



# **Asset/Liability Management – Cashflow** ***Know how long I can invest (Duration) – Part I***

**A presentation to: AGRIP and the National League of  
Cities Risk Information Sharing Consortium**

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# Agenda

- The Actuarial Review – What does the Actuary do?
- Reserves
- Rates
- Investment Income's Effect on Insurer Results
- Wrap-up and Discussion
- Appendix — Glossary of Terms and Other

# The Actuarial Review – What does the Actuary do?

## The actuarial process

- What does an actuary do?
  - Uses mathematical analyses to:
    - Project future events based on prior experience
    - Evaluate the uncertainty of those estimates
    - Quantify the financial implications of these potential outcomes
- What is the purpose of our reports?
  - Used for:
    - Reserving
    - Rate/premium setting
    - Reinsurance/retention studies

## Actuarial methods are applied to reported and paid loss and allocated loss adjustment expense data

- Loss development method
  - Reported
  - Paid
- Initial expected loss method
- Bornhuetter-Ferguson methods
  - Reported
  - Paid
- Case reserve development method
- Frequency/severity method

## Loss development method

- Loss development triangle
  - Objective: fill in the square

Accident Year	Evaluated as of (Months)					
	12	24	36	48	60	Ultimate
1	2,520	3,929	5,622	6,595	6,877	?
2	3,091	4,791	6,847	8,045	?	?
3	4,862	7,565	10,818	?	?	?
4	7,151	11,120	?	?	?	?
5	8,137	?	?	?	?	?

- What causes upward movement as a year matures?
  - Existing claims develop upward during discovery process
  - New claims emerge

## Loss development method

- “Square” the triangle using development factors, selected by the actuary

Accident Year	Evaluated as of (Months)					
	12	24	36	48	60	Ultimate
1	2,520	3,929	5,622	6,595	6,877	<b>6,994</b>
2	3,091	4,791	6,847	8,045	8,391	8,534
3	4,862	7,565	10,818	12,700	13,246	13,472
4	7,151	11,120	15,902	18,668	19,471	19,802
5	8,137	<b>12,653</b>	18,094	21,242	22,156	<b>22,532</b>

Examples:

- $12,653 = 8,137 \times 1.555$

- $6,944 = 6,877 \times 1.017$

- $22,532 = 8,137 \times 1.555 \times 1.430 \times 1.174 \times 1.043 \times 1.017$

## Bornhuetter-Ferguson method

Accident Year	Initial Expected	Loss Dev. Factor	Percent Reported	Expected Reported	Expected Unreported	Actual Reported	Indicated Ultimate
1	6,980	1.017	98.3%	6,864	117	6,877	6,994
2	7,997	1.061	94.3%	7,539	458	8,045	8,503
3	14,033	1.245	80.3%	11,269	2,764	10,818	13,582
4	19,493	1.781	56.2%	10,946	8,547	11,120	19,667
5	23,010	2.769	36.1%	8,310	14,700	8,137	22,837
<b>Total</b>	<b>71,514</b>			<b>44,928</b>	<b>26,586</b>	<b>44,997</b>	<b>71,583</b>

