57.8%	83.3%
GT $1 billion	99.0%	75.6%	94.7%
Total	87.7%	36.5%	56.8%

Table 13
Percentage of Bonds In Each Schedule D Grouping
Life Insurers By Asset Size Group

	Asset Size Group						
Schedule D Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Governments	71.2%	51.3%	37.6%	32.4%	21.9%	22.0%	14.9%
States, Territories and Possessions	2.2%	2.0%	1.5%	2.0%	1.5%	0.9%	1.4%
Political Subdivisions of States, Territories, and Possessions	2.2%	2.3%	0.6%	1.1%	1.2%	0.9%	0.4%
Special Revenue and Special Assessment Obligations	7.4%	9.2%	16.4%	13.9%	17.4%	17.1%	15.4%
Public Utilities (Unaffiliated)	5.4%	8.4%	9.8%	10.2%	11.2%	10.9%	12.2%
Industrial and Miscellaneous (Unaffiliated)	11.6%	26.5%	34.0%	40.1%	46.3%	47.7%	54.9%
Credit Tenant Loans	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	0.4%
Parents, Subsidiaries, and Affiliated Bonds	0.1%	0.3%	0.1%	0.2%	0.3%	0.4%	0.5%
Total Bonds	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 14
Median Number of Bond Issues In Each Schedule D Grouping
Life Insurers By Asset Size Group

	Asset Size Group						
Schedule D Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Governments	6.0	13.0	20.0	19.0	30.0	30.0	93.0
States, Territories and Possessions	2.0	2.0	2.0	2.0	3.0	3.0	7.0
Political Subdivisions of States, Territories, and Possessions	2.0	4.0	1.0	2.5	2.0	2.0	4.0
Special Revenue and Special Assessment Obligations	4.0	5.0	11.0	13.5	22.0	22.0	83.0
Public Utilities (Unaffiliated)	3.5	5.0	10.0	12.5	20.0	20.0	65.0
Industrial and Miscellaneous (Unaffiliated)	4.0	14.0	27.0	43.0	72.5	72.5	299.0
Credit Tenant Loans	0.0	1.0	1.0	2.0	2.0	2.0	6.0
Parents, Subsidiaries, and Affiliated Bonds	2.0	1.0	1.0	1.0	1.5	1.5	2.0
Total Bonds	10.0	39.0	79.0	105.0	176.0	176.0	647.0

Table 15
Distribution and Median Number of Issues By Type of Preferred Stock
Life Insurers By Asset Size Group

Aggregate Amount of Preferred Stock By Type

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	8,415,817	5,001,612	9,715,619	732,207	23,865,255
$10 - $50 million	51,174,294	36,179,600	49,916,734	4,608,047	141,878,675
$50 - $100 million	33,309,732	19,100,151	20,507,269	1,811,404	74,728,556
$100 - $250 million	228,246,071	55,781,087	85,294,334	27,522,616	396,844,108
$250 - $500 million	209,675,569	132,122,036	211,714,164	50,923,432	604,435,201
$500 - $1,000 million	250,899,122	136,291,049	187,340,877	88,293,760	662,824,808
GT $1 billion	2,746,865,038	1,208,931,058	3,121,332,473	1,239,578,510	8,316,707,079

Distribution By Type of Preferred Stock

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	35.3%	21.0%	40.7%	3.1%	100.0%
$10 - $50 million	36.1%	25.5%	35.2%	3.2%	100.0%
$50 - $100 million	44.6%	25.6%	27.4%	2.4%	100.0%
$100 - $250 million	57.5%	14.1%	21.5%	6.9%	100.0%
$250 - $500 million	34.7%	21.9%	35.0%	8.4%	100.0%
$500 - $1,000 million	37.9%	20.6%	28.3%	13.3%	100.0%
GT $1 billion	33.0%	14.5%	37.5%	14.9%	100.0%

Median Number of Issues of Preferred Stock

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Preferred Stock
LT $10 million	2.0	2.0	3.0	1.0	3.0
$10 - $50 million	3.0	2.0	2.0	1.0	4.0
$50 - $100 million	3.0	1.0	2.0	1.0	3.5
$100 - $250 million	6.0	2.0	3.0	1.0	5.0
$250 - $500 million	5.0	2.0	2.0	1.0	4.0
$500 - $1,000 million	3.5	1.0	4.0	1.0	5.5
GT $1 billion	8.0	3.0	3.0	1.0	10.0

Table 16
Distribution and Median Number of Issues By Type of Common Stock
Life Insurers By Asset Size Group

Aggregate Common Stock By Type and Asset Size

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	4,744,263	13,557,115	40,471,057	29,741,580	88,514,015
$10 - $50 million	16,845,499	85,279,853	143,351,378	464,032,551	709,509,281
$50 - $100 million	7,606,716	12,720,137	72,239,507	468,323,041	560,889,401
$100 - $250 million	14,445,144	102,762,330	231,746,802	1,091,614,146	1,440,568,422
$250 - $500 million	43,821,991	122,842,905	480,222,860	2,996,402,538	3,643,290,294
$500 - $1,000 million	146,211,435	98,881,770	934,665,812	3,175,118,776	4,354,877,793
GT $1 billion	895,546,383	1,615,847,639	15,469,051,594	43,242,514,584	61,222,960,200
Total	1,129,221,431	2,051,891,749	17,371,749,010	51,467,747,216	72,020,609,406

