

**INSURER MODELS: A SAMPLE
(SEMINAR ON PROFITABILITY, 4/91)**

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Insurer Models: a Sample

The Fireman's Fund Approach

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- **Integrated method of Fireman's Fund**
 - ⇒ Key concern is treatment of risk
 - ⇒ Ratemaking and Valuation must be consistent
 - ⇒ Capital requirements based on risk of balance-sheet items
 - ⇒ Price depends on risk (loss discounted at risk-adjusted yield)
 - ⇒ Balance sheet valuation depends on price (economic value of losses)

- **Exhibit 1: How the risk adjustment works**
 - ⇒ Shows relationship between balance sheet values and price
 - ⇒ Asset return equals weighted average return of equity and reserves

- **Economic value accounting**
 - ⇒ Balance sheet items are valued at their worth in a market exchange
 - ⇒ Assets valued at market
 - ⇒ Liabilities (reserves) discounted to market (present) value
 - ⇒ Reserve value includes price of risk
 - ⇒ Consistency requires capital value = $MV(\text{assets}) - MV(\text{liabilities})$
 - ⇒ Statutory surplus irrelevant?

- **Exhibit 2: Separation of investment and insurance operations**
 - ⇒ Capital requirements for assets & reserves
 - ⇒ Investment operation acts as a bank
 - ⇒ Insurance operation gets riskless yield on its cash
 - ⇒ No further need to consider asset risk in pricing

- **Key assumptions of pricing model**
 - ⇒ Riskless yield (duration-matched Treasury notes)
 - ⇒ Risk adjustment (derived from historical data)
 - ⇒ Income taxes built into pretax risk adjustment
 - ⇒ Projected cash flows by product line

- **Exhibit 3: Pricing model applied to a typical product line**
 - ➔ Illustrative example using hypothetical values
 - ➔ Risk varies by reserve category (UPR, IBNR, Case)
 - ➔ Target combined ratio (Page 1) uses appropriate risk adjustment
 - ➔ Breakeven combined ratio (Page 2) uses zero risk adjustment

- **Exhibit 4: Return on equity for a profit center**
 - ➔ Implementation of integrated pricing, valuation and profit measurement system
 - ➔ Target accident-year combined ratio is output of pricing model
 - ➔ "Breakeven" combined ratio also computed
 - ➔ Actual rate of return in profit center derived from these ("boxed" area in Exhibit)
 - ➔ No need for balance sheet at profit center level

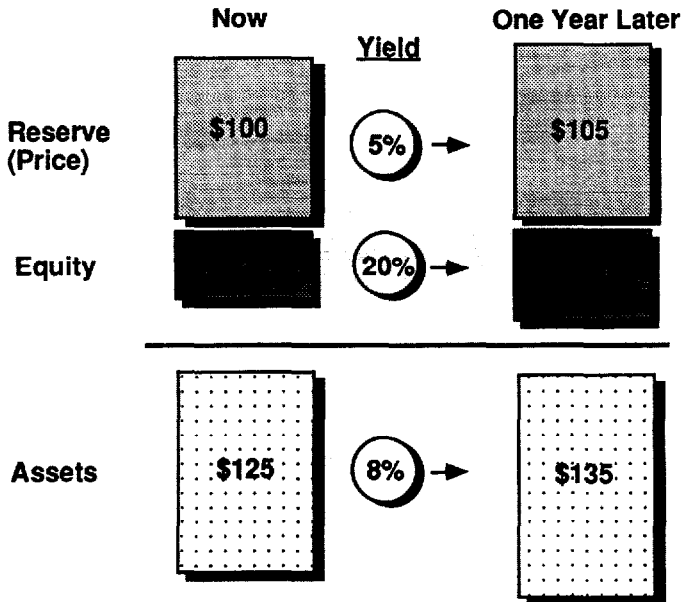
- **Extensions of pricing model**
 - ➔ Risk adjustment variation by line (Surety, Earthquake)
 - ➔ Credit risk (negative risk adjustment)
 - ➔ Ceded reinsurance
 - ➔ Servicing carrier & involuntary insurance

- **Practical problems with model & applications**
 - ➔ Explaining method & concepts to users (in-house & regulators)
 - ➔ Fixing the riskless yield in advance of plans
 - ➔ Relying on underwriting areas to furnish cash flow data
 - ➔ Not all cash data are available or easy to analyze
 - ➔ Indicated rate may not "sell" (may be suboptimal)

HOW THE RISK ADJUSTMENT WORKS: A NUMERICAL EXAMPLE

Required Equity	25% of Discounted Reserves
Required Return on Equity	20% Pretax
Yield Rate	8% Riskless
Paid Loss	\$105 Paid One Year Later

What Price (Discounted Loss) Matches These Assumptions?



