INTRODUCTION TO EXPERIENCE RATING

2013 Reinsurance Boot Camp

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Willis Re

Introduction to Experience Rating
Agenda

- Basic experience rating methodology

- Credibility weighting with exposure rate

- Diagnostics: telling the story

Introduction to Experience Rating
Basic Experience Rating Methodology

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Steps in Experience Rating:

1. Compile historical premium and loss data

   – Exclude catastrophe and shock losses and price separately

2. Adjust subject premium to future level

3. Adjust historical losses to future price and treaty coverage levels

4. Develop adjusted layer losses to ultimate

5. Select the non-cat / non-shock experience (loss cost) rate

6. Load for catastrophe/shock losses

1. **Compile historical experience**

- Review contract or placement slip if possible:
    - What is the treaty term?
    - What is the exposure basis?
    - What is the definition of a risk?
    - What is the definition of ultimate net loss?
        - ALAE pro-rata or included?
        - ECO/XPL?
    - If multiline, is there a basket retention?

1. **Compile historical experience**

- Need historical premiums and losses on same basis

$$\text{Experience Rate (Loss Cost)} = \frac{\text{Trended Ultimate Layer Losses}}{\text{Trended On-Level Subject Premium}}$$
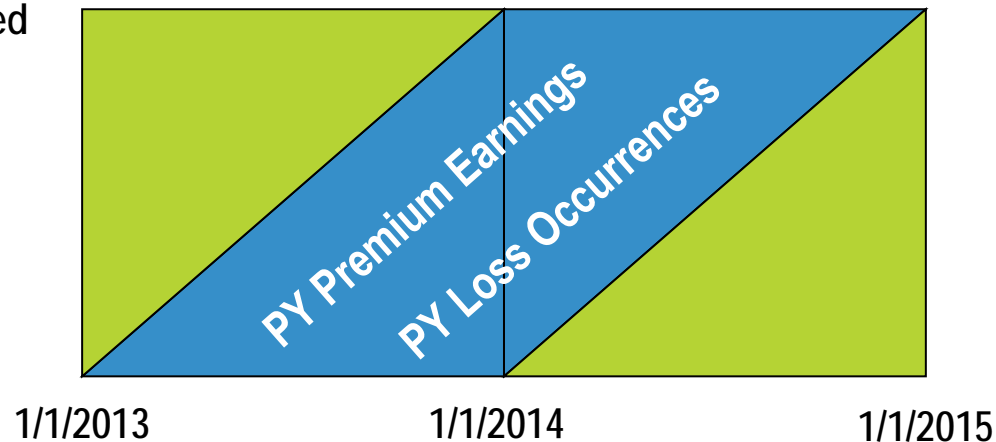
- Treaty accounting period may be
  - Policy Year
    - "Risks Attaching"
    - "Losses Occurring on Risks Attaching"
  - Accident Year
    - "Losses Occurring"
    - "Losses Occurring During"

- PY WP = Written Premium on policies issued during the year
- PY Loss = (Paid + OS) on all claims attaching to policies issued during the year

