Market Cycle:
Validation of a Rate Change Index via Regression

October 2009

Agenda

Preliminaries – Purpose of Rate Monitor

Regression Model

Example(s) with Actual Data

Interpreting the Model

Making use of the Model

Preliminaries

What is the purpose of a rate monitor?

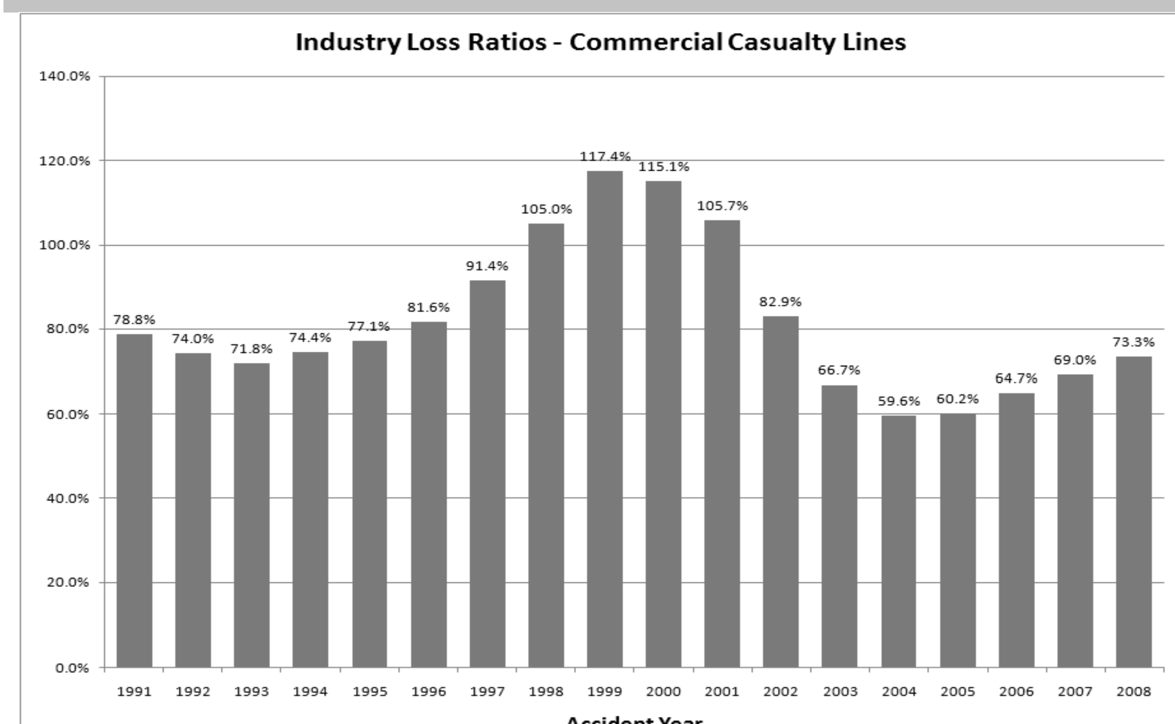
•Practical: Evaluate how prices are changing

•Statistical: Rate monitor is an explanatory variable that predicts movement in profitability.

