Title: INTERACTION OF TOTAL RETURN PRICING AND ASSET MANAGEMENT IN A PROPERTY/CASUALTY COMPANY

Author: Owen M. Gleeson

Biography: Currently Assistant Vice President and Actuary at General Reinsurance Corporation; previously employed at USFG Corporation in a variety of capacities including Actuary in Corporate Actuarial Department and Vice President -- Financial Planning. Member of the Casualty Actuarial Society (ACAS-1975; FCAS-1978) and American Academy of Actuaries (1978). Education: BA, MS and PhD in Mathematics - St. Louis University.

Abstract: This paper proposes to show that it is not possible for a property-casualty company to price on a total return basis and achieve the targeted return without the aid of a detailed flow of funds statement. It is demonstrated that, for a company to achieve a targeted total rate of return, it is imperative that a company position itself so that funds can be invested at the assumed rate. As part of the demonstration an example of a hypothetical company is presented and the flow of funds constructed and analyzed. Projections of proforma statements of sources and uses of funds are employed to show that a company so situated must pay for "old losses" with "new money." Data is presented suggesting that many companies in the industry are positioned in a similar fashion. The cause of the problem is identified and a tentative solution offered. Additional data is compiled from Annual Statements of a sample of companies indicating that assets maturing in a given year are insufficient to meet current payments on losses incurred in prior years. Finally, solutions to some of the problems in the area of planning and forecasting are suggested.

1. Introduction

Changes in the economic structure of the United States over the past two decades have had significant impact on all segments of the financial services industry. Some segments have been quicker to react than others and, even within a given segment, such as the property - casualty insurance business, the response to the changing conditions has shown a wide variation.

In order to operate in an environment characterized by sharp changes it is necessary that the management of an enterprise be able to react to the unpredictable events. One such event is the sharp fluctuations in investment rates. Effective response to any one of a range of events requires a degree of sophistication in planning that is unprecedented in the industry. Of course part of the planning process is the objective analysis of the current financial condition of the company and the identification of the opportunities and constraints.

The intention of this note is to examine the problems that can occur in the situation in which interest rates move up for a number of years and in which the maturity of assets significantly exceeds the maturity of liabilities. Foremost among the problems is the lack of flexibility to respond to changes, and in particular the difficulty in implementing a strategy of pricing on a total return basis. It will be seen that a program such as this can only be effectively carried out when the planning process involves the functions of pricing, planning and investment. In addition to the discipline and coordination that is required it is also necessary that the proper tools be available to analyze the current situation and to

control the process of implementing the operational plan. The tool that will be examined here is the Statement of Sources and Uses of Funds both on actual and proforma bases.

It is conventional to construct Statements of Sources and Uses of Funds by starting with accounting statements, the income statements and the balance sheet, and construct the flow of funds statement through a series of adjustments. This can be a cumbersome process and will not be employed in this presentation. In the highly simplified example that follows, it is very easy to calculate the inflow and outflow of funds directly and for this reason the exposition will dispense with the distracting intermediate steps.

The example constructed here hypothesizes a highly idealized economic scenario rather than drawing on past data. Motivation for this approach stems from a desire to focus on the structure of the situation and to keep details simple enough so that the reader does not become bogged down in nuances that are beside the point. It will also obviate the need for parenthetical explanations of random and nonrandom deviations from the norms in actual economic events.

Of course no business operates in the world of contrived examples but rather in world in which deviations from the expected are to the anticipated. Therefore at the conclusion of this paper some space will be devoted to examination of the range of results that might obtain and in particular, how the actuary can play a significant role in quantifying risks associated with given strategies.

In spite of the fact that the following analysis focuses on a situation in which a company is using total return pricing in determining strategy, this focus should not be construed as necessarily

recommending this methodology. Nor should the problems that will be brought to light be interpreted as arguments against the use of this technique. Approaches to the conduct of the business of a given company will depend upon its situation and circumstances as well as the attitude of management towards required results.

2. Financial Profile of Hypothetical Company

As indicated in the introduction, the example which will be constructed will be very simple so that the model does not become enmeshed in unnecessary detail.

A. History of Premiums and Losses

Year	Written Premiums	Earned(1) Premiums	Incurred Losses(2)
1980	140,000		
1981	150,000	145,000	116,000
1982	160,000	155,000	124,000
1983	170,000	165,000	132,000
1984	180,000	175,000	140,000

(1) Earned Premiums = (1/2)(Prior year's written premiums) + (1/2)(Current year's written premiums).

