



CARIBBEAN ACTUARIAL ASSOCIATION



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# **2016 Annual Conference**

## ***Connecting Minds: Sharing Knowledge and Impacting Societies***

**CAA 26th Annual Conference &  
25<sup>th</sup> Anniversary Celebration**

**Torarica Hotel  
Paramaribo, Suriname**

**30<sup>th</sup> November to 2<sup>nd</sup> December 2016**





# Competitive Pricing for Car Insurance

## Part 1 – Introduction to Ratemaking

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2<sup>nd</sup> December 2016



# Agenda

- Introduction & Basics
- Ratemaking Elements
- Ratemaking Adjustments
  - Losses
  - Premiums
- Indicated Rate Change
- Classification Ratemaking
- Predictive Modelling

# Introduction

## Ratemaking Objectives

- Typical objective is to determine the “indicated” rate level such that:
  - The present value of the revenue cash flows for a certain future period is equal to ...
  - The present value of the corresponding expected claim costs and expense costs (including a provision for profit) for that period
- A prospective exercise

## Ratemaking Considerations

- Stability vs. Responsiveness
  - Experience Period
- Homogeneity vs. Credibility
  - Combine risks that are sufficiently alike
  - Maintain a critical mass
  - Signal vs. Noise

# Introduction (cont'd)

## Ratemaking Process

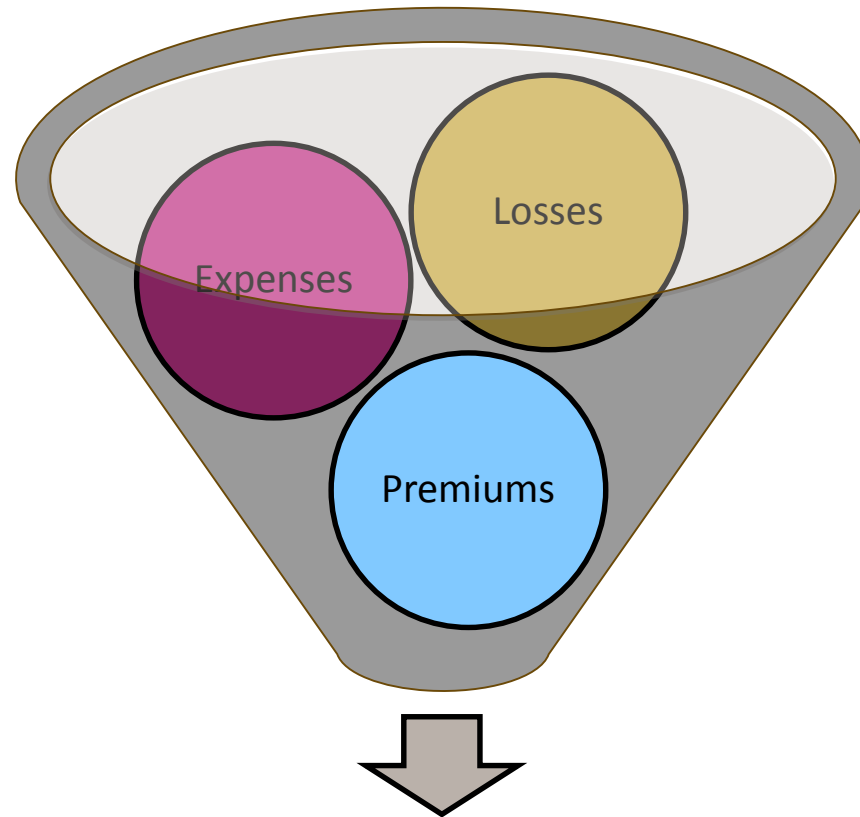
- Compilation and analysis of data
- Development of pricing tactics
  - Competitive analysis concurrent with actuarial analysis
  - Tactical decision-making (actuarial indications vs. market analysis)
- Approval by regulator (if required)
- Implementation
  - Loading and testing new rates
  - Lead time to brokers

# Introduction (cont'd)

## Data Structure

- Accident Year
  - Premium data grouped by accounting year
  - Claim data grouped by year of accident
  - Good match between premiums and claims
  - Claims evolve over time
  - Requires estimation of ultimate values
- Other data structures
  - Policy or underwriting year
  - Accounting year