Don't Ask: *"Do I believe this rate index?"*

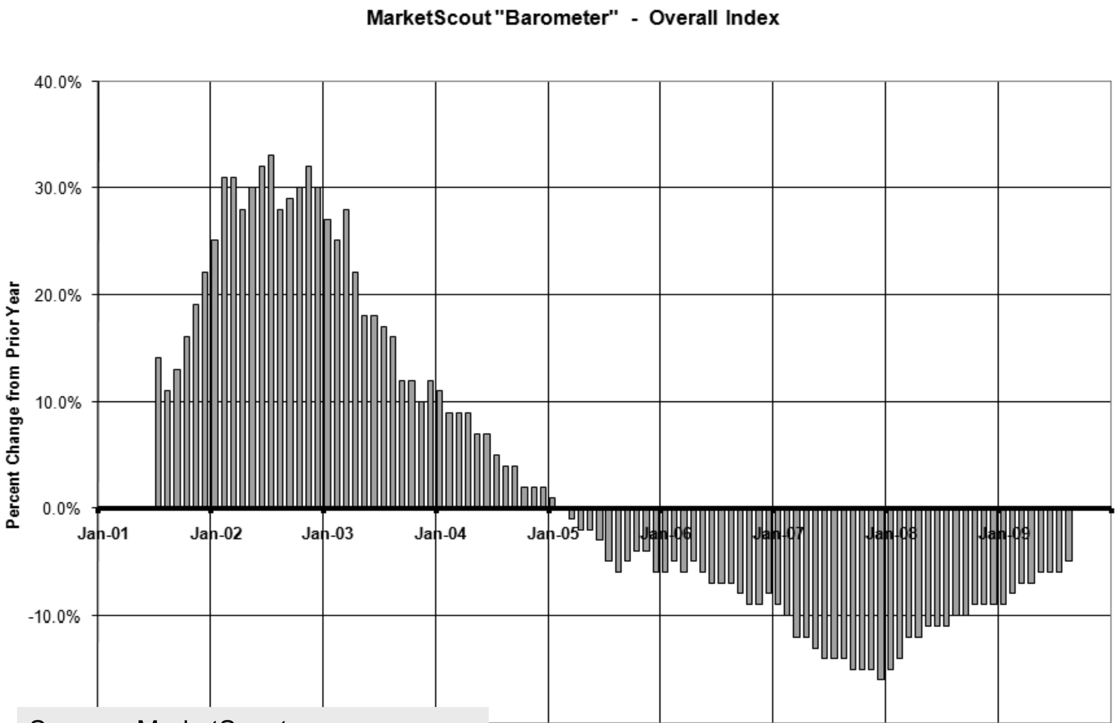
Instead Ask: *"Does this rate index have explanatory power?"*

Preliminaries



Source: Industry Schedule P

Preliminaries



Source: MarketScout

Preliminaries

	Loss Ratio Change versus Rate Change		
	Carried		
Accident	Ult. Loss	Percent	Market Scout
Year	Ratios	Improvement	AY Change
2001	105.7%		
2002	82.9%	105.7% / 82.9% = 27.5%	22.2%
2003	66.7%	82.9% / 66.7% = 24.3%	25.3%
2004	59.6%	66.7% / 59.6% = 12.0%	10.8%
2005	60.2%	59.6% / 60.2% = -1.0%	1.0%
2006	64.7%	60.2% / 64.7% = -7.1%	-5.3%
2007	69.0%	64.7% / 69.0% = -6.2%	-9.8%
2008	73.3%	69.0% / 73.3% = -5.8%	-13.3%

Rate Monitor Sources

Survey Data:

Pros: 1) Available quickly

2) Can include opinions on subtle changes (terms & conditions, etc)

Cons: 1) Possible bias based on who responds to the survey

2) Difficult to compile consistently over a long period

3) May not apply to a specific book of business

Preferable to calculate a rate change index specifically for a book of business.

Defining a Regression Model

We can define the relationship between loss ratios in different accident years based on trend and rate change.

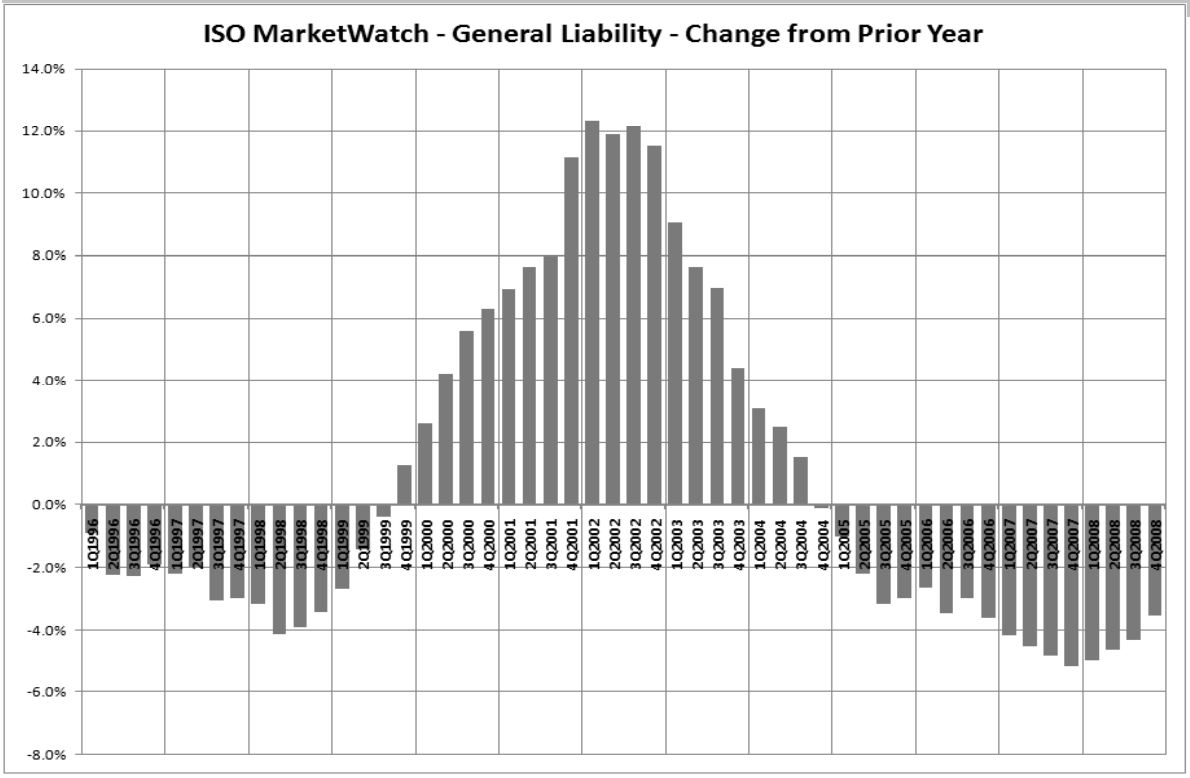
$$LR_{year\ t} \approx LR_{year\ 0} \cdot \frac{(1 + trend)^t}{\{Rate\ Index_{year\ t}\}^\beta}$$