(2) The ratio for losses and loss adjustment expense is assumed to be 80% in each year.

B. Assumptions

1. Payout on Incurred Losses

The payout rate on accident year losses is given by the schedule:

Calendar Year	Percent
Current	40%
1st Following	30%
2nd Following	15%
3rd Following	10%
4th Following	5%

2. Expense Components

Category	Percent
Commission	15%
Premium Tax	3%
General Expense	8%

3. Agent's Balances

The assumption made here is that there is a delay of about 36 days i.e., 1/10 of a year in the remittance of premiums by agents to the company.

4. Dividends

The companys anticipates paying dividends to stockholders in the amount of $5,000 during 1985.

C. Balance Sheet

To the history and assumptions above is appended the additional supposition that the ratio of premium to surplus at year end 1984 is 3 to 1. The following simplified balance sheet results.

Balance Sheet

Assets		Liabilities	
Bonds	$282,700	Loss Reserves	$148,000(2)
Agents Balances	15,300(1)	Unearned Premium	90,000(3)
	$298,000	Surplus	60,000
			$298,000

(1) $15,300 = (1/10)(1 - .15)(180,000)$

(2) $148,000 = (.60)(140,000)+(.30)(132,000)+(.15)(124,000)+(.05)(116,000)$

(3) $90,000 = \frac{1}{2}(180,000)$

D. Asset Maturity Schedule

The following maturity schedule has not been constructed in a way that is intended to mirror a profile of the industry or any company within the industry. Varying levels of cash flow, widely fluctuating interest rates and other economic events over the recent past have been such that the yield by duration of an actual company would not show the smoothness of progression presented in the example. The only aspect of the maturity schedule which is similar to that of the industry is that the average maturity of the assets is greater than the average maturity of liabilities.

Year	Amount	Yield Rate	Yield
1985	28,270	.0533	1,507
1986	28,270	.0667	1,886
1987	28,270	.0711	2,010
1988	28,270	.0733	2,072
1989	28,270	.0747	2,112
1990	28,270	.0756	2,137
1991	28,270	.0762	2,154
1992	28,270	.0767	2,168
1993	28,270	.0770	2,177
1994	28,270	.0773	2,185
	282,700		20,408

The invested assets are assumed to be bonds and it is further assumed that the bonds are carried at par value. As a result if the company chooses to liquidate the bonds in a period of high interest rates it will suffer an accounting loss and a decrement to its statutory surplus.

3. Planning in a Vacuum

Now suppose that the company embarks on its planning process for the upcoming year (1985) and finds that the current and projected rates for year range from 8 to 12 percent depending upon maturity of the assets. Its targeted return on equity is 15%. Another factor entering into the analysis are that the company wishes to continue to write at approximately a 3:1 ratio. The company does not feel constrained to selecting early maturities and hence assumes that funds can be invested at the maximum rate of 12%. It has adopted a philosophy of total return pricing and so seeks the loss

ratio that will result in the 15% return on equity. The analysis that follows is, by itself, neither unusual nor unreasonable.

Losses will be paid out as indicated in Section 2 and the funds invested at 12% so that the discount factor is .8414. This naturally is obtained as: $(.40)/(1.12)^{\frac{1}{2}} + (.30)/(1.12)^{3/2} + (.15)/(1.12)^{5/2} + (.10)/(1.12)^{7/2} + (.05)/(1.12)^{9/2} = .8414$

The ratio of premiums to surplus for the company is 3 to 1 so that the profit as related to surplus is 3 times that of the profit margin in each dollar of premium. In addition to the income from premiums, the company is earning investment income on the assets equal to the surplus. The rate of return on these assets will be assumed to be the same as that of the portfolio as a whole. Therefore, the target loss ratio is the solution to the equation [1-(.8414 X LR + .26)] X 3 + .0722 = .15 and is 84.87% which will be rounded to 85%. At this point, it will be assumed that the company is satisfied with a target combined of 111% which will produce an economic return on equity of 15% although both statutory accounting and GAAP results will be poorer than this due to the lag in the earning of investment income and that fact that loss reserves are not discounted.

The question that will now be investigated is whether this target can be achieved given the constraints and financial condition of the company. To answer this it is necessary to turn to a proforma statement of sources and applications of funds for the year 1985.