# Ratemaking Elements



**Rate Indication**



# Ratemaking Elements (cont'd)

## Exposures (vehicle counts), Premiums

- Written and Earned

## Claims and Claim Counts

- Paid (closed), outstanding (open), and incurred
- Ratios and statistics
  - Frequency = # claims ÷ exposure units
  - Severity = claim dollars ÷ # claims
  - Loss cost = claim dollars ÷ exposure units
  - Loss ratio = claim dollars ÷ earned premiums

# Ratemaking Elements (cont'd)

## Expenses

- Loss Adjustment Expenses
  - Allocated (external)
  - Unallocated (internal)
- Other Expenses
  - Fixed vs. variable
  - Known vs. estimated

# Ratemaking Elements (cont'd)

## Profit Provision

- A margin over and above expected hard costs
- Profit = Premium – (Losses + Expenses)
- Considers investment income on insurance operations and investment income on capital

# Ratemaking Adjustments

## Adjustments to Losses

- Loss development
- Loss cost trend
- Product changes

## Adjustments to Premiums

- Premium trend
- Rate level changes
- Product changes

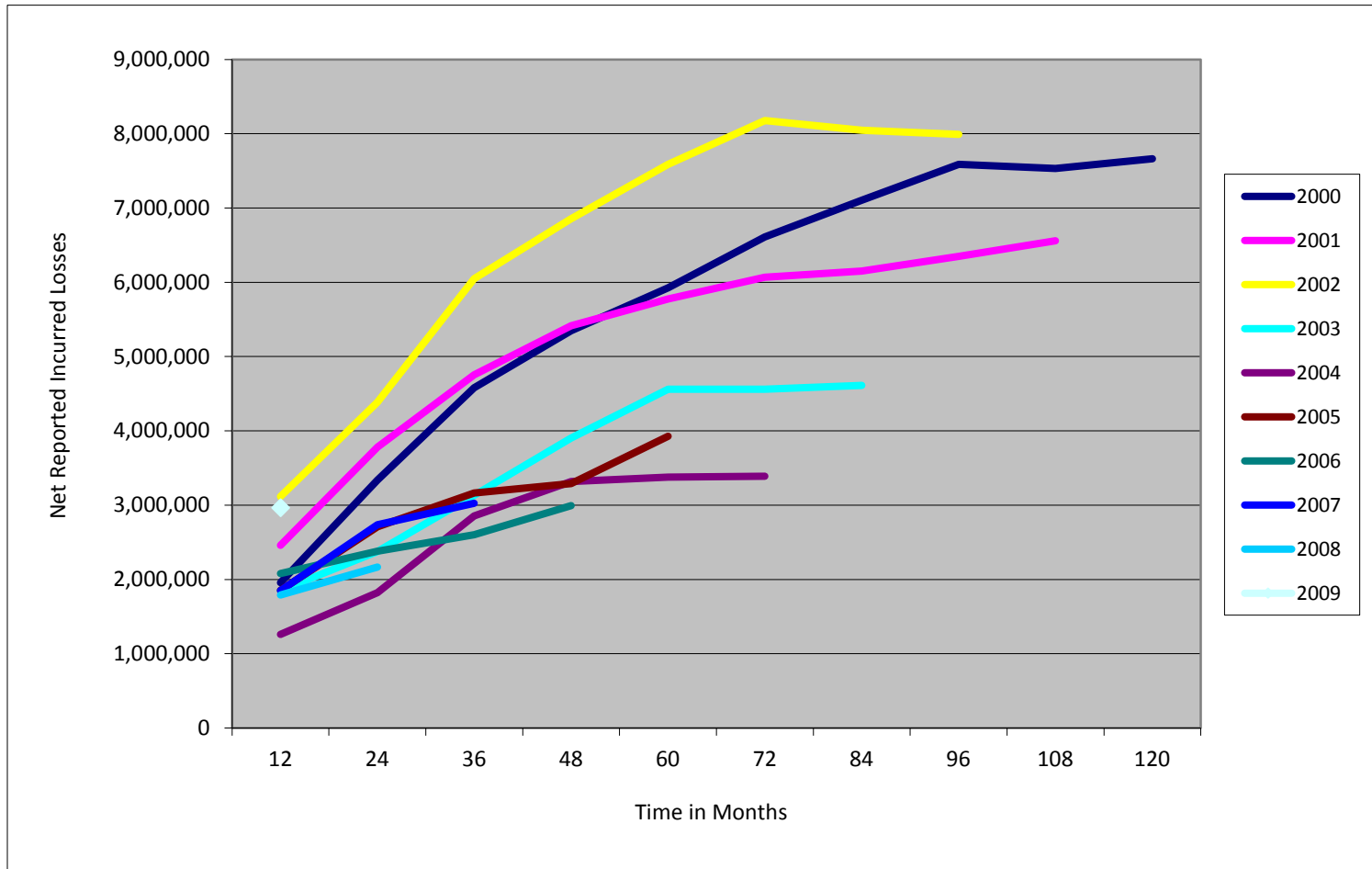
# Ratemaking Adjustments (cont'd)