This relationship can then be rearranged into a linear form by taking the logarithms of each side.

$$ln(LR_{year\ t}) = ln(LR_{year\ 0}) + ln(1 + trend) \cdot t + \beta \cdot ln(Rate\ Index_t) + e_t$$

Example of Regression Model

Munich Re America
Munich Re Group



Example of Regression Model

Munich Re America
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ISO MarketWatch:

•Source of data

•Market share and segment represented

•How the index is calculated (note: it gets modification factors, ILFs, etc)

•What would not be included

Example of Regression Model

Munich Re America
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General Liability - Total GL (prem/ops and products combined)

	Loss	ISO	Y	X					
AY	Ratio	Index	log(LR)	Time	log(Index)	Fitted	log(Fit)		
1992	72.9%								
1993	74.1%								
1994	78.2%								
1995	74.1%								
1996	80.3%	0.9919	-0.218838	0	-0.008099	78.9%	-0.236541	Beta	2.18
1997	81.9%	0.9708	-0.199091	1	-0.029662	85.2%	-0.159999	Net Trend	3.01%
1998	94.9%	0.9401	-0.052073	2	-0.061738	94.1%	-0.06058	Base ELR	77.6%
1999	99.8%	0.9153	-0.002489	3	-0.088493	102.8%	0.02726		
2000	101.8%	0.9336	0.0176277	4	-0.068691	101.4%	0.0137927	R^2	98.2%
2001	95.3%	0.9950	-0.048119	5	-0.005021	90.9%	-0.09513	# points	12
2002	74.8%	1.1015	-0.289928	6	0.0966721	75.1%	-0.286789	# param	3
2003	65.6%	1.2087	-0.421924	7	0.1895726	63.2%	-0.459316	**Adj R^2**	**97.8%**
2004	59.0%	1.2590	-0.526975	8	0.2303401	59.5%	-0.518403		
2005	60.6%	1.2529	-0.500374	9	0.2254864	62.0%	-0.478219		
2006	67.0%	1.2169	-0.400199	10	0.1962822	68.0%	-0.38505		
2007	76.6%	1.1698	-0.26624	11	0.1568604	76.4%	-0.269647		
2008		1.1137		12		87.5%			
			-0.242385				-0.242385		