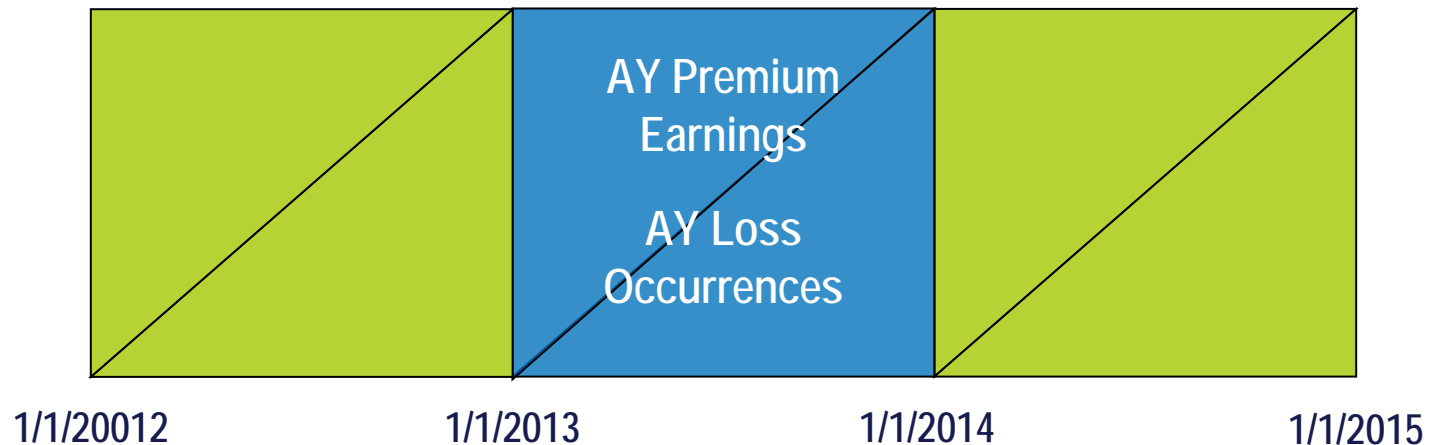**Willis Re** MANAGING EXTREMES

- AY EP $\quad$ = WP – UEPR ending + UEPR prior

  $\quad\quad\quad\quad$ = (WP) – (Increase in UEPR)

- AY Inc. Loss = (Paid + OS) on all claims occurring during the year

AY Premium Earnings

AY Loss Occurrences

| 1/1/20012 | 1/1/2013 | 1/1/2014 | 1/1/2015 |

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1. **Compile historical experience**

- Get all the details on historical losses
    - Include all historical losses that would trend into the layer (rule of thumb: get all losses > half of your attachment point)
    - Split out ALAE for each loss
    - Include historical policy limits (and SIR if applicable)
    - Confirm that losses are assembled by occurrence, not by claimant
    - Include line of business detail
    - Include catastrophe/clash indicator, if applicable

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Basic Experience Rating Methodology

- Other data considerations

  - Portfolio has changed over time

    - Ceding company has exited contractors class
    - Minimum deductibles have been increased from 5k to 10k

  - ALAE Treatment

    - ALAE Excluded
    - ALAE Included
    - ALAE Pro Rata

2. Adjust subject premium to future level

- Filed (manual) rate changes

- Price-level changes
  - Schedule-rating, company tiers, etc.
  - Also include "soft" changes such as terms & conditions, changes in underwriting standards, etc.