## Loss (Claim) Development

- Estimate the ultimate values of claims and claim counts
- Use past development experience to estimate future development
  - The most recent data is the least mature and (accordingly) the most uncertain
  - The oldest data is mature, but may not be relevant (e.g. changes in book of business, product reform)

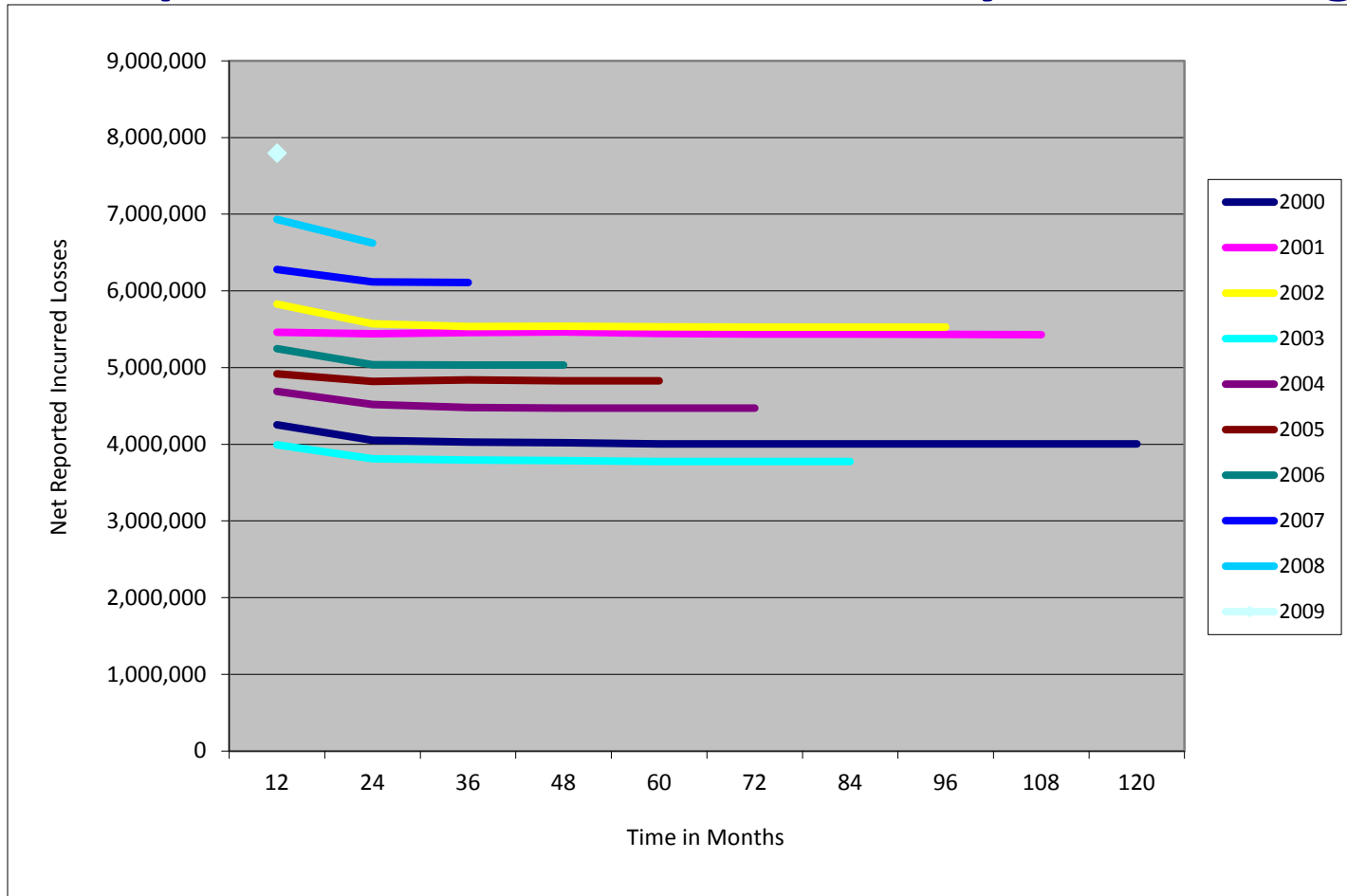
# Adjustments to Losses (Cont'd)