4. Sources and Applications of Funds

With the exception of newly formed companies, each property-casualty company is, to a certain extent, constrained by the past

in its ability to react to new situations. The most significant constraints in the context of the problem under discussion is the requirement to pay losses in the current and future years which are the result of coverages issued in past years and the results of the investment policies of those years. Because of this it is necessary to start with a study of the application of funds. It is assumed that the company writes premiums in the amount of 190,000 in 1985 so that the earned premium figure is 185,000. The incurred losses for 1985 will be $(\frac{1}{2})(180,000)(.80) + (\frac{1}{2})(190,000)(.85) = 152,750$. Application of funds is calculated as follows:

Paid Losses	141,100 (1)
Paid Expenses	20,900 (2)
Dividends	5,000
	167,000

(1) $141,100 = (.40)(152,750) + (.30)(140,000) + (.15)(132,000) + (.10)(124,000) + (.05)(116,000)$

(2) $20,900 = (.11)(190,000)$

Note that commissions are not included in paid expenses but that this will not cause a problem in that the inflow of paid premium will be net of commissions.

Sources of funds include not only those from continuing operations but also from maturing assets. These will be projected separately then totaled.

Inflow from Operations:		
Paid Premiums	$160,650	(1)
Investment Income	22,309	(2)
	$182,959	

(1) $160,650 = 15,300 + (9/10)(.85)(190,000)

(2) $22,309 = 20,408 - (1/2)(.0533)(28,270) + (1/2)(.12)(28,270) + 1/2(15,959)(.12)$

When funds from maturing assets are added to the inflow/outflow difference the total funds available for investment at 12% amounts to 44,229 = 182,959 - 167,000 + 28,270. It is assumed here that the company will not liquidate bonds maturing in 1986 and following because of the fact that they were purchased in a time when interest rates were lower than the current level and hence sale at market would cause a decrement to surplus.

It can now be seen that, given this last listed constraint and the prior history of the company, it is not possible to implement the strategy of writing at a combined ratio of 111% and obtaining at 15% return on equity. The reason for this of course is that for the strategy to be successful an amount equal to the losses incurred on the premiums written in 1985 must be invested at the new money rate of 12% as indicated in Section 3. But this amount is 157,250 and the funds available for investment at 12% total only 44,229 for a shortfall of 113,021.

An estimate of the difference between statement and market value is developed in Appendix A. This Appendix also presents some evidence of the magnitude of the decline in bond prices over the last 25 years and the industry condition with respect to differ-

ence in the market/statement values of bonds.

Appendix B is devoted to the study of a sample of property-casualty companies with a view towards determining the relation between maturing assets and demands on funds resulting from prior commitments.

5. Analysis of Achieved Results

The funds assigned to the 1985 losses can be segregated into two portions, first the funds newly invested at 12% and secondly funds from the incoming portfolio. As an expedient it will be assumed that the rate on the required additional funds will be that of the average of the portfolio, that is 7.43% = (20,408 - 1,507)/(282,700 - 28,270). This gives a weighted rate of the portfolio supporting the losses incurred in 1985 of approximately 8.71% where [(44,229)(.12) + (.0743)(113,021)]/157,250 = 8.71%.

The discount factor using this rate of return is .879 so that the return on premiums written during 1985 is actually 1 - [(.879)(.85) + .26] = 1 - 1.0072 = -.0072, that is a slight loss rather than the anticipated gain. This results in a return on equity of approximately 5.1% rather than the originally targeted 15%.

The company would not only fail to achieve the targeted rate of return on equity but may not even obtain a sufficient addition to surplus to maintain a 3 to 1 ratio. In this example the harm is not great as shown in the following analysis.

Surplus (12/31/84):	60,000
Income Statement	
Earned Premiums	185,000
Incurred Losses	152,750
Expenses	49,400
Underwriting Gain	-17,150
Investment Income	22,309
Net Income	5,159
Dividends	5,000
Surplus (12/31/85)	60,159

Premium to Surplus Ratio = 190,000/60,159 = 3.158

Although the company only increases its premium to surplus ratio slightly and no real problem is generated, it would be easy to construct a situation in which the resulting decline in surplus came as a great shock to the company and caused real difficulties. Unpleasant surprises should not befall companies with access to a reasonably accurate financial planning model -- other than those resulting from overly optimistic assumptions.