- Exposure trend
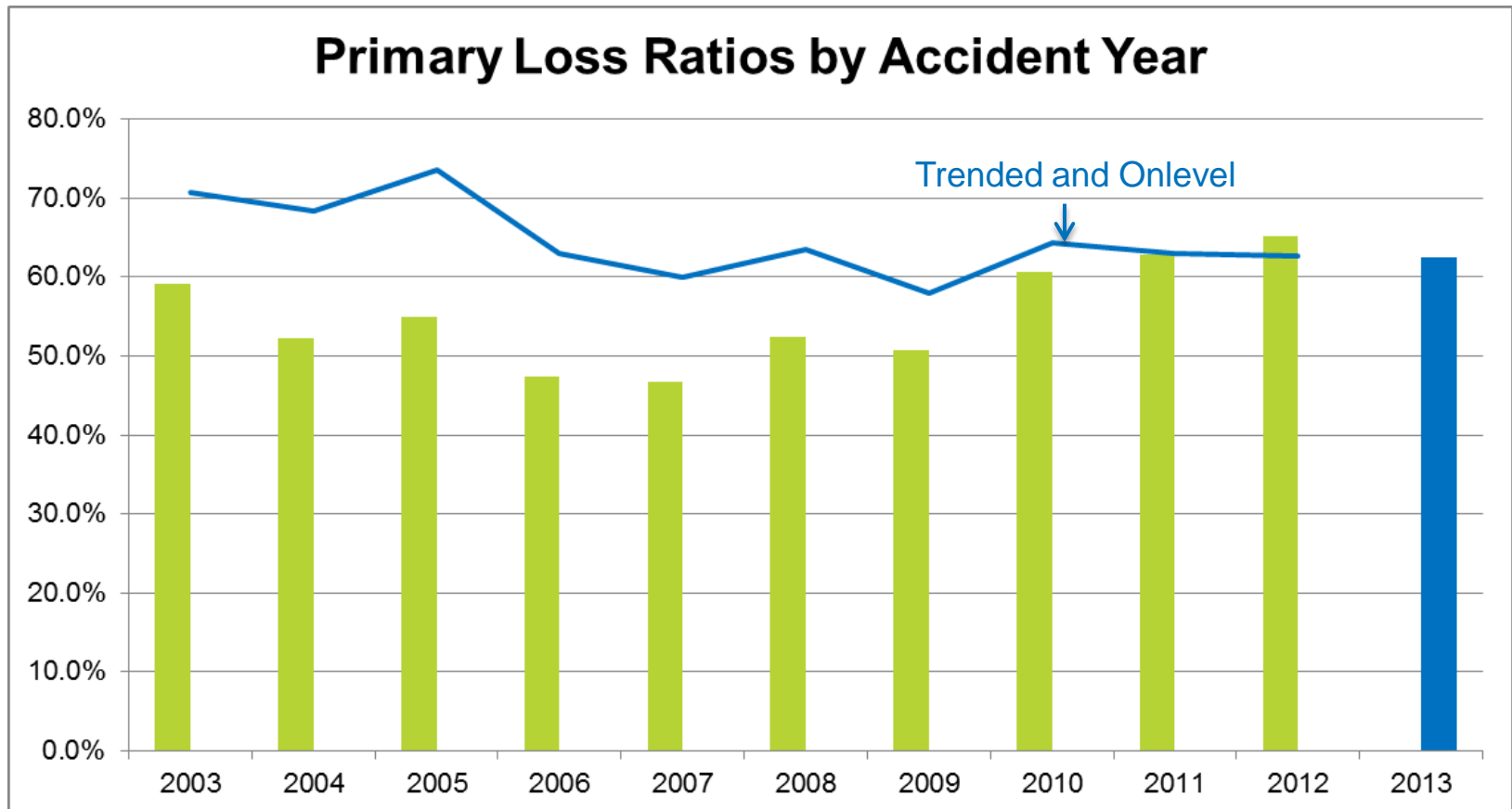 - For inflation-sensitive exposure bases

2. Adjust subject premium to future level

- Goal is to adjust historical premium to a level "as if" it has been written during the future period.

  - The split between "rate" and "price" is not always obvious (e.g. where are LCM's or package factors included?)

  - Often times ceding company provides renewal price changes, which include rate and other price-level changes

    - How are limit and deductible changes accounted for?

    - How has exposure change been factored in?

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2. Adjust subject premium to future level

Primary Loss Ratios by Accident Year

Trended and Onlevel

2. Adjust subject premium to future level

- Note to actuaries coming from a primary rate-filing background:

  – In a rate filing, you typically adjust premium to the **current** rate level.

  – In reinsurance pricing, you want to adjust premium to the **average** rate level in the future period.

- CAS papers on this topic:

  Burt D. Jones's An Introduction to Premium Trend; CAS Exam Study Note, 2002

  Trent Vaughn's Commercial Lines Price Monitoring; CAS Forum Fall 2004

  Ira Robbin's paper Monitoring Renewal Rate Change on Cat-Exposed Excess Property Business;   CAS E-Forum 2009 Winter