## Loss Development illustration – Auto bodily injury



# Adjustments to Losses (Cont'd)

## Loss Development Illustration - Auto Physical Damage



# Adjustments to Losses (Cont'd)

## Loss Development Illustration – Auto Medical Expenses (No Fault)

Accident Year	Cumulative Incurred Losses – By Development Period (Months)					
	<u>12</u>	<u>24</u>	<u>36</u>	<u>48</u>	<u>60</u>	<u>72</u>
2005	765	851	901	953	988	1,011
2006	851	993	1,052	1,105	1,130	
2007	947	1,147	1,224	1,311		
2008	1,095	1,405	1,498			
2009	1,257	1,761				
2010	1,913					

Accident Year	Loss Development Factors				
	<u>24/12</u>	<u>36/24</u>	<u>48/36</u>	<u>60/48</u>	<u>72/60</u>
2005	1.112	1.059	1.058	1.037	1.023
2006	1.167	1.059	1.050	1.023	
2007	1.211	1.067	1.071		
2008	1.283	1.066			
2009	1.401				



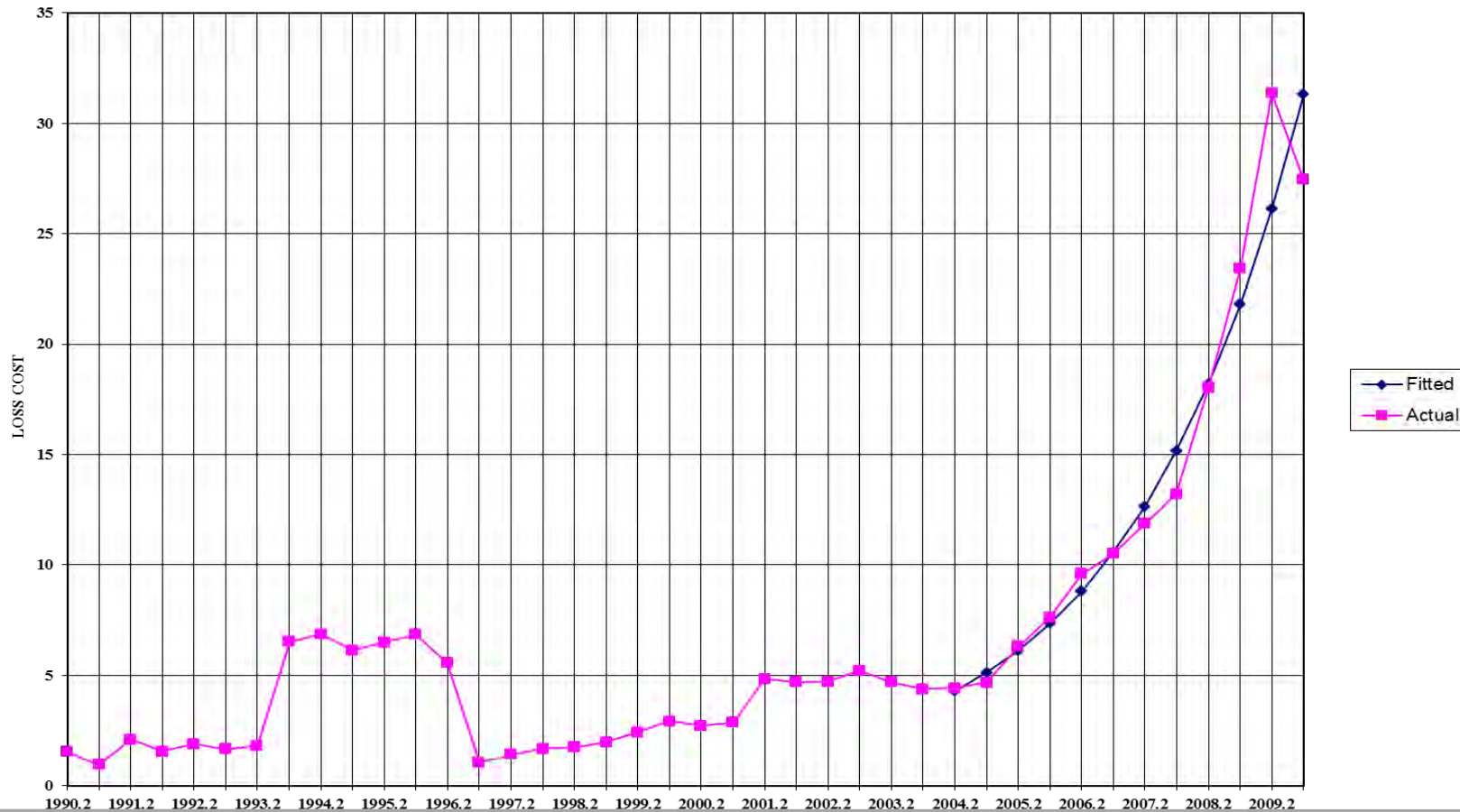
# Adjustments to Losses (Cont'd)