Regression: log(LR) = Time * alpha + log(Index) * beta + constant

Example of Regression Model

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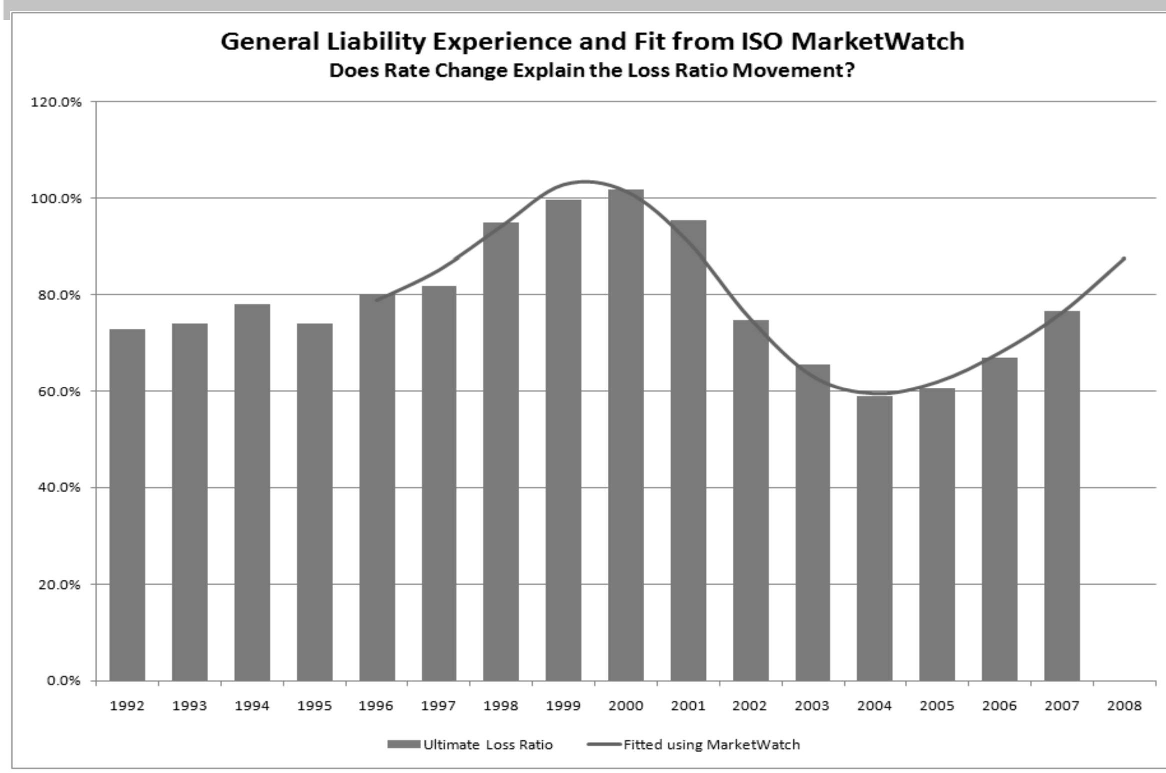


Interpreting the Regression Output

The ISO Market Watch rate change index is based on matching expiring and renewal policies. Some other effects may also be taking place at the same time:

- Wider swing in adequacy of new business
- Shifting of rating classifications
- Enforcement of exposure audits
- Tightening or relaxing of terms & conditions

The modeled coefficient of **2.18** magnifies the cycle beyond what is captured in the expiring/renewal index.