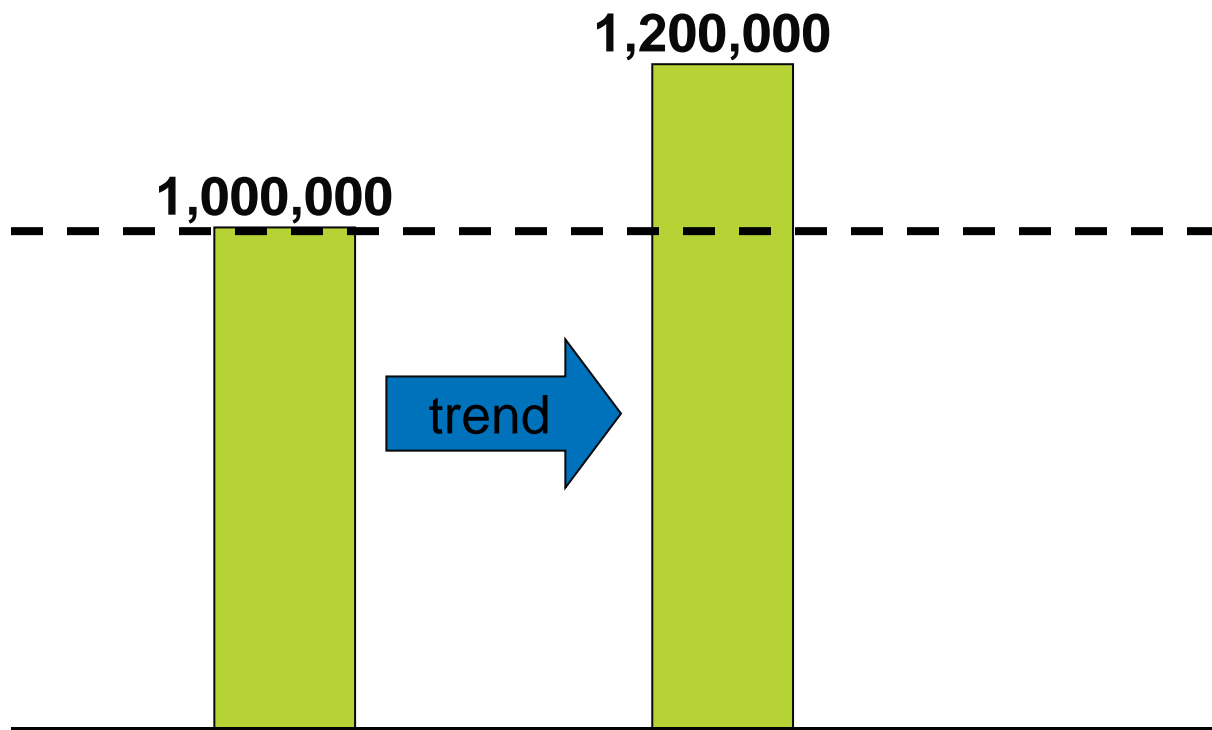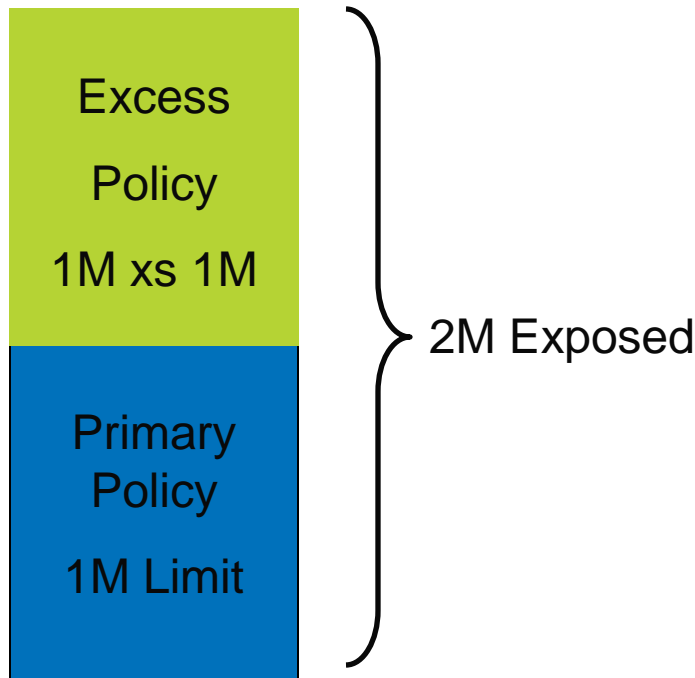 Neil Bodoff's Measuring Rate Change; CAS E-Forum, Winter 2009

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Basic Experience Rating Methodology

3. Adjust historical losses to future price and treaty coverage levels

- Need to adjust historical losses up to the midpoint of the treaty period

- Typically we apply trend to the ground-up loss then cap the trended loss at the historical policy limit

- Trended and capped losses are then layered

3. Adjust historical losses to future price and treaty coverage levels

- Trend period depends on the treaty basis

3. Adjust historical losses to future price and treaty coverage levels

- Leveraged effect of trend on excess layers

3. Adjust historical losses to future price and treaty coverage levels

- Trend impact on excess layer

Layer: 500,000 excess of 500,000			
	Untrended	**Trended**	**Trend %**
Total # Claims	100	100	
Ground-up Loss	17,723,204	19,141,060	
Ground-up Severity	177,232	191,411	8.0%
Layer count	8	9	12.5%
Layer Severity	263,324	275,013	4.4%
Layer Loss	2,106,590	2,475,117	17.5%