## Loss Trend

- Recognize the effects of economic and social influences over time
- Adjust estimated ultimate claims from an average accident date in the past to an average accident date in the future
- Trend based on loss costs, or separate analysis of frequency and severity
- Consider product reforms

# Adjustments to Losses (Cont'd)

IBC INDUSTRY DATA (AIX DATA - AB BY KOL)  
ONTARIO --- PRIVATE PASSENGER VEHICLES  
LOSS COST TREND  
ACCIDENT BENEFITS - CAREGIVER DISABILITY (KOL 48 68)



# Adjustments to Losses (Cont'd)

## Other Adjustments

- E.g. - Ontario Automobile for example
  - Change to no-fault June 1990 (increase accident benefits, reduction to third party liability)
  - Many product reforms since then

## Other Adjustments

- Data
- Large losses
- Catastrophe losses

# Adjustments to Premiums

- **Premium is also subject to trends**
  - Natural change over time in class mix
- **Rate level (on-level) adjustments**
  - To recognize impact of rate changes through time
- **Product Reforms**

# Indicated Rate Change

## Indicated Average Rate Level Change

- Compare future loss ratio to PLR
  - Future loss ratio based on adjusted premiums and adjusted losses (incl. trend to future loss date)
  - Select permissible loss ratio  
( $PLR = 100\% - \% \text{ expenses}$ )
- Consider credibility of indications
  - An objective measure of the level of confidence being assigned to a given statistic
  - Range of credibility is 0% to 100%
  - Select a balance of credibility (if data not fully credible)
    - Broader experience base
    - Prior analysis

# Indicated Rate Change (Cont'd)

- Indicated Average Rate Level Change
  - Work done in accordance with accepted actuarial practice
  - In accordance with standards of practice and applicable regulations
  - Consider other guidance (e.g. Educational Notes)
- Proposed Average Rate Level Change
  - Market considerations
  - Policyholder impact
  - Dislocation

# Classification Ratemaking

- Distribute the indicated or proposed average rate level change across categories, such as
  - Territories or regions
  - Vehicle use
  - Type and age of vehicle
  - Operator's accident & conviction record
- System used to assign risks to groups based upon the expected cost or benefit

# Classification Ratemaking (Cont'd)

- Characteristics of a good classification system
  - Objective
  - Practical, reasonable
  - Classifications are exhaustive and mutually exclusive
  - Classifications are publicly acceptable
- Statistical Considerations:
  - Homogeneity
  - Credibility
  - Predictive stability (statistical sense)