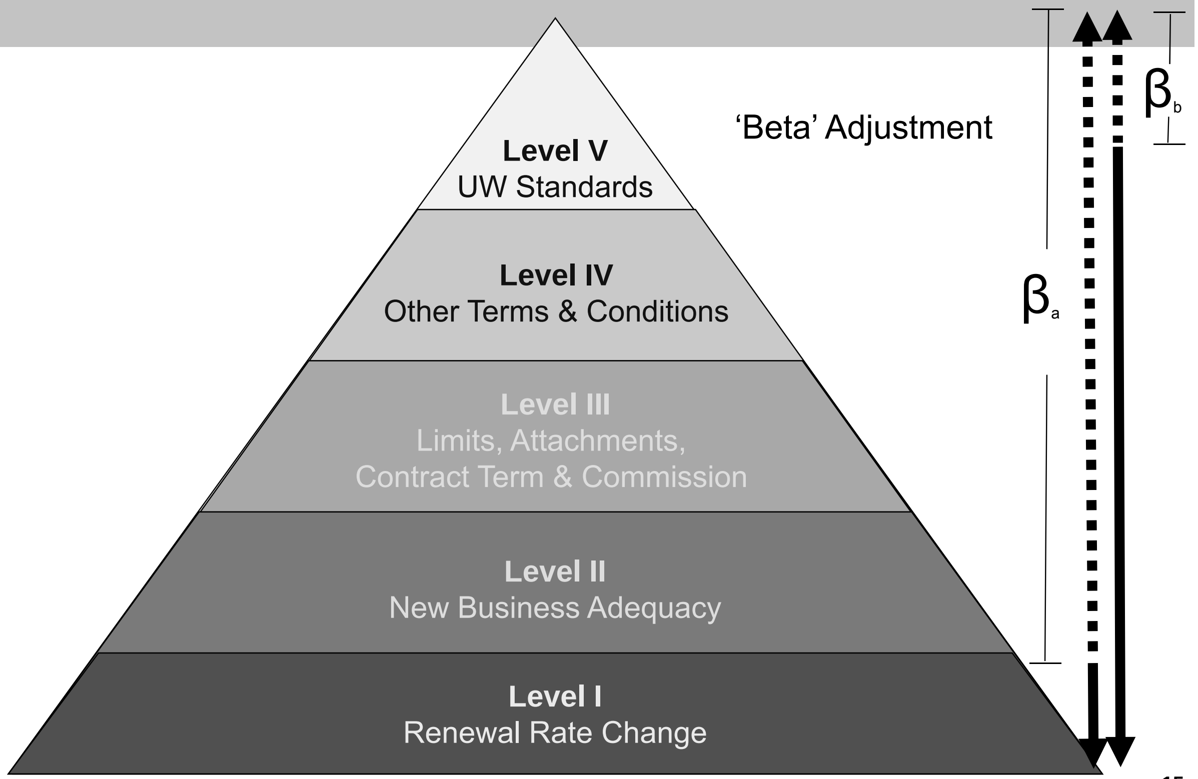
Rate Monitors and Beta

Beta's are specific to a book of business. They are a function of:

1. Sensitivity to the underwriting cycle
   - Dependent on the particular market
   - Dependent on the client's strategy (e.g. Impact of growth objectives on loss ratios)
2. The information not captured in a client's rate monitor or loss index
   - In the U.S., client's typically calculate their own rate changes but their is no standard calculation.

