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THE MARKET CYCLE & RESERVING CYCLE

CAS Seminar on Reinsurance – June 2, 2015

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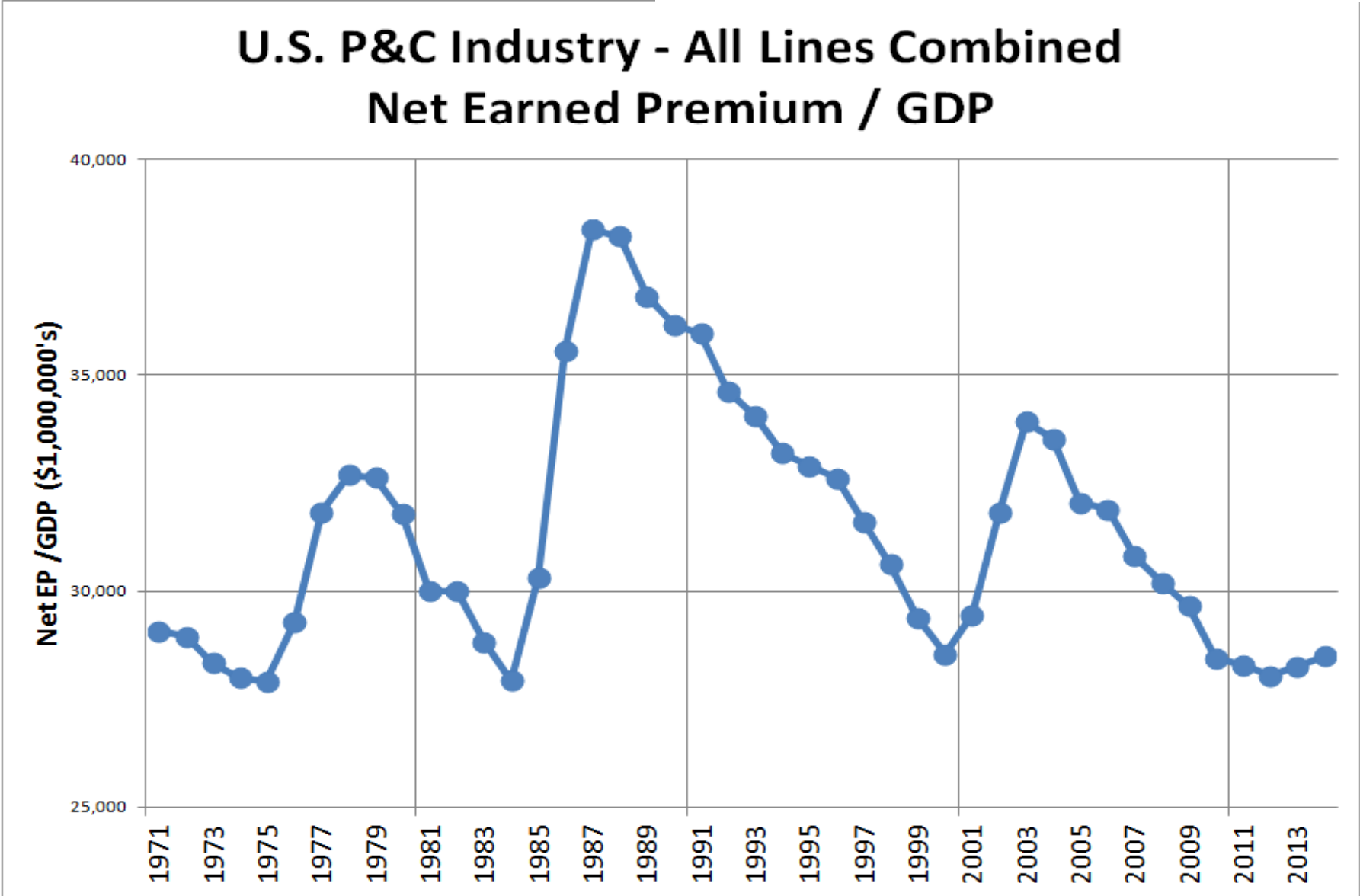
Agenda