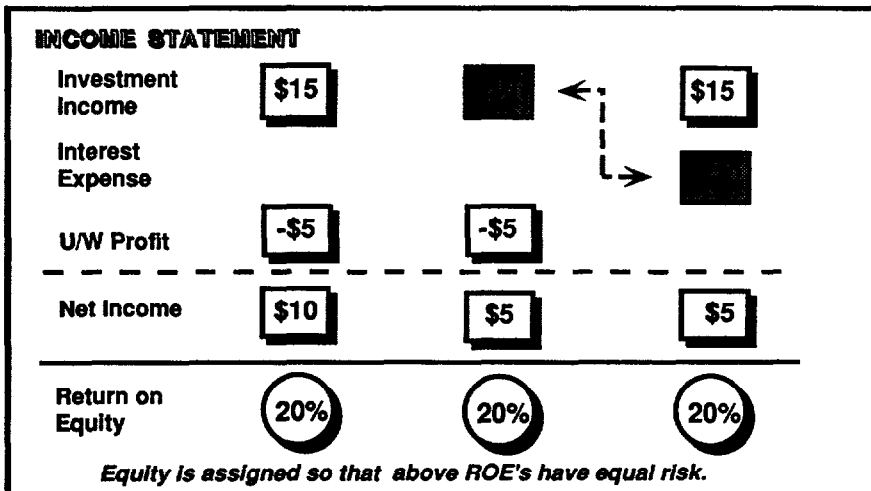
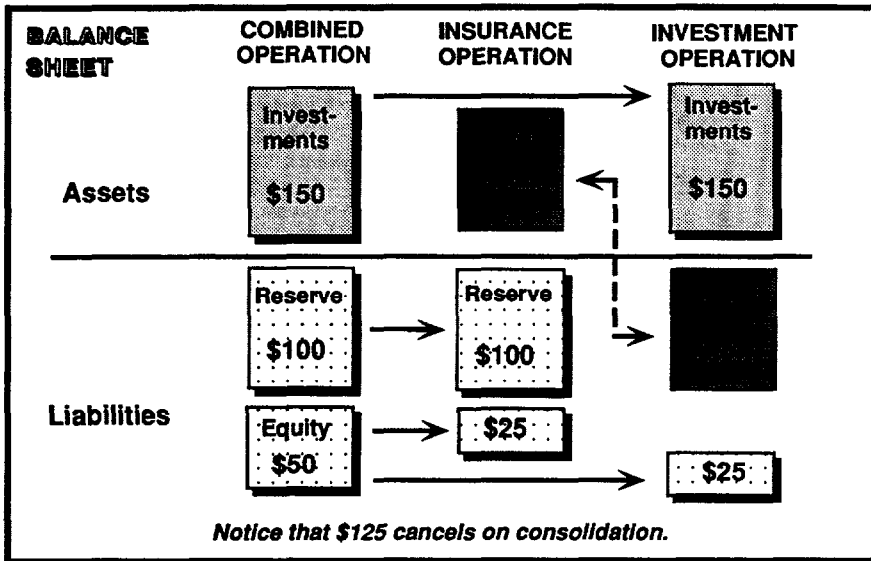
Yield Rate Relationship: $8\% = [5\% (100) + 20\% (25)] / 125$

Risk Adjustment = Profit Provision = $(8\% - 5\%) = 3\%$

Formula is $3\% = .25 (20\% - 8\%)$

Separation of Investment and Insurance Operations

Required Return on Equity	20%	Pretax
Asset Yield	10%	Risky
Riskless Yield Rate	8%	
Loss	\$105	Paid One Year Later