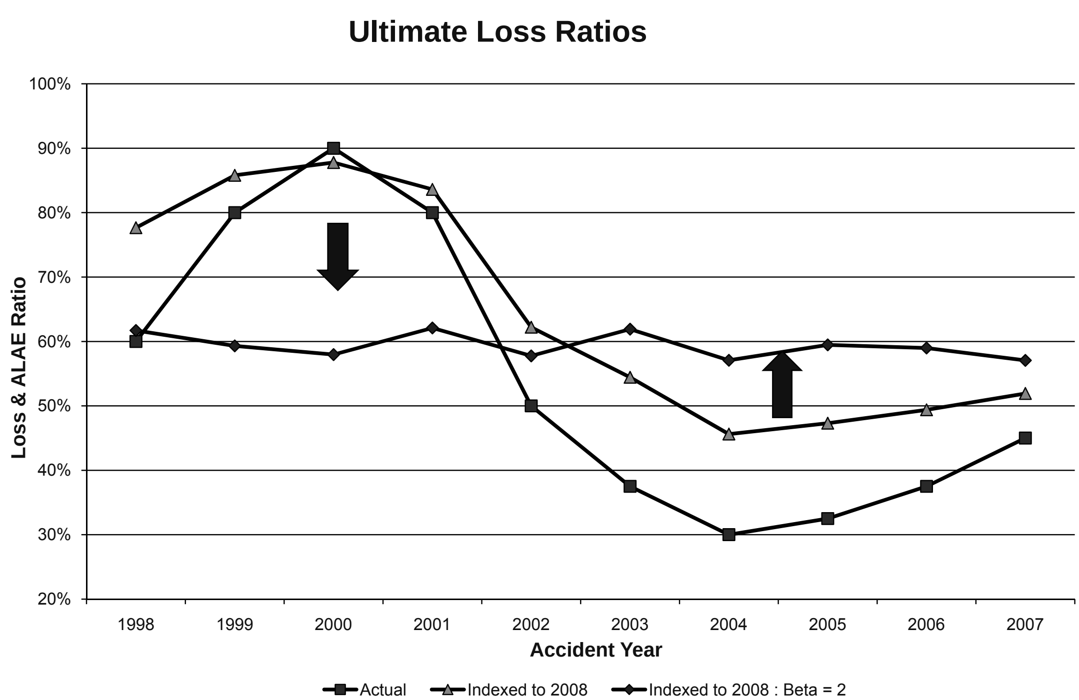
Interpreting the Regression Output

Rate Change Pyramid



Interpreting the Regression Output

Reinsurance Pricing
Individual Account Example



Residual Trend

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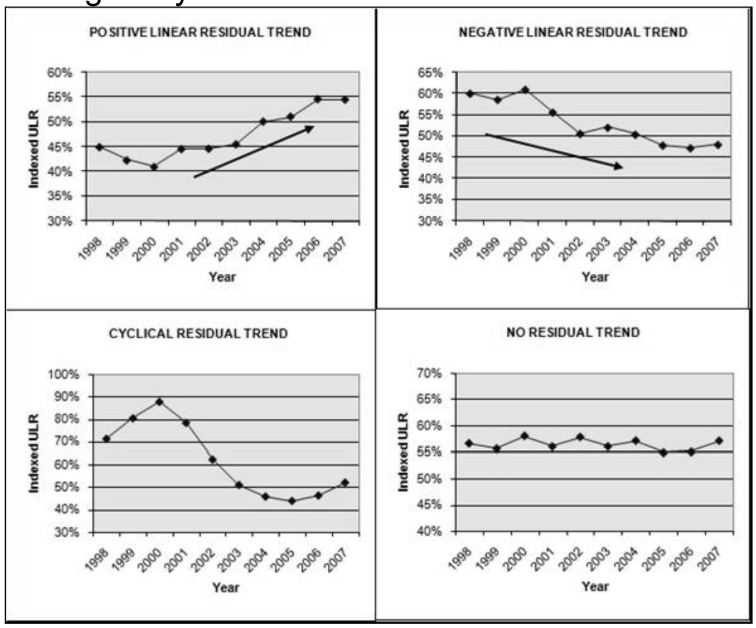
Index Testing: Do your Indexed ULRs show a “residual trend”?



Reserving

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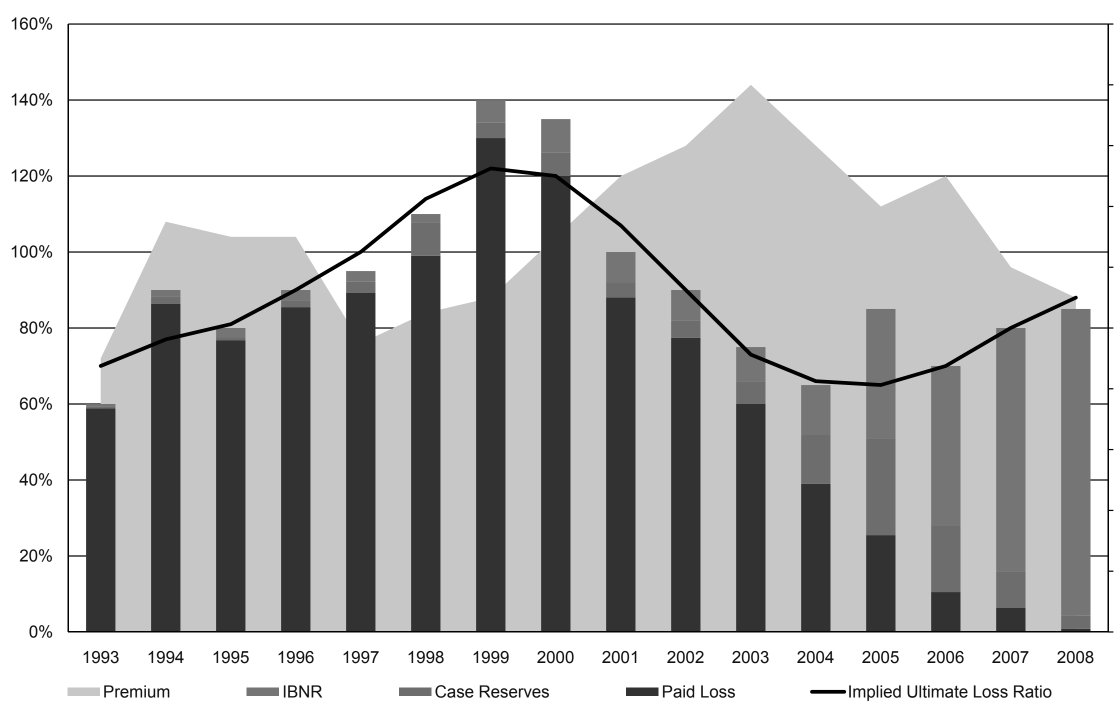

Conclusion

Good rate monitors exist and are an important tool that should be used throughout the Insurance Control Cycle

Thank you very much for your attention.

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