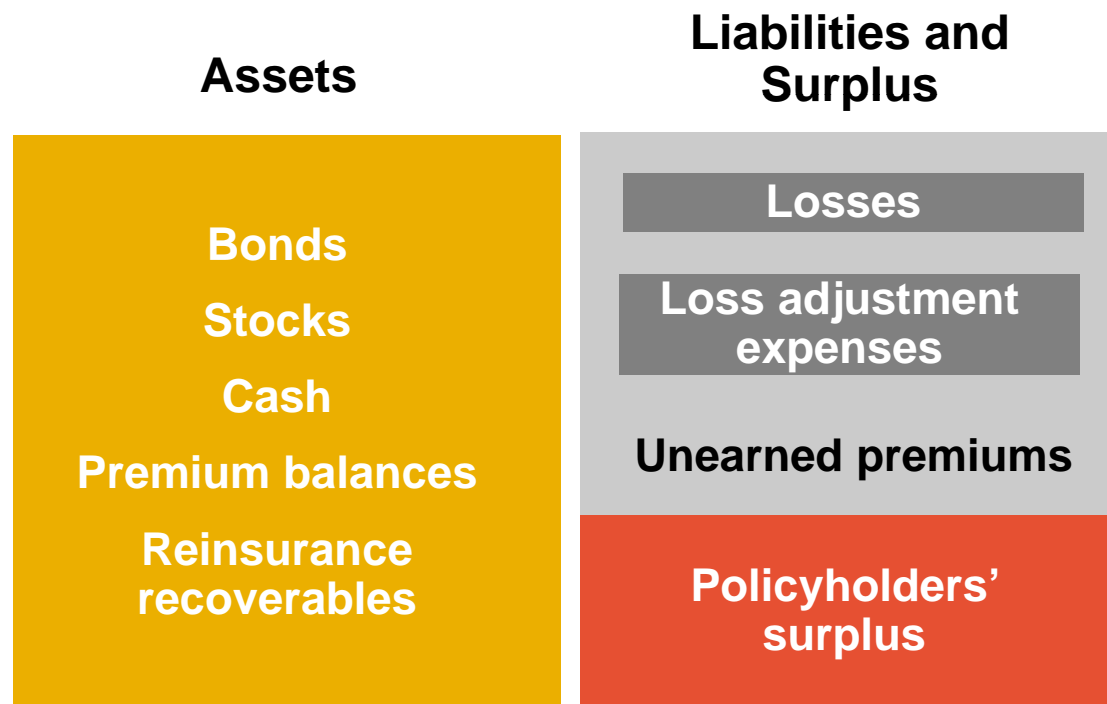
## Selection of ultimate losses

Accident Year	Ultimate Losses					
	Reported Loss Development	Paid Loss Development	Initial Expected	Reported Bornhuetter-Ferguson	Paid Bornhuetter-Ferguson	Selected
1	6,994	6,970	6,980	6,994	6,975	6,990
2	8,534	8,605	7,997	8,503	8,548	8,525
3	13,472	13,695	14,033	13,582	13,872	13,600
4	19,802	20,200	19,493	19,667	19,767	19,750
5	22,532	21,000	23,010	22,837	22,540	22,800
<b>Total</b>	<b>71,334</b>	<b>70,470</b>	<b>71,514</b>	<b>71,583</b>	<b>71,702</b>	<b>71,665</b>