6. Solutions

There are many actions that a company might take in the effort to avoid the pitfalls demonstrated in the previous example. Only two will be suggested here -- one dealing with revision of asset management and the other dealing with a more effective use of a sources and applications of funds statement.

The problem presented here resulted from a mismatch of liabilities and assets combined with a shift to higher rates. Volatility of interest rates has now become a fact of life and it is incumbent on

those charged with the successful conduct of the affairs of a company to recognize the need to accomodate this aspect of the economic environment in the planning. In order to respond to challenges and changes a company must maintain a significant degree of flexibility and this includes flexibility in the assets that it manages. It is tempting to reach for the last few basis points by going further out on the yield curve but, as can be seen from this example, this causes a loss of ability to respond to changing conditions and to take advantage of new opportunities.

One observation that should be made is that, all things being equal, newly capitalized companies have an advantage over older companies with ill-positioned assets. The latter are forced to make the choice between, on the one hand, realizing losses by selling assets resulting in a weakening of the statutory balance sheet and, on the other hand, paying for "old losses" with "new money." This situation will allow the new companies to be more competitive and still receive an acceptable economic return. However, in the case where the older companies have followed a program of matching assets and liabilities this threat should not be a concern.

Another action that the company in this example might have taken centers on the use of a more realistic interest rate. In this situation the company was positioned in such a way that it could not invest the new money fully at the 12% rate. The analysis indicated that rate available for the assets to be matched with the losses incurred in 1985 was 8.71%. This information could be used as input into the pricing policy to determine that target loss ratio. As seen previously the discount factor was .879 so that the target

loss ratio could be determined from the equation

$$[1 - (.879 \times LR + .26)] \times 3 + .0722 = .15$$

The solution is LR = .812 which is rounded to 81% with a combined ratio of 107%.

7. The Actuary's Role

Important items of the analysis is the example include the level of loss reserves and the payout on losses. Both of these have been used without reference to the variation experienced in each. The actuary is particularly well suited to provide management with estimates of the variation in these elements and thereby play a vital role in analyzing the current position of the company, its constaints and its range of opportunities.

Pricing also is substantially within the purview of the actuary and when a company prices on the base of total return it is absolutely essential that the company have not only a good estimate of the ultimate cost but also reasonably accurate projections of the cash flows associated with premiums, losses, expenses and investment income. For many actuaries this is already part and parcel of their work and for others an extension of their current functions.

These are but two of the obvious applications of the actuary's expertise in the areas of implementing the use of proforma sources and application of funds statements and total return pricing. In addition the actuary is particularly well suited to the assessment of risk associated with various strategies and to the application of optimization techniques to determine the best strategies.

8. Summary and Conclusion

The example presented in this paper has been shown to be representative of many companies in the insurance industry -- at least in the aspect of the mismatch between liabilities and assets. Difficulties of planning and strategy determination have been explored with particular reference to total return pricing. It has been shown that, to put it very simply, a company cannot fully take advantage of high interest rates and apply these to its pricing if the funds generated cannot be entirely invested at the prevailing rates. Better analysis and planning can be achieved through the use of proforma statements of the source and application of funds.

In a rapidly changing environment a company needs to remain flexible. Deployment of assets in such a way that reduces the range of use of these assets can be detrimental to a company. In particular the purchase of bonds with extremely distant maturities in order to take advantage of the additional yield commits a company to holding these securities to maturity in the event that interest rates rise and under the circumstances where a company cannot afford the reduction in stated worth resulting from sale. This limited study would suggest that companies should invest in bonds with shorter maturities. It is still an open question as to whether pure asset/liability matching is necessary.

There are many who feel that the long uptrend in interest rates is in the process of being reversed. This does not mean that the concepts explored in this paper will not apply in this event. A substantial portion of the bonds owned by property casualty insurance companies were purchased at a time when rates were extremely low

