Price Optimization

CAMAR Fall 2010 Meeting

December 2, 2010

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Agenda

- What is price optimization?
- Key aspects
  - inputs
  - algorithm
  - implementation
- Business benefits and wider implications

Background

Current pricing abilities scorecard for the insurance industry

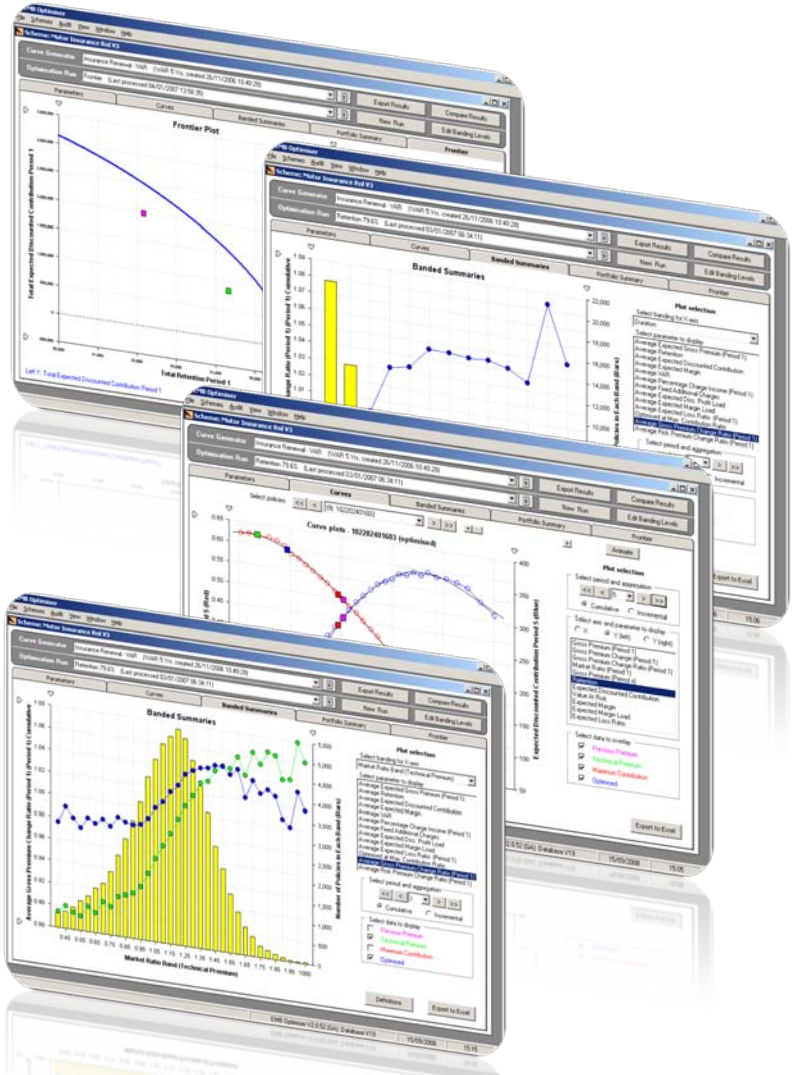
Task	Ability
Aggregate loss costs	
Granular loss costs	
Price competitive position	
Policyholder reaction to price	
Bringing it all together	

What is Price Optimization?