A numbers are for illustration only, and not for use in pricing

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3. Adjust historical losses to future price and treaty coverage levels

- Inclusion of excess policies

Supported Excess

Excess Policy 1M xs 1M
Primary Policy 1M Limit

2M Exposed

Unsupported Excess

Excess Policy 1M xs 1M

1M Exposed

3. Adjust historical losses to future price and treaty coverage levels

- Proper application of inflation trend on excess losses
    - Add underlying loss or SIR to excess loss amount before trending

    or

    - Use a higher trend percent to reflect "leverage"

4. Develop losses to ultimate

- Factors depend on layer of reinsurance being priced
  - We apply LDFs to trended layer losses so that all years are on the same basis

- Development is an aggregate loss concept
  - Includes new claims (true IBNR), development on known claims, reopening of closed claims, etc.
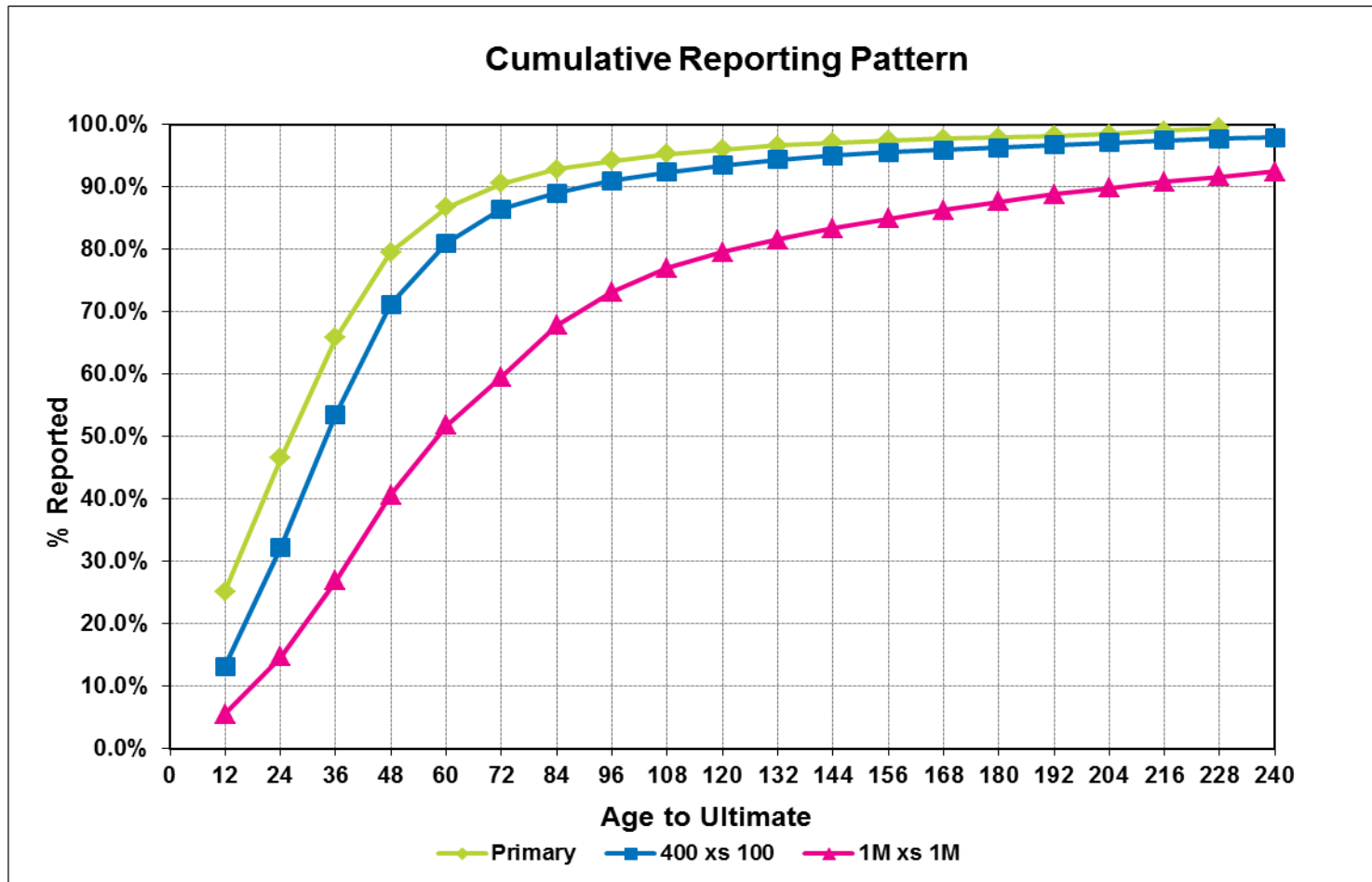
4. Develop losses to ultimate