Distribution of Common Stock By Type

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	5.4%	15.3%	45.7%	33.6%	100.0%
$10 - $50 million	2.4%	12.0%	20.2%	65.4%	100.0%
$50 - $100 million	1.4%	2.3%	12.9%	83.5%	100.0%
$100 - $250 million	1.0%	7.1%	16.1%	75.8%	100.0%
$250 - $500 million	1.2%	3.4%	13.2%	82.2%	100.0%
$500 - $1,000 million	3.4%	2.3%	21.5%	72.9%	100.0%
GT $1 billion	1.5%	2.6%	25.3%	70.6%	100.0%
Total	1.6%	2.8%	24.1%	71.5%	100.0%

Median Number of Issues of Common Stock

Range	Public Utilities (Unaffiliated)	Banks, Trust and Insurance Companies (Unaffiliated)	Industrial and Miscellaneous (Unaffiliated)	Parents, Subs, and Affiliates	Total Common Stock
LT $10 million	2.0	2.0	2.0	1.0	2.0
$10 - $50 million	3.0	2.0	7.0	1.0	4.0
$50 - $100 million	5.0	3.0	4.0	1.0	3.0
$100 - $250 million	3.0	2.0	3.0	1.0	3.0
$250 - $500 million	3.0	2.0	5.5	2.0	5.0
$500 - $1,000 million	6.0	3.0	11.5	2.0	7.0
GT $1 billion	5.0	4.0	14.0	3.0	17.0

Table 17
Dollars and Distribution of Mortgages In Each Schedule B Grouping
Life Insurers By Asset Size Group

	Asset Size Group						
Schedule B Grouping	Less than $10 million	$10 - $50 million	$50 - $100 million	$100 - $250 million	$250 - $500 million	$500 - $1,000 million	More Than $1 billion
Farm - Purchase Money	140	812	0	639	67	4,991	391,115
Farm - Other	1,773	2,358	340	2,681	24,018	71,706	8,887,138
Residential - Insured	5,458	4,935	6,988	32,141	79,110	30,071	861,450
Residential - Purchase Money	2,897	11,063	18,128	1,313	631	48,434	40,786
Residential - Other	29,626	127,434	39,759	136,887	187,307	768,418	5,993,944
Commercial - Insured	1,180	20	2,411	27	2,826	98,699	534,596
Commercial - Purchase Money	5,695	10,895	7,338	22,777	38,080	68,779	4,235,284
Commercial - Other	19,434	105,183	247,804	685,561	1,971,998	2,774,557	186,961,309
Total Mortgages	66,201	262,701	322,768	882,026	2,304,037	3,865,655	207,905,623
Note: Amounts shown are in thousands of dollars ($000s)							
Farm - Purchase Money	0.2%	0.3%	0.0%	0.1%	0.0%	0.1%	0.2%
Farm - Other	2.7%	0.9%	0.1%	0.3%	1.0%	1.9%	4.3%
Residential - Insured	8.2%	1.9%	2.2%	3.6%	3.4%	0.8%	0.4%
Residential - Purchase Money	4.4%	4.2%	5.6%	0.1%	0.0%	1.3%	0.0%
Residential - Other	44.8%	48.5%	12.3%	15.5%	8.1%	19.9%	2.9%
Commercial - Insured	1.8%	0.0%	0.7%	0.0%	0.1%	2.6%	0.3%
Commercial - Purchase Money	8.6%	4.1%	2.3%	2.6%	1.7%	1.8%	2.0%
Commercial - Other	29.4%	40.0%	76.8%	77.7%	85.6%	71.8%	89.9%
Total Mortgages	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Number of Companies with:							
<10 Mortgages	66	63	27	22	16	10	12
10-50 Mortgages	27	32	20	18	19	23	29
51-100 Mortgages	5	8	7	7	19	14	16
101-1,000 Mortgages	2	11	8	22	25	14	103
1,000+ Mortgages	0	0	0	0	1	3	30
Median Number of Mortgages	4.0	6.0	15.5	34.0	67.5	46.5	234.0

Table 18
Leverage and Return on Surplus For Selected Income Categories
Life Insurers By Asset Size Group

Weighted Average For Asset Size Group

Range	Investment Income ROA	Other Income ROA	Net Income ROA	Leverage	Investment Income ROS	Other Income ROS	Net Income ROS
LT $10 million	9.61%	-5.56%	4.04%	1.64	15.79%	-9.15%	6.65%
$10 - $50 million	5.29%	-2.71%	2.58%	2.52	13.36%	-6.84%	6.51%
$50 - $100 million	6.37%	-3.79%	2.58%	3.28	20.88%	-12.43%	8.45%
$100 - $250 million	6.49%	-4.45%	2.04%	4.42	28.72%	-19.69%	9.03%
$250 - $500 million	6.98%	-4.70%	2.28%	4.97	34.65%	-23.33%	11.31%
$500 - $1,000 million	6.42%	-4.83%	1.60%	5.36	34.43%	-25.87%	8.56%
GT $1 billion	6.92%	-6.27%	0.65%	10.98	75.98%	-68.84%	7.14%

Median For Asset Size Group

Range	Investment Income ROA	Other Income ROA	Net Income ROA	Leverage	Investment Income ROS	Other Income ROS	Net Income ROS
LT $10 million	4.23%	-1.14%	3.30%	1.41	6.12%	-1.53%	5.03%
$10 - $50 million	5.27%	-2.57%	2.56%	2.74	14.58%	-6.49%	6.96%
$50 - $100 million	6.25%	-4.10%	1.92%	4.28	27.09%	-18.12%	8.40%
$100 - $250 million	6.12%	-4.84%	1.05%	6.08	36.74%	-30.59%	7.88%
$250 - $500 million	6.77%	-5.35%	1.27%	6.96	48.92%	-38.49%	9.06%
$500 - $1,000 million	6.76%	-5.55%	0.95%	8.11	51.61%	-47.63%	9.14%
GT $1 billion	6.99%	-6.29%	0.77%	11.51	79.58%	-72.26%	8.50%