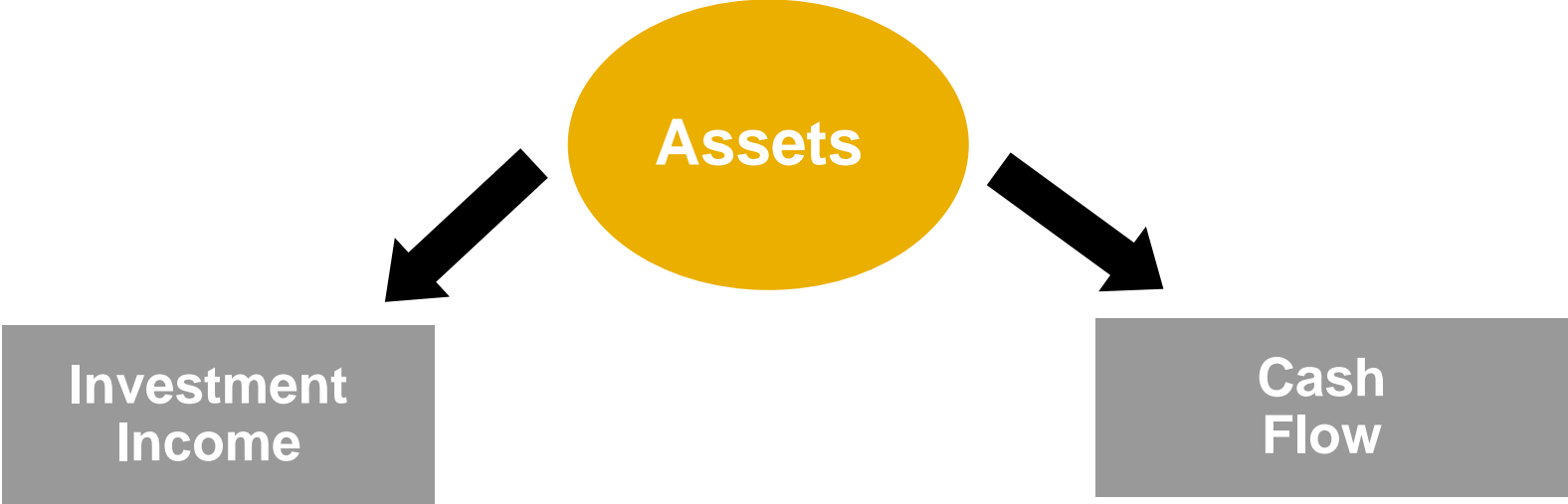
# Reserves

## Reserving is reflected on the balance sheet

- Policyholders' surplus protects the pool from unforeseen adverse events

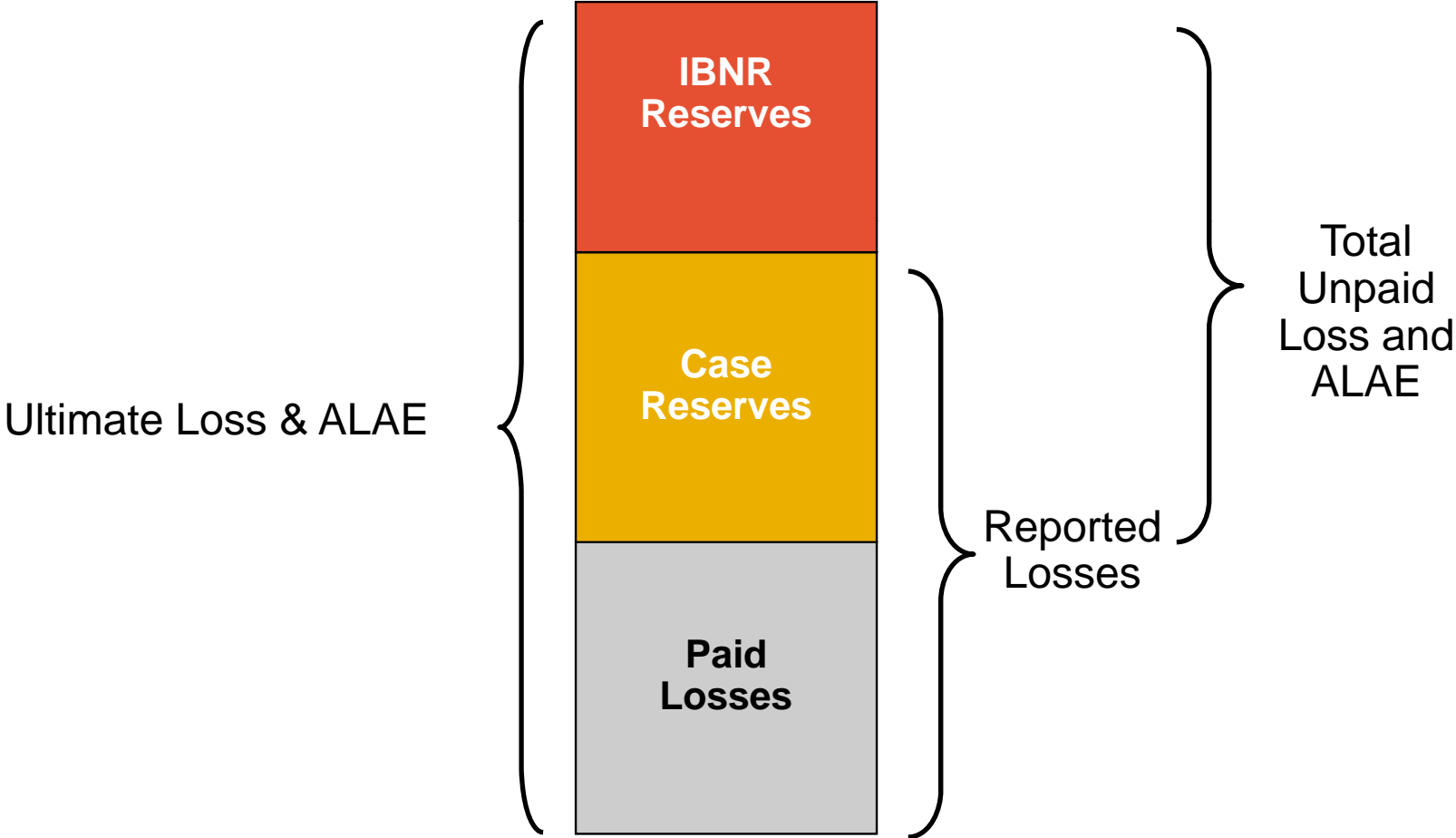


Insurers allocate assets based on two main abilities—  
 - to provide income, and  
 - to cover future cash flows (i.e., claim payments)



Relative Income Potential	Financial Instrument	Cash Flow Implications
Medium to High	Bonds	Steady, similar to claim payouts
High	Stocks	Volatile, uncertain
Low	Cash	Highly liquid
Low to None	Receivables (i.e., premium and reinsurance)	Subject to credit risk
Low	Other (i.e., real estate)	Little