1. High-Level View of the Market Cycle and Reserving Cycle
2. Example with Specialty Carriers
3. A Model for the Cycle

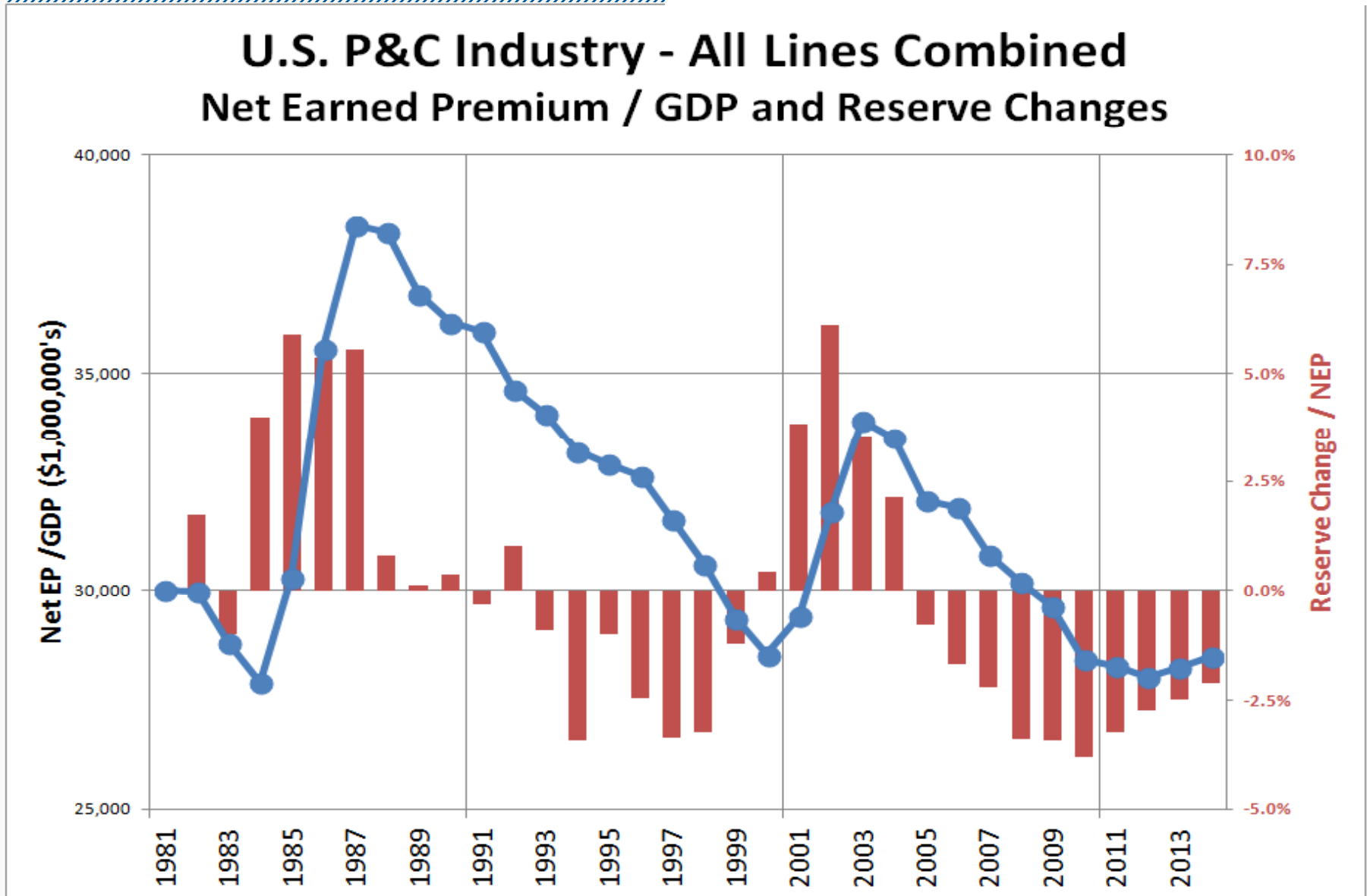
High-Level View of Market Cycle

Source: AM Best Aggregates & Averages, SNL



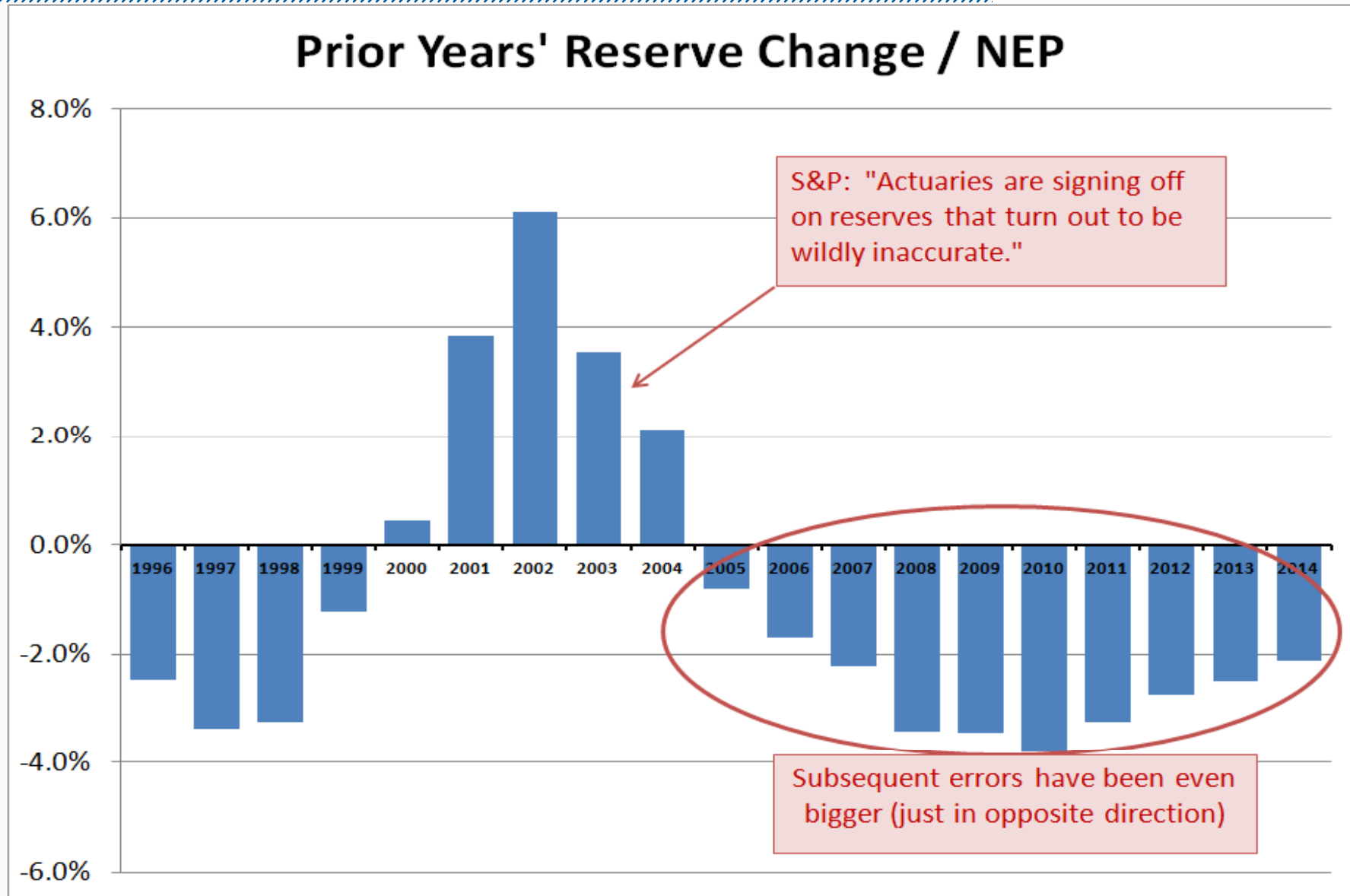
High-Level View of Market Cycle: Correlation with Reserve Changes