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4. Develop losses to ultimate

- Note on loss development:
  - Most recent periods are very green and may have zero losses reported to date. Should these years be included?
  - If there are losses, then they are hit with a huge LDF.

- Alternative methods:
  - ELR
  - Bornhuetter-Ferguson (B-F)
  - Cape Cod

4. Develop losses to ultimate

- LDF Method:

  - Ultimate = Reported loss x LDF

- B-F method:

  - Ultimate = Reported loss + premium x ELR x (1-1/LDF)

But what ELR do we use?

4. Develop losses to ultimate

- Average of prior year ultimate loss ratios:

$$\text{ELR} = \frac{\sum \text{Ultimate Loss}}{\sum \text{Subject Premium}}$$

- Cape Cod ELR:

$$\text{ELR} = \frac{\sum \text{Reported Loss}}{\sum \text{Premium / LDF}}$$

4. Develop losses to ultimate

ABC Insurance Company **General Liability** **500,000 excess of 500,000 - Loss plus ALAE included**											
Accident Year	**Historical Subject Earned Premium** **(1)**	**Rate/Price OnLevel Factor** **(2)**	**Exposure Trend** **(3)**	**Adjusted Subject Premium** **(4)=(1)*(2)*(3)**	**LDF** **(5)**	**Adj. Subject Premium / LDF** **(6)=(4)/(5)**	**Layered Loss+ALAE Evaluated 12/31/2012** **(7)**	**Trended Layered Loss+ALAE** **(8)**	**LDF Ult. Loss Rate** **(9)=(8)/(6)**	**Trended Ultimate Layered Loss+ALAE*** **(10)**	**Trended Ultimate Loss Rate** **(11)=(10)/(4)**
2003	19,215,561	0.712	1.219	16,686,614	1.195	13,958,752	9,300	604,779	4.33%	763,667	4.58%
2004	18,273,944	0.724	1.195	15,802,035	1.228	12,871,735	122,259	942,986	7.33%	1,113,665	7.05%
2005	16,676,622	0.764	1.172	14,920,560	1.269	11,761,896	0	5,671	0.05%	189,651	1.27%
2006	14,924,410	0.802	1.149	13,755,409	1.326	10,374,976	609,711	1,096,962	10.57%	1,293,860	9.41%
2007	16,628,500	0.884	1.126	16,559,038	1.420	11,657,470	142,331	529,773	4.54%	815,271	4.92%
2008	17,458,606	0.972	1.104	18,739,314	1.576	11,893,852	475,081	1,213,582	10.20%	1,612,305	8.60%
2009	19,810,337	1.021	1.082	21,893,136	1.885	11,616,269	1,052,224	1,210,428	10.42%	1,809,017	8.26%
2010	22,121,506	1.076	1.061	25,266,074	2.618	9,651,043	18,209	171,122	1.77%	1,080,640	4.28%
2011	24,142,794	1.079	1.040	27,101,340	4.503	6,018,241	0	37,923	0.63%	1,265,935	4.67%
2012	25,714,864	1.041	1.020	27,313,636	12.466	2,191,115	0	0	0.00%	1,463,294	5.36%
Total	194,967,144			198,037,157		101,995,350	2,429,115	5,813,226	5.70%	11,407,305	5.76%
03-11	169,252,280			170,723,521		99,804,235	2,429,115	5,813,226	5.82%	9,944,011	5.82%
Prospective Premium:		27,000,000								1,555,250	5.76%