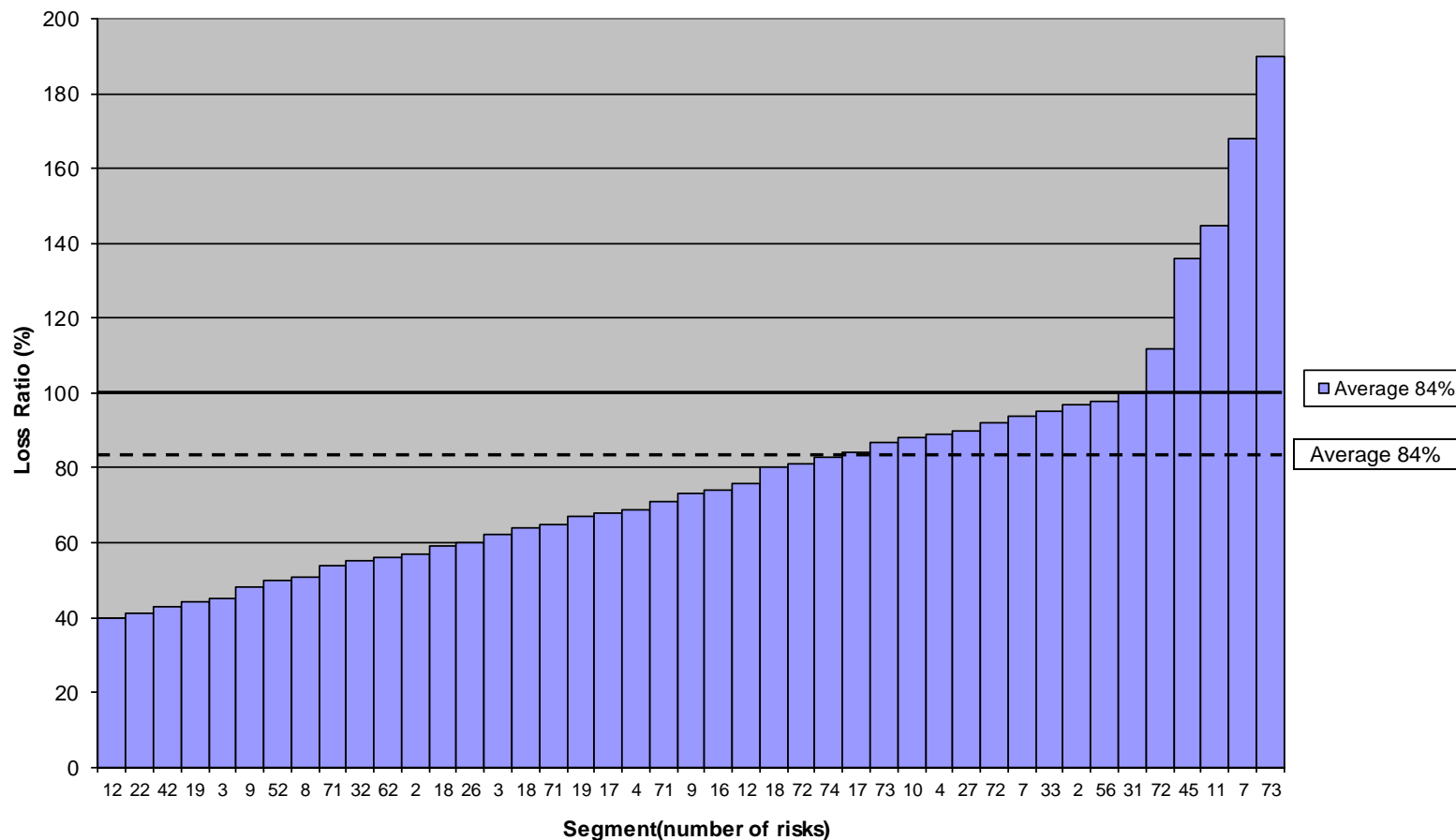


# Predictive Modelling

- Form of data mining
  - Data mining is the analysis of historical data to discover relationships between data elements
- Defensive strategies
  - Help determine market inefficiencies
  - Mitigate the risk of anti-selection
- Offensive strategies
  - Helps understand consumer behaviour
  - Identify pockets of business offering opportunities for profitable growth

# Predictive Modelling (Cont'd)

## ABC Insurance Company Automobile - Countrywide



# Opportunities & Challenges

- Automotive engineering
  - Passive & active safety features
  - Autonomous vehicles (future of insurance)
- Distracted driving

# Thank you ...

*Questions ??*

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