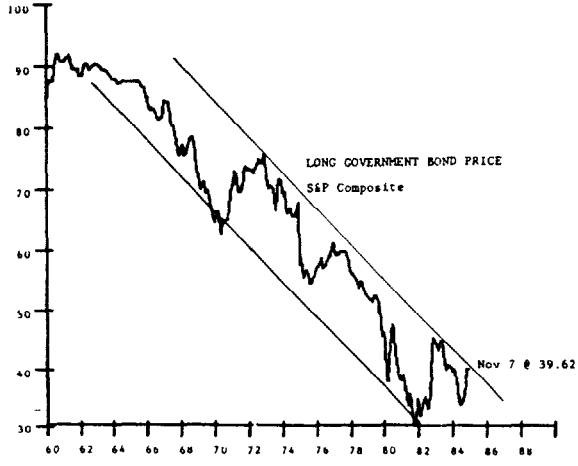
by today's standards. A cessation of increase in interest rates will not provide an immediate solution to the problem of bonds with statement values in excess of market values. Nor will a small decrease in the level of interest rates. Therefore, if companies are constrained not to sell bonds at a loss because of the resulting capacity problem, they should find proforma statements of sources and applications of funds of vital use in planning -- at least for the next few years.

Finally, it should be clear that the planning, pricing and investment functions cannot operate independently in the current environment if a company hopes to achieve satisfactory results. A process of coordination and control must be introduced that brings together the different skills so that the parties involved not only have a thorough understanding of the impact of their actions on the company but also so that they work together towards objectives which are mutually consistent.

Appendix A - Book/Market Differential in Bond Holdings

The company is holding a portfolio of bonds on which the coupon yield is less than that currently available according to the hypothesized economic scenario. The long general decline in the bond market over the past 25 years resulting from the increase in interest rates is well known and graphically illustrated in Figure 1.

Figure 1



This coupled with the industry practice of investing long although the liabilities are fairly short has led to a condition in the industry where the market values of bonds are substantially below the statement value. For a number of years First Boston Corporation has issued a study on this important aspect of property casualty insurers' financial condition. Part of the 1984 study which exemplifies the magnitude of the problem is reproduced on the following page.

Table 1

Property-Casualty Insurance Operations
Statutory Surplus Adjusted For Unrealized Bond Losses
The Relationship of Writings to Surplus, 12/31/83
($ in millions)

	1983 Premiums Written (1)	12/31/83 Statutory Surplus (2)	Property-Casualty Bond Portfolio 12/31/83 Book (3)	Market (4)	Unrealized Losses (5)	12/31/83 "Adjusted" Surplus (Column 2 Less 72% of Col. 5) (6)	Premiums Written to Policyholders' Surplus (Column 1 Div. by Col. 2) (7)	(Column 1 Div. by Col. 6) (8)
Aetna Life & Casualty	$ 4,416	$1,645	$6,158	$4,985	$1,173	$800	2.7x	5.5x
Chubb	1,241	401	1,376	1,211	165	282	3.1	4.4
CIGNA	3,535	1,314	5,161	4,333	828	718	2.7	4.9
Continental	2,401	936	3,311	2,841	470	598	2.6	4.0
General Re	902	836	2,462	2,180	282	633	1.1	1.4
Kemper	858	354	853	718	135	257	2.4	3.3
Ohio Casualty	843	426	994	793	201	281	2.0	3.0
Progressive	245	95	234	232	2	93	2.6	2.6
SAFECO	888	494	928	916	12	485	1.8	1.8
St. Paul	1,744	783	2,785	2,457	328	547	2.2	3.2
Travelers	2,945	1,057	4,708	3,587	1,121	250	2.8	11.8
USF&G	1,989	779	2,151	1,993	158	665	2.6	3.0
Total	$22,007	$9,117				$5,608		
Weighted Average							2.4x	3.9x

Source: The First Boston Corporation

It has been asserted earlier that the hypothetical company would suffer a decrement to surplus if forced to sell bonds. As is the case with other sections of this highly idealized situation, determination of the amount will depend on assumptions and methods which greatly simplify the situation. However, the results are acceptably accurate for the purposes of example and planning. The redemption value of the bond and the statement value are assumed to be equal with the statement value having been given earlier in the Asset Maturity Schedule. Yields also have been given so that all that is needed for a rough estimate of the market value of the bonds is the currently prevailing interest rates by maturity. The data is given on the following page.