**Typical Product Line
Total Profit Concept
Target Calculation Summary**

<i>Generic Inputs</i>						
Riskless Yield	8.00%			Equity Weights by Reserve Category		
Base Risk Adjustment	5.00%			UEPR	1.30	
				IBNR	1.10	
				Case	0.60	
Line Specific Inputs						
	% of Premium	Duration in Years	Risk Adjustment	Risk Adjusted Yield	Present Value Amount	Benefit From Present Value
Premium	100.00	0.45	0.00%	8.00%	96.58	-3.42
Underwriting Costs						
Loss & LAE	67.88	3.45	5.06%	2.94%	61.42	6.46
Commissions	18.30	0.48	0.00%	8.00%	17.63	0.67
Internal Expense	15.62	0.37	0.00%	8.00%	15.18	0.44
TL&F	2.40	0.75	0.00%	8.00%	2.27	0.13
Dividends	0.10	1.89	0.00%	8.00%	0.09	0.01
Total	104.30				96.58	7.72
Underwriting Profit	-4.30				0.00	-4.30

**Typical Product Line
Total Profit Concept**

Breakeven Calculation Summary

	% of Premium	Duration in Years	Risk Adjust- ment	Risk Adjusted Yield	Present Value Amount	Benefit From Present Value
Premium	100.00	0.45	0.00%	8.00%	96.58	-3.42
Underwriting Costs						
Loss & LAE	75.23	2.99	0.00%	8.00%	59.77	15.45
Commissions	18.30	0.48	0.00%	8.00%	17.63	0.67
Internal Expense	17.32	0.37	0.00%	8.00%	16.83	0.49
TL&F	2.40	0.75	0.00%	8.00%	2.27	0.13
Dividends	0.10	1.88	0.00%	8.00%	0.09	0.01
Total	113.34				96.58	16.76
Underwriting Profit	-13.34				0.00	-13.34

**PROFIT CENTER REPORTING
INCOME STATEMENT
(IN PENNIES)**

LINE: ACTUARIAL PRODUCT LIABILITY

**YEAR-TO-DATE
* DECEMBER 1990 ***

	ACTUAL		PLAN		PRIOR YEAR	
	\$ AMOUNT	% GROWTH	\$ AMOUNT	% GROWTH	\$ AMOUNT	% GROWTH
PREMIUMS						
1 GROSS PREMIUM WRITTEN	380,210	5.2	361,026	(0.1)	361,381	16.1
2 NET PREMIUM WRITTEN	380,072	5.2	361,074	0.0	361,115	15.8
3 NET PREMIUM EARNED	368,893	5.8	353,070	1.3	348,561	14.6
	\$ AMOUNT	% PREMIUM	\$ AMOUNT	% PREMIUM	\$ AMOUNT	% PREMIUM
EXTERNAL EXPENSES						
4 COMMISSIONS	30,481	8.3	27,882	7.9	29,962	8.6
5 TAXES, LICENSES AND FEES	14,317	3.9	12,356	3.5	14,619	4.2
6 DIVIDENDS	23,294	6.3	19,772	5.6	21,316	6.1
7 INVOL BUSINESS CHARGE	13,206	3.6	12,535	3.6	13,564	3.9
8 TOT AY EXTERNAL EXPENSES	81,297	22.0	72,546	20.5	79,461	22.8
CLAIMS & RELATED EXPENSES						
9 AY NON-CAT LOSSES	276,720	75.0	269,282	76.3	257,276	73.8
10 AY NON-CAT LOSS EXPENSES	44,149	12.0	39,544	11.2	40,416	11.6
11 CATASTROPHE LOSS CHARGE		0.0		0.0		0.0
12 TOT AY CLAIMS & RELATED EXP	320,869	87.0	38,826	87.5	297,691	85.4
INTERNAL EXPENSES						
13 PROFIT CENTER EXPENSES	39,287	10.6	37,316	10.5	35,148	10.0
14 CORPORATE EXPENSES	7,701	2.1	8,047	2.3	8,805	2.5
15 TOTAL INTERNAL EXPENSES	46,988	12.7	45,363	12.8	43,953	12.6
16 NET AY UNDER RESULTS	(80,262)	(21.8)	(73,664)	(20.9)	(72,544)	(20.8)
17 TARGET AY UNDER RESULTS	(47,946)	(13.0)	(45,899)	(13.0)	(31,345)	(9.0)
18 BREAK EVEN AY UNDER RESULT	(84,828)	(23.0)	(81,206)	(23.0)	(62,691)	(18.0)
19 RETURN ON EQUITY		10.1		10.9		3.6