Source: AM Best Aggregates & Averages, SNL



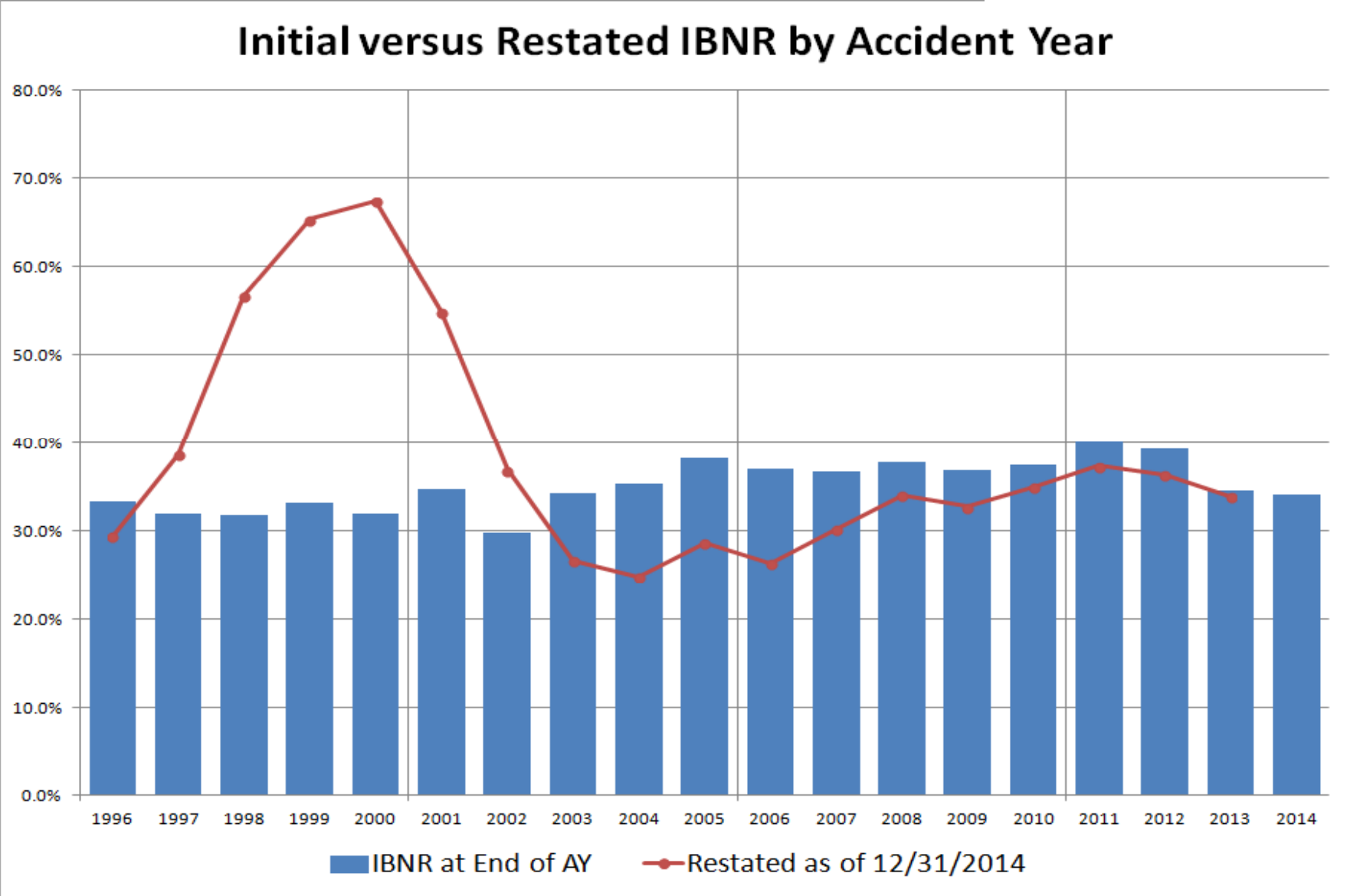
High-Level View of Market Cycle: Reserve Releases Continuing