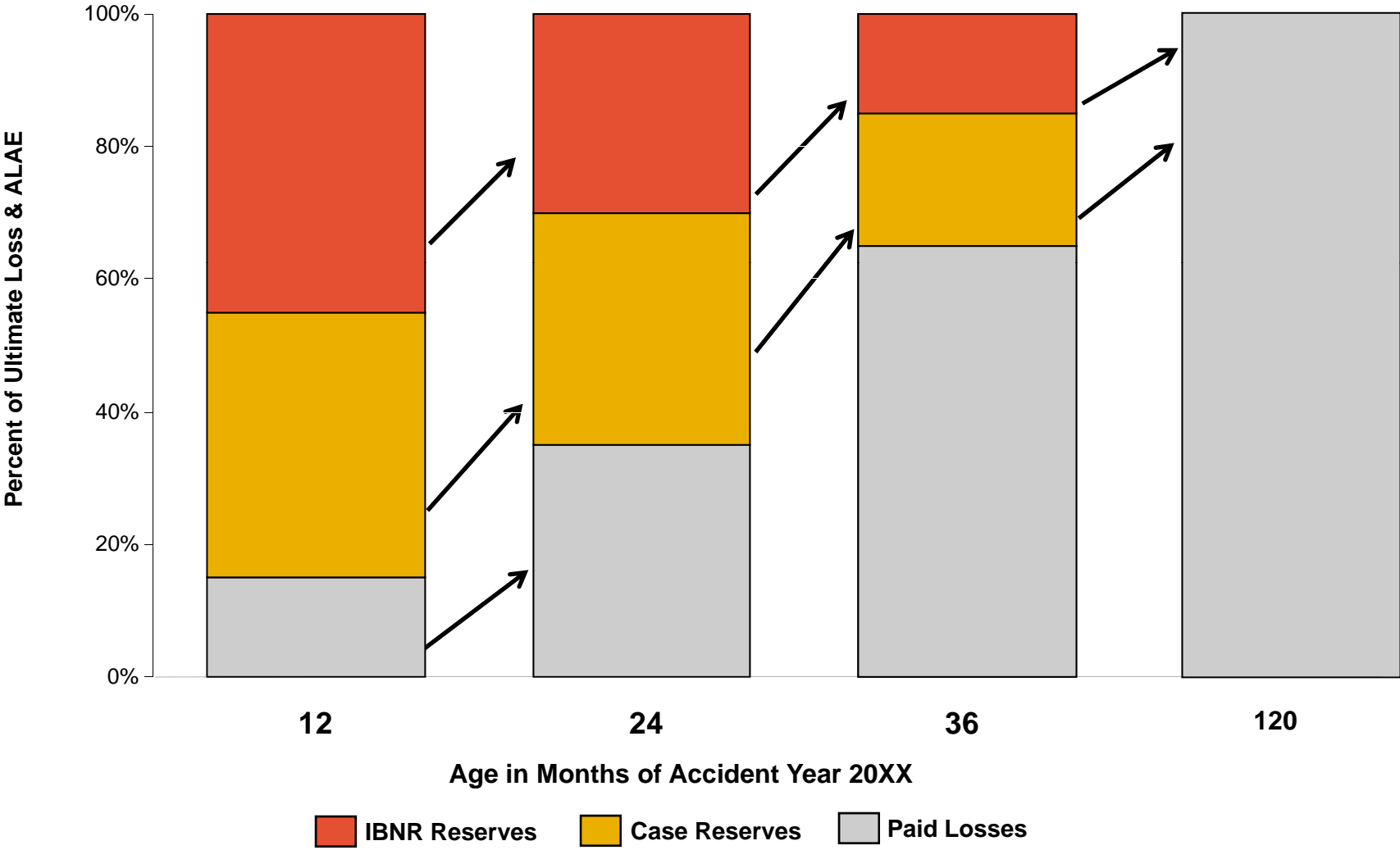
# Components of ultimate loss & ALAE



## What is IBNR?

- “Incurred but not reported” losses
- Includes:
  - Losses occurring but not reported as of an evaluation date
  - Adverse development on case reserves
  - Reported but unrecorded claims
  - Reopened claims
- Why is IBNR needed?

# Over time, case reserves and IBNR reserves decrease until the ultimate loss is paid completely



## A reserving example

Accident Year	Selected Ultimate	Paid at 12/31/10	Estimated Unpaid
1	\$6,990	\$6,280	\$ 710
2	8,525	6,592	1,933
3	13,600	6,476	7,124
4	19,750	2,956	16,794
5	22,800	1,185	21,615
<b>Total</b>	<b>\$71,665</b>	<b>\$23,489</b>	<b>\$48,176</b>

## The Impact of investment income on financial statements

- Net income (Underwriting profit/(loss) + Investment income
  - the result of investment strategies (made each year)
    - about the annual new money revenue streams
  - length of the investment vehicle
    - If too long or short compared to the timing of claim payments (from the outstanding reserve level)
      - the investment strategy may not be optimal
- Also, some entities may discount the reserves

# Rates

## Purpose of a rate analysis

**To establish a rate level reflective of anticipated costs for a specific exposure, coverage and time period**

## Actuaries also consider investment income when performing rate analyses

### Overall Rate Level

- Designed to generate premium income sufficient to cover total loss and expenses related to coverage provided in a given time period
  - Reasonable to reflect a credit for anticipated investment income

### Analysis Considers Anticipated Costs

- Future loss costs
  - Indemnity and Medical (workers compensation only)
  - Allocated loss adjustment expenses (ALAE)
- Future expenses
  - General and administrative
  - Claim handling
  - State assessments (workers compensation only)

# The actuarial analysis estimates the loss cost per exposure unit

## Loss and Allocated Expense Data

### Preferable to Use an “Exposure Base” for Rate Studies

- For example, liability and workers compensation coverages often use a payroll basis
- Rate studies can be performed without exposures,
- Calculate loss costs (loss per unit of exposure)

## Ratemaking formula

- Indicated base rate/current base rate – 1.0
- What is the indicated base rate?
  - Loss per exposure /
  - 1.0 – (operational expenses ratio + reinsurance expense ratio)

## Example: “on level” loss and ALAE costs are derived as follows

### Credible (Entity-Specific) Loss and ALAE Cost — Estimated 2011

Accident Year (1)	Ultimate Loss and ALAE Cost (2)	Trend at 4.0% to 2011 (3)	Loss and ALAE Cost at 2011 Level (4)
2005	\$1,762	$(1.04)^6 = 1.27$	\$2,238
2006	\$1,585	$(1.04)^5 = 1.22$	\$1,934
2007	\$1,436	$(1.04)^4 = 1.17$	\$1,680
2008	\$1,704	$(1.04)^3 = 1.12$	\$1,908
2009	\$1,574	$(1.04)^2 = 1.08$	\$1,700
Selected 2011 loss and ALAE cost			\$1,850

## There are still other important considerations

### Discounting for Anticipated Investment Income

- Policies provide positive cash flow for the entity
  - Premiums/contributions are paid by the end of the policy period
  - Losses are paid later, sometimes years later, than the end of the policy period
    - It is standard practice to incorporate these cash flow concepts into the overall rate level
- Should consider investment risk when selecting interest assumption (not necessarily market rate)
  - Risk free is similar to Treasury yields
  - Input from investment advisors on expected return on new money

## Ratemaking Formula Revisited

- Indicated base rate / current base rate – 1.0
- What is the indicated base rate?
  - Loss per exposure x
  - Investment income offset factor /
  - 1.0 – (operational expenses ratio + reinsurance expense ratio)
- Other variations of the formula exist
- Each major line of coverage's indication should be reviewed
  - Frequently, an overall rate level approach is used

## How the present value factor is derived

- Based on the line of coverage's paid loss development
  - Length of paid loss development varies by line of coverage
    - Short tail lines include health, property and auto physical damage
    - Long tail lines include workers compensation and professional liability
- The other parameter/assumption is the investment rate of return
- Illustration follows