Years to Maturity	Redemption Value	Yield	Current Rate
1	28,270	1,507	8.00%
2	28,270	1,886	10.00%
3	28,270	2,010	10.67%
4	28,270	2,072	11.00%
5	28,270	2,112	11.20%
6	28,270	2,137	11.33%
7	28,270	2,154	11.43%
8	28,270	2,168	11.50%
9	28,270	2,177	11.56%
10	28,270	2,185	11.60%

The method used here to estimate the market value of the bonds is the yield-to-maturity method. Then the present value of the bond -- all things being equal -- is given by the formula,

Present Value = (Redemption Value)/$(1 + r)^n$ + (Annual Yield) $a_{\overline{n}|r}$

where r is the yield to maturity, n represents the number of years to maturity and the coupons are assumed to be paid annually. For example, the bonds maturing in 5 years have a present value of $(28,270)/(1.112)^5 + (2,112)\ a_{\overline{5}|.1112}$ which equals 16,626 + 7,767 = 24,393 so that sale of the bonds would result in a decrease in surplus of $3,877. The results of this method of estimating the market value of the bonds versus the statement value of the bonds is given on the following page.

Year of Maturity	Statement Value	Market Value	Discount
1985	28,270	27,571	699
1986	28,270	26,637	1,633
1987	28,270	25,796	2,474
1988	28,270	25,051	3,219
1989	28,270	24,393	3,877
1990	28,270	23,803	4,467
1991	28,270	23,264	5,006
1992	28,270	22,794	5,476
1993	28,270	22,358	5,912
1994	28,270	21,984	6,286
	282,700	243,651	39,049

The stated surplus of the company under study is 60,000 with premiums writings of 180,000 for a 3 to 1 ratio. If the surplus is adjusted to reflect market value of bonds, the adjusted surplus is 20,951 with a resultant ratio of approximately 8.59 to 1.

This ratio is considerably higher than most of the ratios in Column (8) of the table reproduced from the study conducted by David Seifer. The difference is due in part to methodology. The reader should note that the "Adjusted Surplus" in the study is obtained by subtracting 72% of the unrealized bond losses from the stated surplus thereby reflecting the potential impact of capital gains tax. If the unrealized losses had not been reduced by 28% the ratios of premiums to adjusted surplus would have been substantially higher with the weighted average rising to 5.2 from 3.9 as calculated in the table.

Use of yield to maturity has some drawbacks that have been covered in the book "Inside the Yield Book" by Sidney Homer and Martin Leibowitz. However, the technique produces a useful approximation which can be of great value in assessing the projected condition of a company under a variety of scenarios associated with a range of economic events and strategies.

Appendix B - Maturing Assets versus Paid Losses from Prior Years: An Industry Sample

The example constructed in this paper presents a picture of a company with maturing assets far lower than those needed to meet the obligations of the past. Specifically, the losses from 1984 and prior that are projected to be paid in 1985 amount to 80,000 while the maturing assets show only 28,270. This results in a ratio of paid losses from prior years to funds from maturing assets of about 2.8 to 1.

The reader might ask whether this is a strawman or whether this is somehow representative of industry conditions. Some data has been drawn from the Annual Statements of eight companies to examine this question. The companies were selected randomly and include not only stock and mutual companies but companies of varying size. Column (1) is the amount of losses and loss adjustment expense paid in 1983 from accident years 1982 and prior. The figures were compiled using Schedules O and P from the 1982 and 1983 Annual Statements. Column (2) is the amount of funds available to the companies from assets held at year end 1982 and maturing in 1983. The data was obtained using Schedule D-Part 1A and Lines 6.1 and 6.2 of Page 2(Assets) -- Cash and Short-term Investments, respectively.

Company	(1) Paid in 1983 * on 1982 and prior	(2) Assets Maturing* in 1983	(3) (1)/(2)	(4) (2)/(1)
A	1,024,315	239,396	4.28	.234
B	672,908	246,958	2.73	.367
C	644,214	210,042	3.07	.326
D	409,654	120,245	3.41	.294
E	348,573	44,276	7.87	.127
F	210,204	28,003	7.51	.133
G	10,410	3,027	3.44	.291
H	3,522	3,250	1.08	.923
	3,323,800	895,197	3.71	.269(w)
			4.17	.240(u)

*Figures in thousands
(w) - weighted
(u) - unweighted

This exhibit is certainly not to be construed as representing an exhaustive study of industry conditions but rather to show that the hypothetical example is not totally at odds with prevailing conditions. As a matter of fact, if the exhibit is truly representative, then the hypothetical company is in somewhat better shape -- at least in terms of the ability to pay for old losses with maturing assets.

One interpretation of Column (4) is that the sample companies are only able to cover about 27% of obligations from prior years through use of maturing assets. This means that 73% of the obligations coming due must be met through the use of new funds. The figures for the hypothetical company are 35% and 65% respectively.