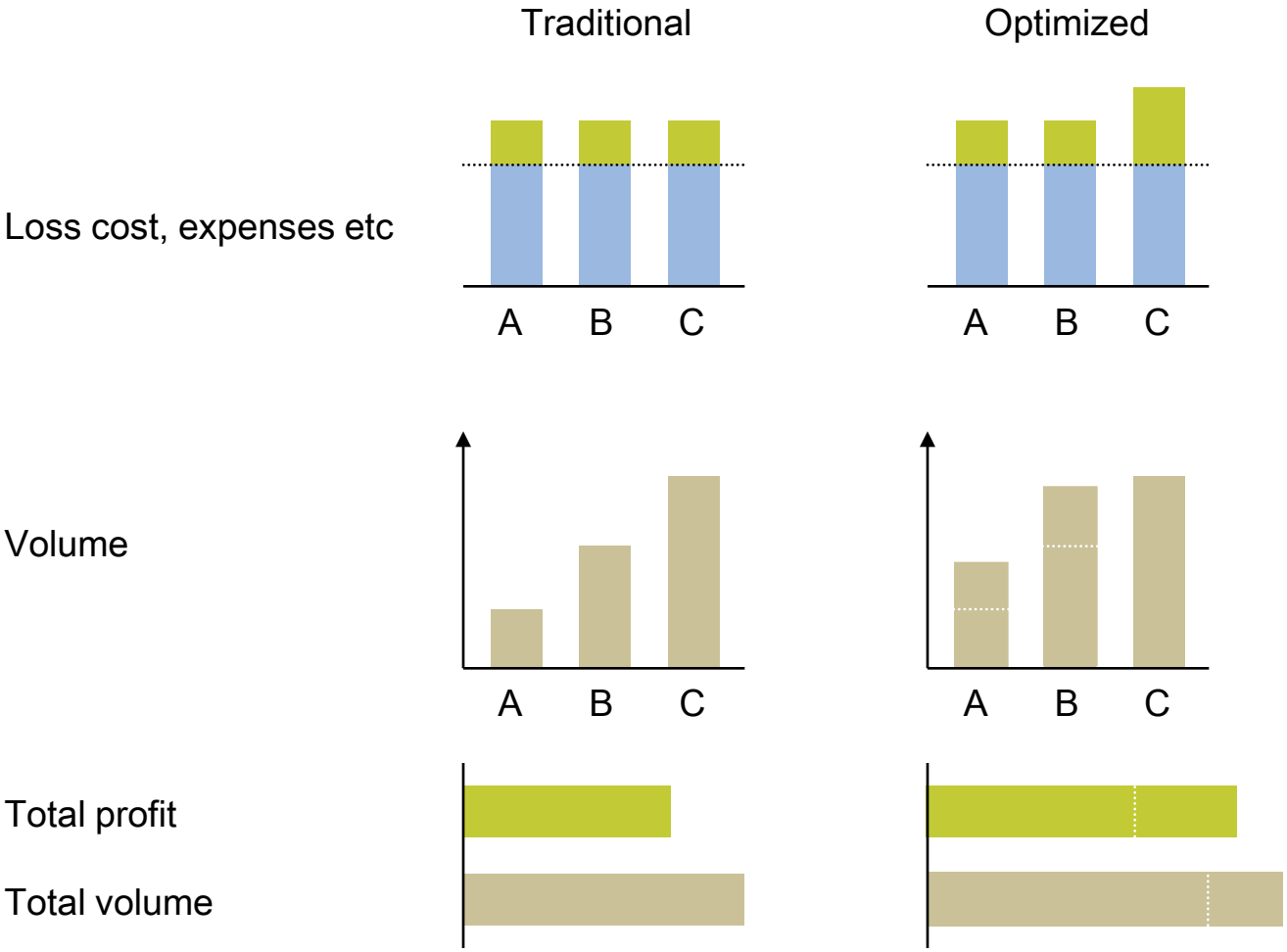
A method that *systematically* combines

- Risk models
- Customer behavior models
- Business goals / constraints

Thousands of rate scenarios are run to determine options that best achieve your profit and volume goals, subject to your constraints.



What is Price Optimization?