## Hypothetical cash flows without a “credit” for investment income

- Example of cash flows

- Premium \$4,000
- General Expenses \$1,000
- Nominal Loss & LAE \$3,000

	Year 1	Year 2	Year 3	Year 4
<b>Cash Balance</b>	<b>4,000</b>	<b>2,560</b>	<b>1,611</b>	<b>643</b>
Expenses	1,000	0	0	0
Available for Investment	3,000	2,560	1,611	643
Investment Income – 2%	60	51	32	13
<b>Subtotal</b>	<b>3,060</b>	<b>2,611</b>	<b>1,643</b>	<b>656</b>
Claim Payments	500	1,000	1,000	500
<b>Cash Balance</b>	<b>2,560</b>	<b>1,611</b>	<b>643</b>	<b>156</b>

- The insurer ends up with a “profit” of \$156

## Alternative with investment income potential considered

- Discount premium level in anticipation of investment income
- Discount factor =  $2,856 / 3,000 = 0.952$

- Premium \$3,856
- General Expenses \$1,000
- Discounted Loss & LAE \$2,856

	Year 1	Year 2	Year 3	Year 4
<b>Cash Balance</b>	<b>3,856</b>	<b>2,413</b>	<b>1,461</b>	<b>490</b>
Expenses	1,000	0	0	0
Available for Investment	2,856	2,413	1,461	490
Investment Income – 2%	57	48	29	10
<b>Subtotal</b>	<b>2,913</b>	<b>2,461</b>	<b>1,490</b>	<b>500</b>
Claim Payments	500	1,000	1,000	500
<b>Cash Balance</b>	<b>2,413</b>	<b>1,461</b>	<b>490</b>	<b>0</b>

- By considering investment income in the rate, the desired “profit” results

# Investment Income

## Potential risks

- Realization of payment pattern
- Achievement of investment return

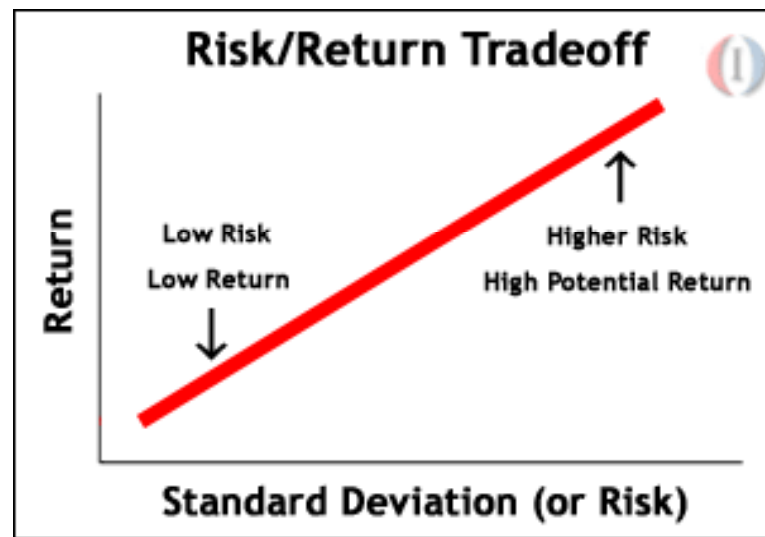
## Investment Income (cont.)

Cashflow lengths vary by line of coverage

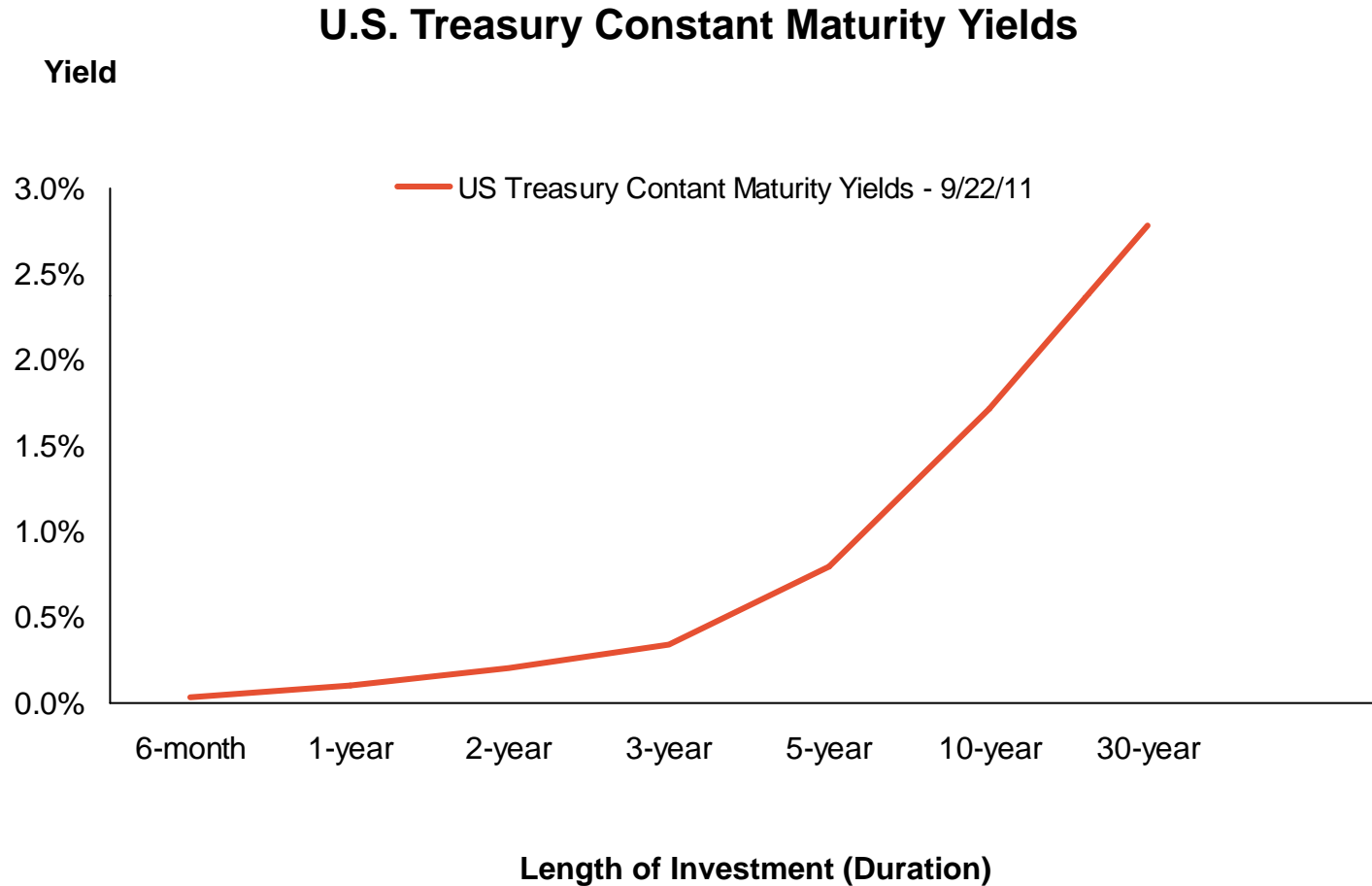
- Short-tailed lines of coverage
  - liquidity is important
- Long-tailed lines of coverage
  - longer term investments could be more feasible