Source: SNL



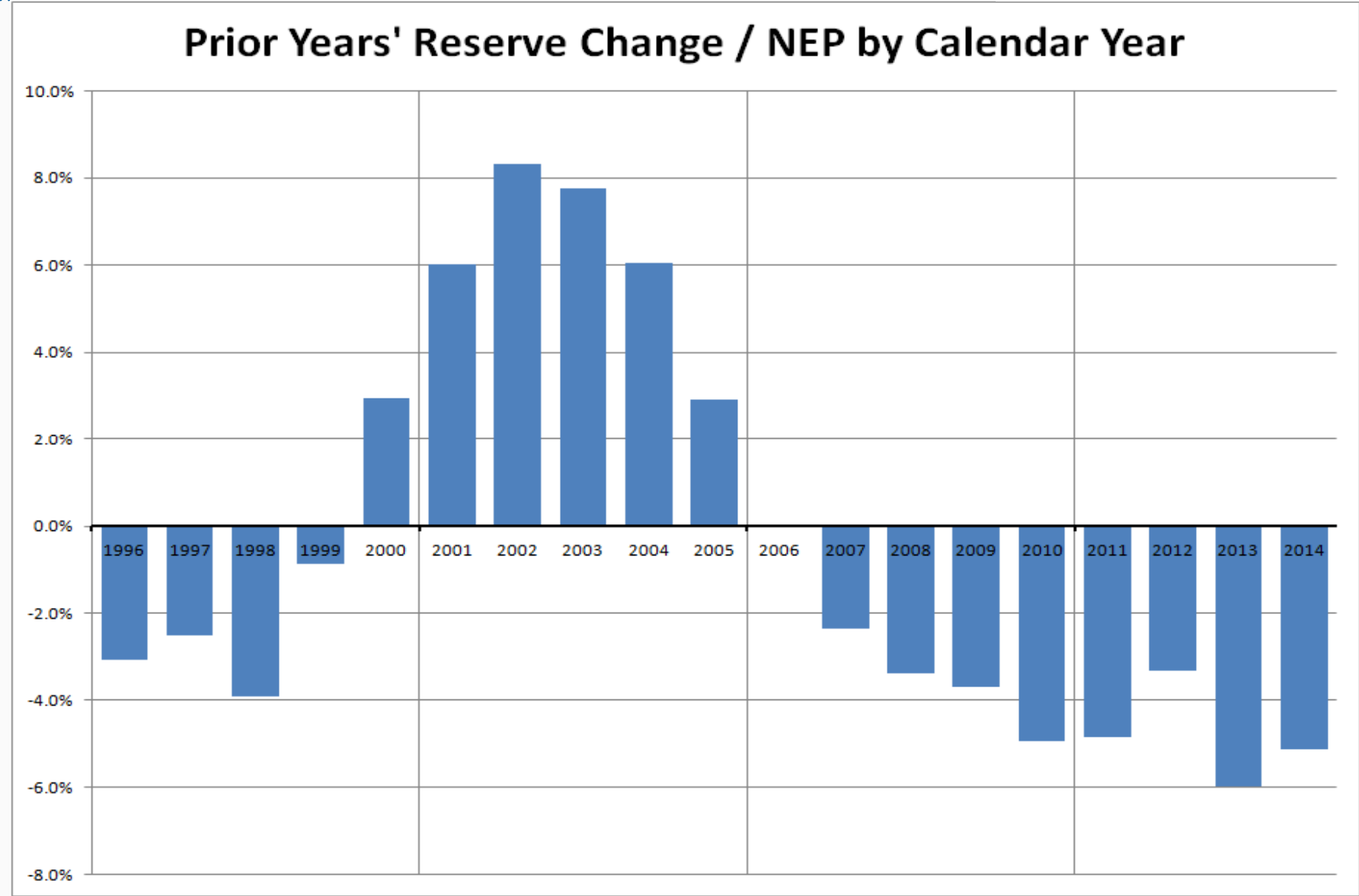
Example for Specialty Carriers

Source: SNL



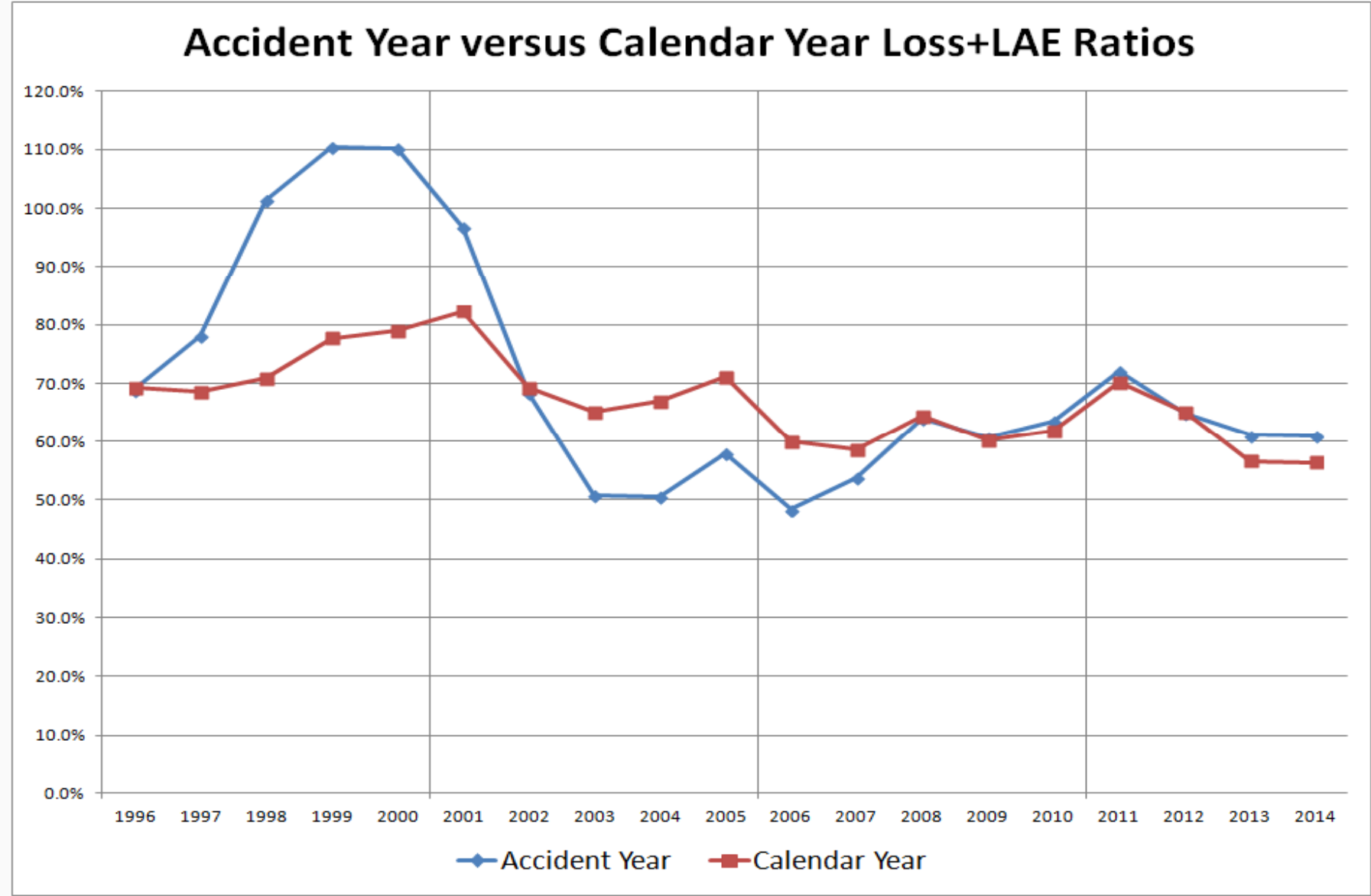
Example for Specialty Carriers

Source: SNL



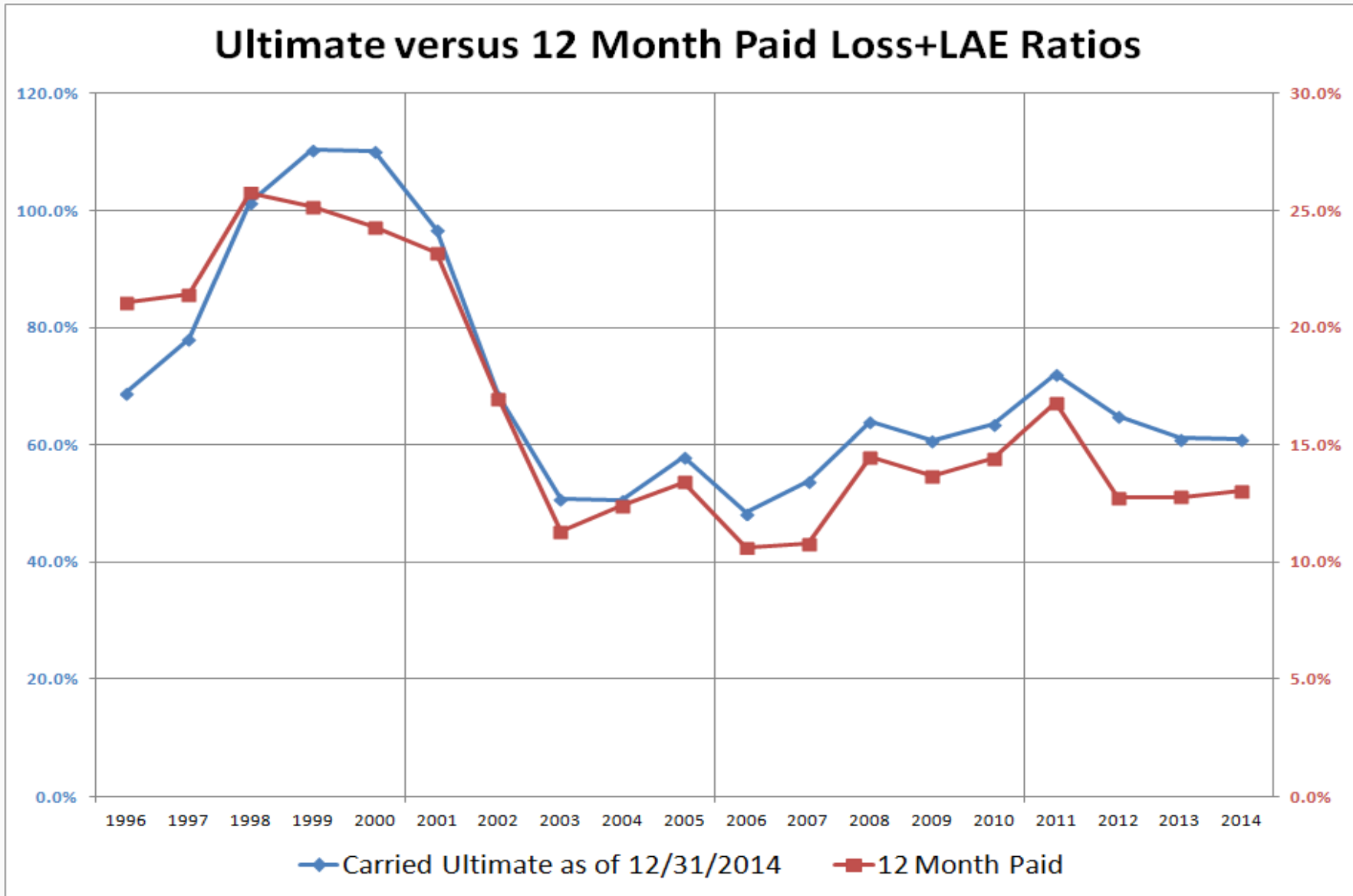
Example for Specialty Carriers

Source: SNL



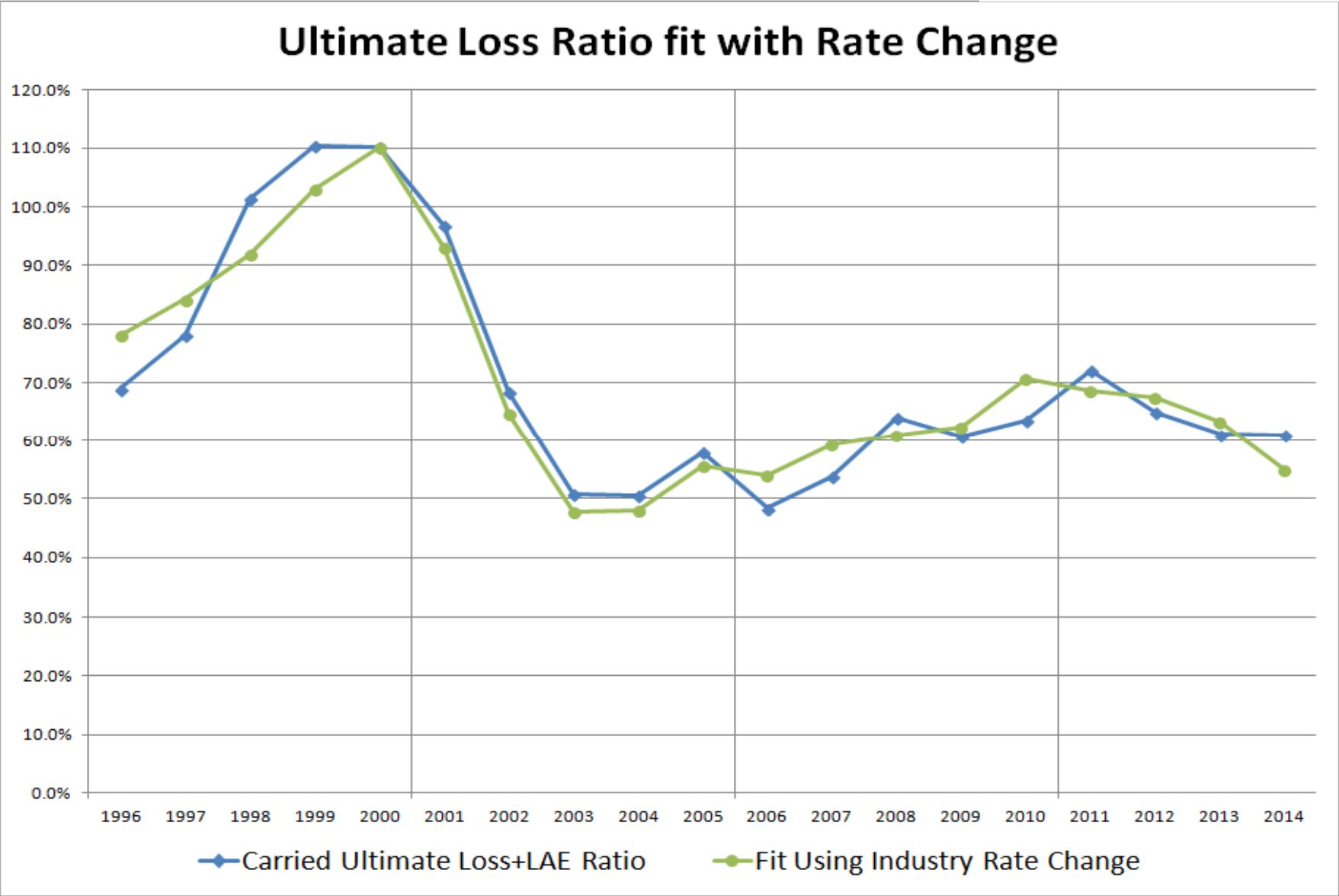
Example for Specialty Carriers

Source: SNL



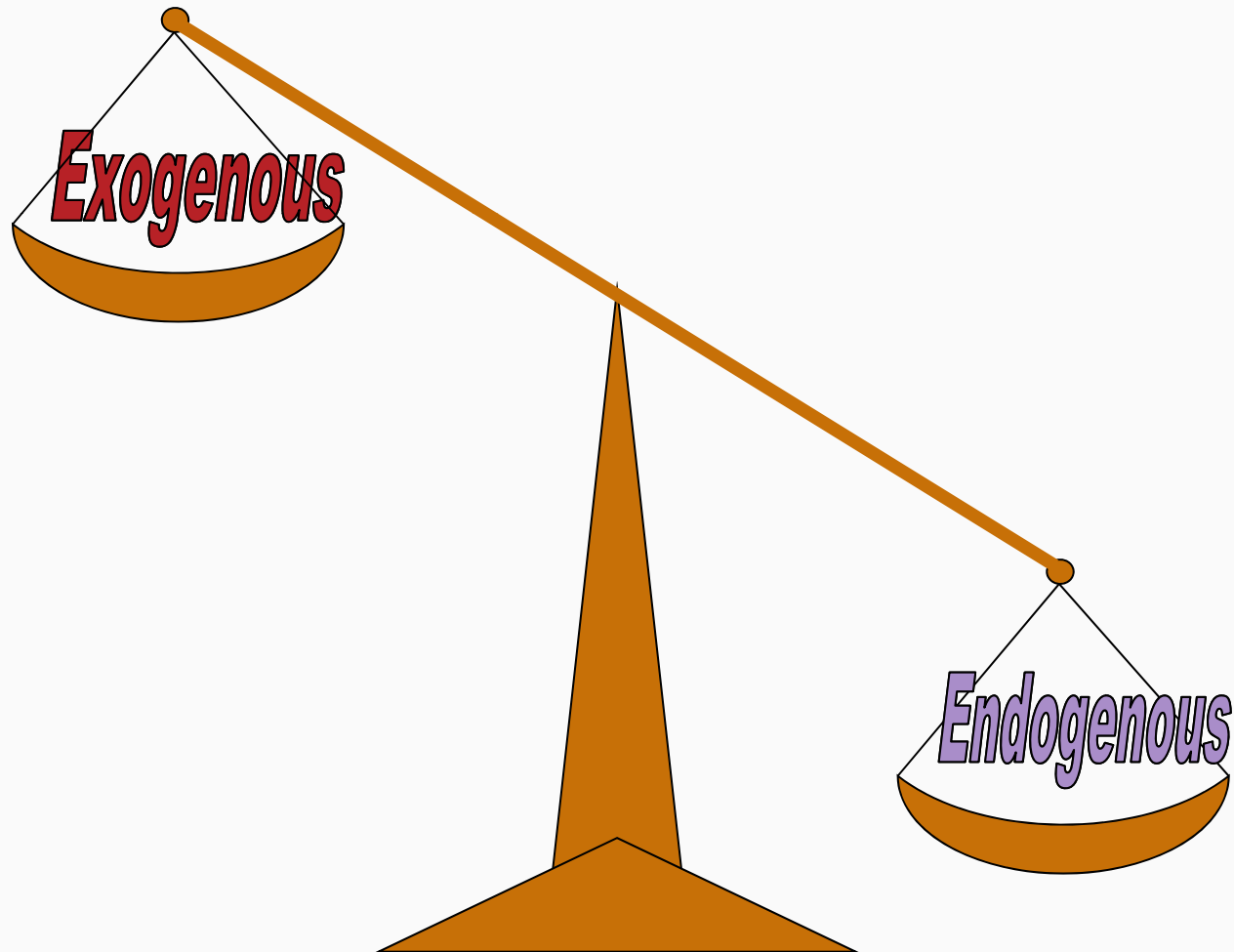
Example for Specialty Carriers

Source: SNL



A Mathematical Model of the U/W Cycle

What are the drivers of the reserving cycle?