(6) = "Exposed Premium"   * "Cape Cod" Calculation: (10) = (8)+(4)*Total(9)*[1-1/(5)]

Basic Experience Rating Methodology

- ALAE Treatment

Layer: $300K xs $200K

Gross Loss & ALAE ($K)			Reinsurance Recovery ($K)				
			ALAE Excluded	ALAE Pro Rata			ALAE Included
Loss	ALAE	Loss + ALAE	Loss	Loss	ALAE	Loss + ALAE	Loss + ALAE
300	150	450					
500	100	600					

Basic Experience Rating Methodology

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Layer: $300K xs $200K

Gross Loss & ALAE ($K)			Reinsurance Recovery ($K)				
			ALAE Excluded	ALAE Pro Rata			ALAE Included
Loss	ALAE	Loss + ALAE	Loss	Loss	ALAE	Loss + ALAE	Loss + ALAE
300	150	450	100	100	50	150	250
500	100	600	300	300	60	360	300

Introduction to Experience Rating
Credibility

- Experience rating = projection of losses based only on what took place for this specific account

  - Accuracy of claim cost trend factors

  - Accuracy of excess loss development factors

  - Accuracy of subject premium on-level factors

  - Stability of excess loss cost

  - Changes in underlying exposure or policy limits over time

- Exposure rating = projection of losses using expected loss ratio, ceding company's inforce portfolio characteristics and severity curves

  - Accuracy of ground up loss ratio/ELR

  - Accuracy of predicted portfolio distribution by line/ILF table/policy limit

  - Accuracy of bureau ILFs in treaty layer

  - Exposure not contemplated by ILFs, e.g. clash potential

  - "Niche" business unlike industry average in exposure rating curves

Introduction to Experience Rating
Credibility

- Final loss cost =

$$\left[\begin{array}{c} \text{experience} \\ \text{loss cost} \end{array} \right] \times (\text{credibility}) \ + \ \left[\begin{array}{c} \text{exposure} \\ \text{loss cost} \end{array} \right] \times (1 - \text{credibility})$$

  - No single "right" measure of credibility
  - Factors that increase credibility:
    - Large # of claims expected
    - Low attachment point
    - Stability in historical loss costs