## Risk and return should be considered in selecting the rate of return used in the rate study

- The actuarial rate analysis
  - usually performed three to twelve months prior to the inception date of the rate year
- The higher the investment rate of return...
  - The more risk that the Pool is taking on
  - If an investment had a high return with low risk, eventually everyone would want to invest there



A way to evaluate interest rate assumptions is to review yields at the average claim maturity length



## After reflecting investment income, an example of the rate level indication is illustrated as follows

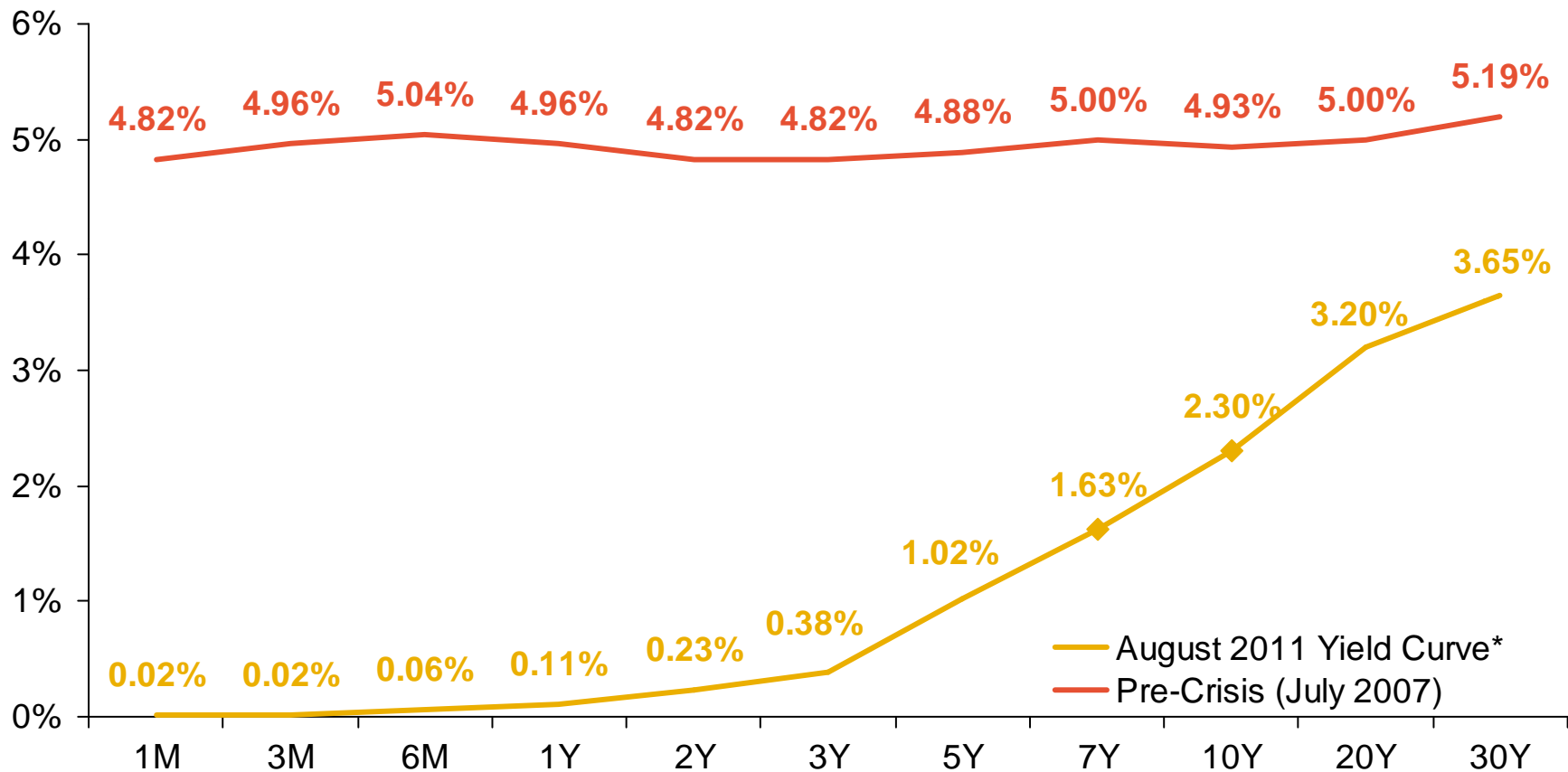
1. Selected loss cost at the entity's SIR* (e.g., \$250k)	\$1,850
● Discounted for investment income (factor of 0.95)	<b>\$1,758</b>
2. Operational expenses ratio	13%
3. Reinsurance ratio	15%
4. Indicated average rate level $(1a)/(1.0 - [(2)+(3)])$	\$2,441
5. Present average rate level	\$2,200
6. Indicated rate level change $[(4)/(5)-100\%]$	+11%
7. Selected rate level change	<u>          ?</u>