Assumptions

- Begin with deterministic steady-state for losses:
 - Each year's expected loss is $(1+g)$ times the prior year
 - Value is unknown, but not a random variable

- Reserving is always done with a Bornhuetter-Ferguson method using the same permissible loss ratio, say, $PLR=65\%$

- Pricing is done assuming reserving is done correctly
 - Pricing is an average of last three CY losses (adjusted for growth)

A Mathematical Model of the U/W Cycle

The premium for a given year is based on the average of the “n” most recent calendar year incurred losses (CYIL).

This definition immediately creates a relationship of calendar year (CY) results as a rolling average of accident year (AY) results.

$$Prem_j = \frac{1}{n} \cdot \sum_{k=1}^n \frac{CYIL_{j-k} \cdot (1+g)^k}{PLR}$$

$$ProfitAY_j = PLR \cdot Prem_j - L_j$$

$$ProfitCY_j = PLR \cdot Prem_j - CYIL_j = \sum_{i=1}^{\infty} ProfitAY_{j+1-i} \cdot \beta_i$$

The Calendar Year Incurred Loss (CYIL) can be written in a recursive form as a weighted average of prior calendar year losses.

Technically this is known as a **linear difference equation** (discrete analogy to a linear differential equation).

Simplified versions of the cycle can also be generated:

$$CYIL_j - L_j = \frac{1}{n} \cdot \sum_{k=1}^n \left\{ (CYIL_{j-k} - L_{j-k}) - \sum_{i=1}^{\infty} (CYIL_{j+1-i-k} - L_{j+1-i-k}) \cdot \beta_i \right\} \cdot (1 + g)^k$$

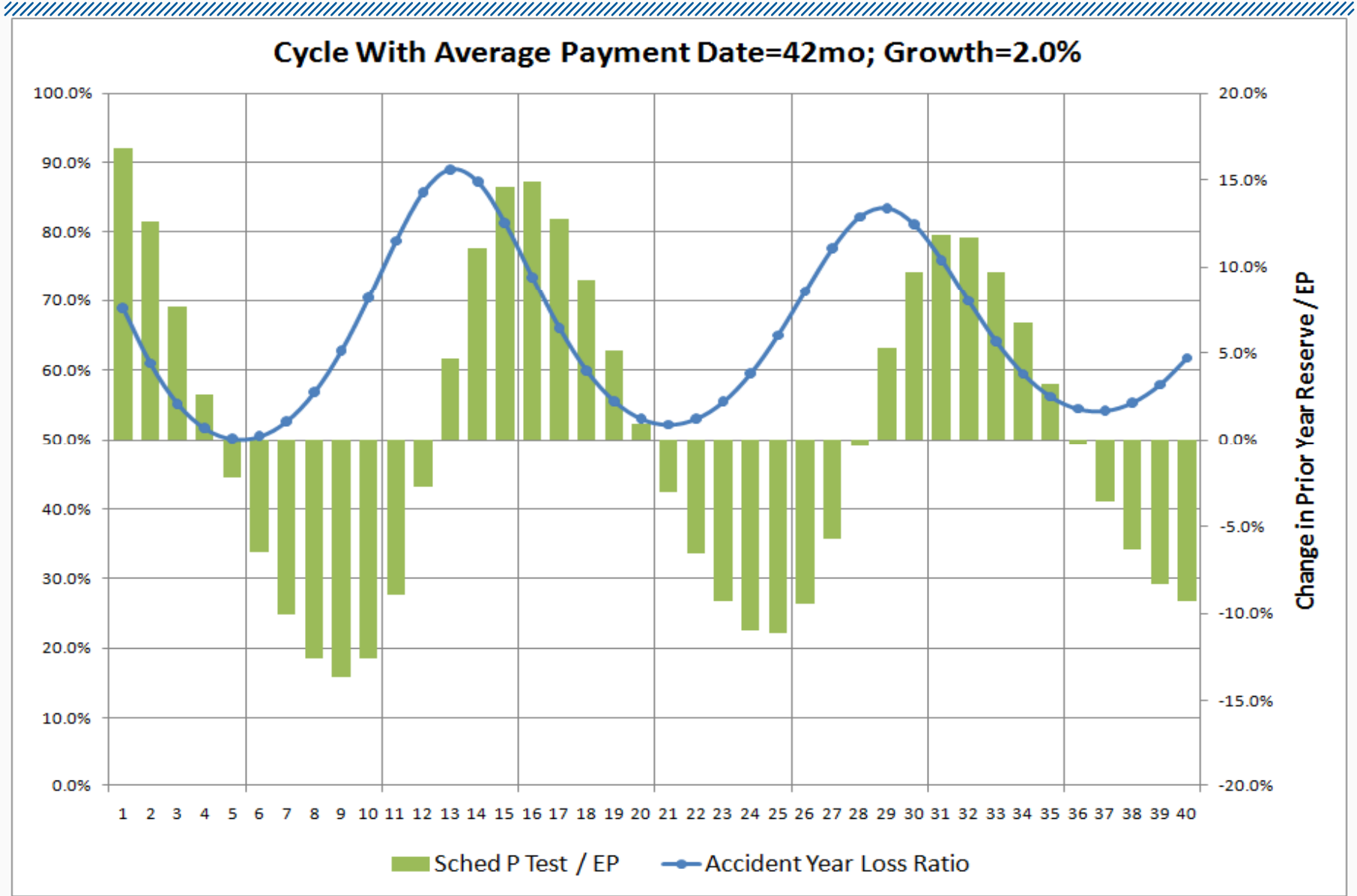
If $n=1$ and $\beta_2 = 1$ and $\beta_k = 0$ for $k \neq 2$ (all loss paid in 2nd year):