Example of Standard Credibility Procedure

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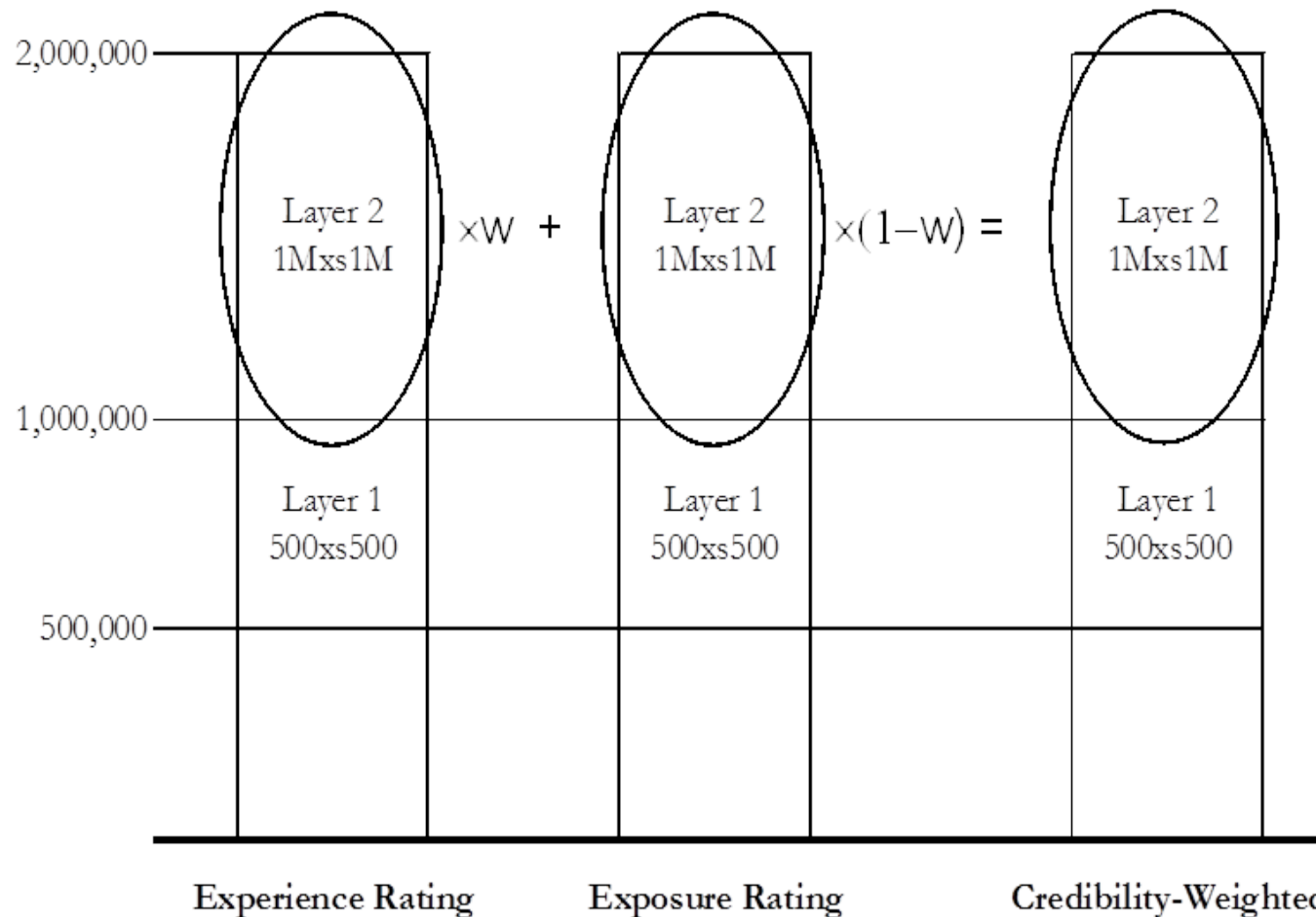
- An additional estimate can be produced using exposure-rating relativities applied to a lower layer (e.g. 500,000 xs 500,000)

$$\hat{\mu}_{rel} = \hat{\mu}_{exper\_500x500} \cdot \left\{ \frac{\hat{\mu}_{expos\_1Mx1M}}{\hat{\mu}_{expos\_500x500}} \right\}$$

Using Exposure-Rating Relativities

- Does the experience rating make sense?

    - Graphical display
        - Use ground-up loss ratio experience to evaluate trend and onlevel

    - Comparisons
        - Prior years' experience rating
        - Exposure rating

- Simple test of actual versus expected:

Actual versus Expected Analysis							
Accident Year	**Evaluated 12/31/2011**	**LDF**	**Evaluated 12/31/2012**	**LDF**	**Expected Link Ratio**	**Expected Development**	**Actual Development**
2003	571,093	1.103	599,683	1.077	1.024	13,787	28,590
2004	492,265	1.141	559,165	1.103	1.034	16,959	66,900
2005	319,707	1.195	219,653	1.141	1.047	15,131	-100,054
2006	1,762,534	1.277	1,831,330	1.195	1.069	120,944	68,796
2007	250,563	1.407	285,397	1.277	1.102	25,508	34,834
2008	577,569	1.633	969,391	1.407	1.161	92,772	391,822
2009	362,216	2.087	854,699	1.633	1.278	100,702	492,483
2010	333,336	3.376	712,321	2.087	1.618	205,879	378,985
2011	110,169	14.169	408,968	3.376	4.197	352,208	298,799
Total	4,779,452		6,440,607			943,890	1,661,155

Introduction to Experience Rating
Diagnostics: telling the story

- Some questions to ask when reconciling with prior rating or exposure rating:

  - Is the experience rating distorted by large losses?

  - Is the ELR used in the exposure rating consistent with the ceding company's experience? Is the ALAE ratio the same?

  - How has the business changed? Is the experience even relevant?

  - Is this "niche" business unlike the industry average in the exposure rating curves?

Introduction to Experience Rating
Questions?

Thank you for your attention.

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