\*SIR = self insured retention.

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# Investment Income's Effect on Insurer Results

# Treasury Yield Curves: Pre-Crisis (July 2007) vs. August 2011\*



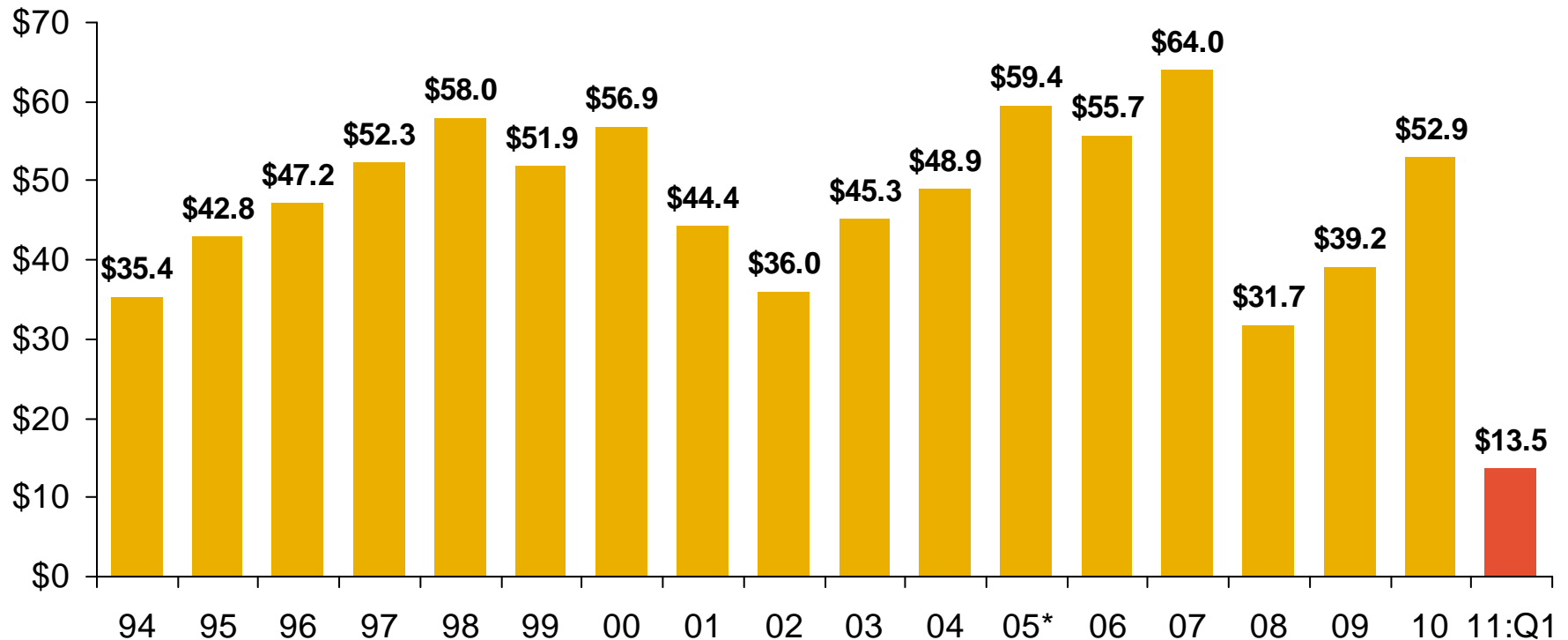
\*Average of daily rates.

Sources: Board of Governors of the United States Federal Reserve Bank; Insurance Information Institute.

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# Property/Casualty Insurance Industry Investment Gain: 1994–2011:Q1<sup>1</sup>

(\$ Billions)



<sup>1</sup> Investment gains consist primarily of interest, stock dividends and realized capital gains and losses.