$$CYIL_j - L_j = CYIL_{j-1} - CYIL_{j-2}$$

$$CYIL_j = a \cdot \cos\left(2\pi \cdot \frac{j}{6} + b\right) \quad \text{where } a \text{ and } b \text{ are arbitrary constants}$$

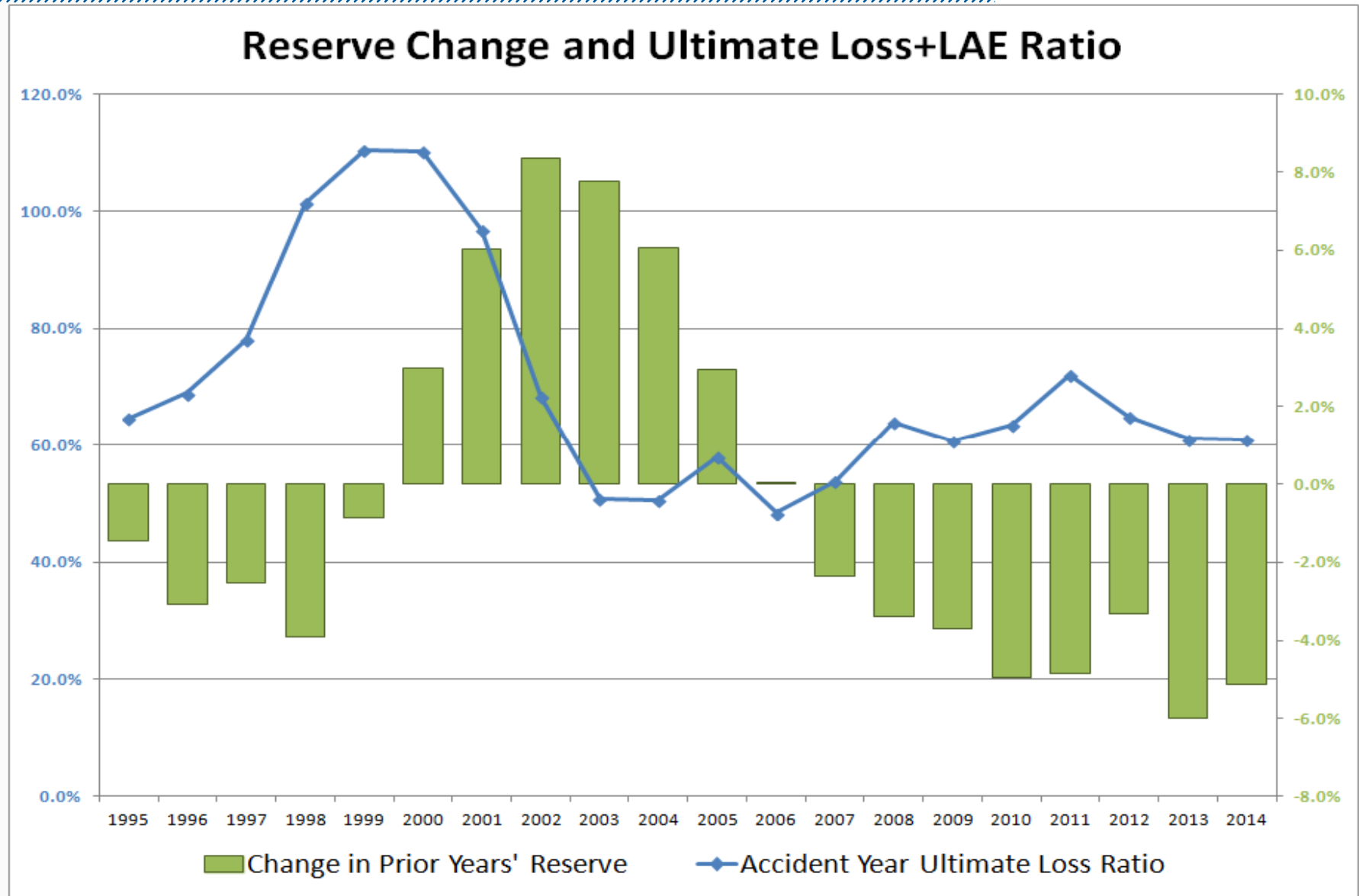
A Mathematical Model of the U/W Cycle

Reserve Change Predicts AY Loss Ratio Change



Example for Specialty Carriers

Source: SNL





- We see both a pricing cycle and a reserving cycle, which are inter-related.
- The reserving cycle continues today.
- Endogenous factors (insurance industry behavior) are a sufficient explanation for much of the observed cycle.

David R. Clark “How to Create a Market Cycle” (working paper, 2010)

<http://www.casact.org/research/wp/>

Donald Mango and Gary Venter “An Introduction to Insurer Operational Risk”

www.actuaries.org/ASTIN/Colloquia/Orlando/Papers/Mango3.pdf

Sean M. Fitzpatrick; “Fear is the Key: A Behavioral Guide to Underwriting Cycles”

Connecticut Insurance Law Journal, Vol. 10, No. 2, pp. 255-275, 2004

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=690316##



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