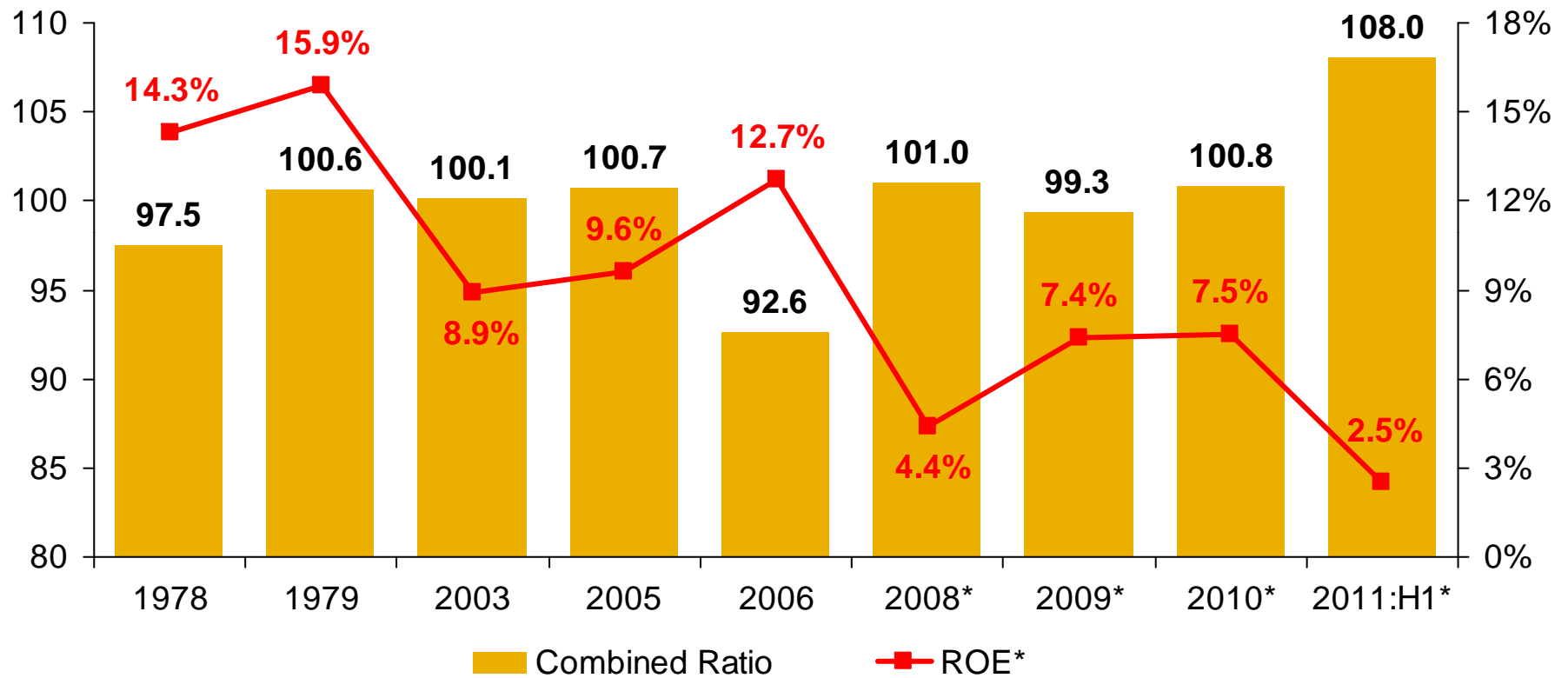
\* 2005 figure includes special one-time dividend of \$3.2B.

Sources: ISO; Insurance Information Institute.

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# Investment Impact on Return On Equity (ROE)

## Combined Ratio / ROE



\* 2009 and 2010 figures are return on average statutory surplus. 2008 -2011 figures exclude mortgage and financial guaranty insurers. 2011 figure is estimate through first half.

Source: Insurance Information Institute from A.M. Best and ISO data.

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# Wrap-up and Discussion

## Appendix — Glossary of Terms and Other

## Glossary of terms

- **Allocated Loss Adjustment Expense (“ALAE”)**: ALAE refers to defense, litigation and medical cost containment expenses, whether internal or external (e.g., attorney fees for defense, cost of engaging experts, etc.)
- **Case Reserves**: The estimate of unpaid loss (or loss and ALAE) amounts established by the claim adjusters for unpaid claims that have been reported to the Pool. Case reserves are established on an individual claim basis.
- **Exposure**: The units in which the Pool’s exposure to loss are measured.
- **Frequency**: Claims per unit of exposure.
- **IBNR**: Loss and ALAE for claims Incurred But Not Reported.
- **Loss**: The use of the term loss without modification includes ALAE, but does not include ULAE
- **Pure Premium**: Loss and ALAE per unit of exposure.
- **Severity**: Average loss and ALAE per claim.
- **Trend Factors**: Factors used to adjust the past loss experience to the cost levels of the period being considered. Trend factors include the effects of inflation and may also include adjustment for anticipated changes in laws, technology and other factors that may be expected to affect loss frequency and/or severity.

## Financial statements are used and interpreted by many different users

- SAP – statutory accounting principles
  - Generally conservative accounting principles, concern is solvency
  - Principal user – regulators, insureds, rating agencies
- GAAP – generally accepted accounting principles
  - Principles based on insurer having “going concern” operations
  - Principal user – management, investors, rating agencies
- Key financial statements
  - Balance sheet
  - Income statement