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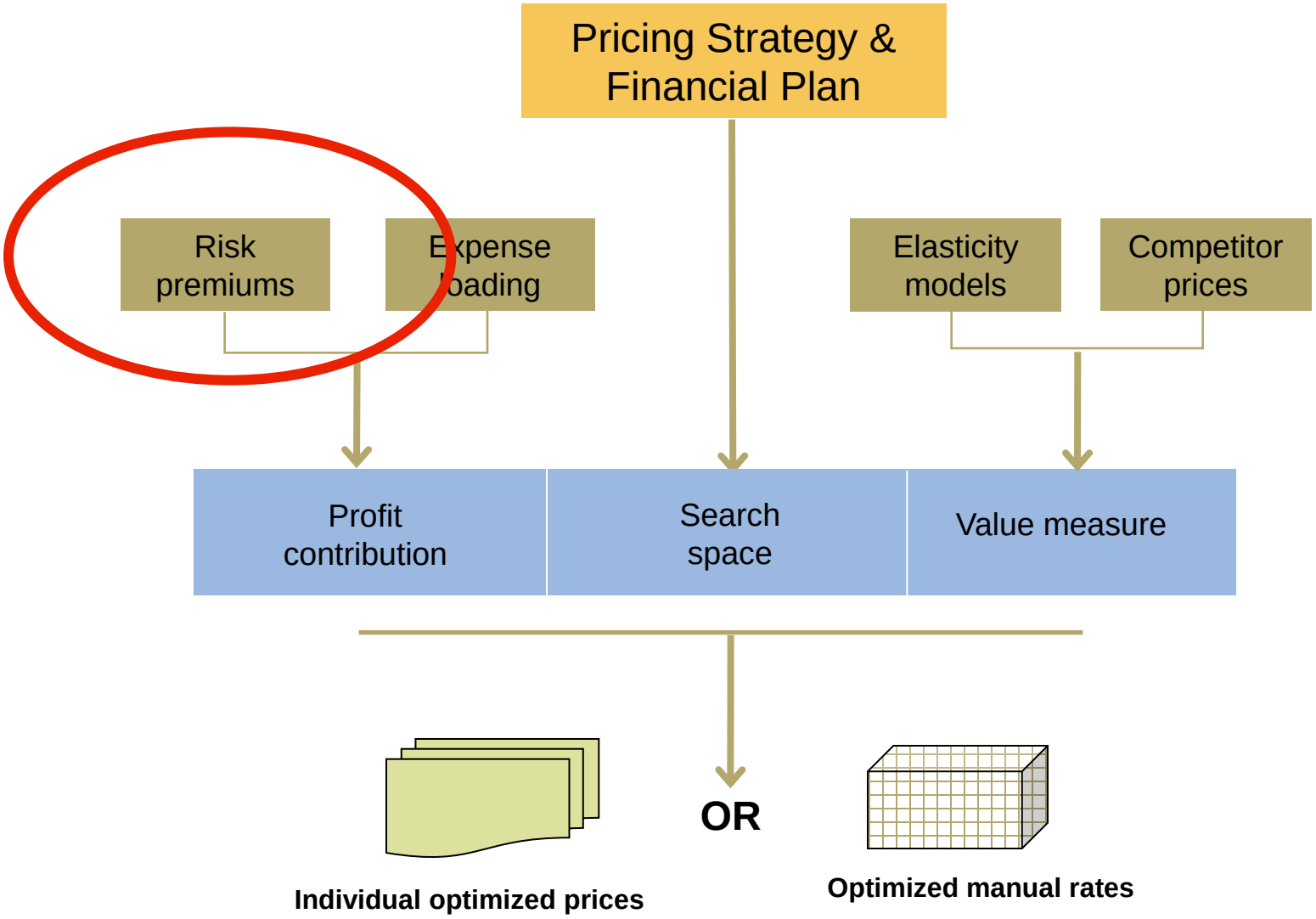
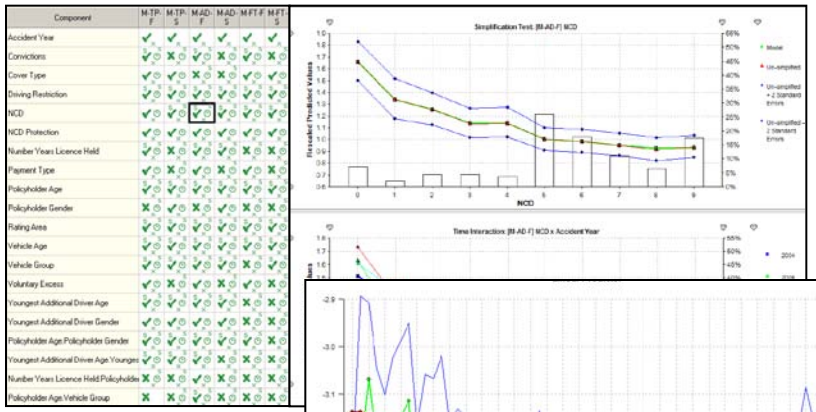
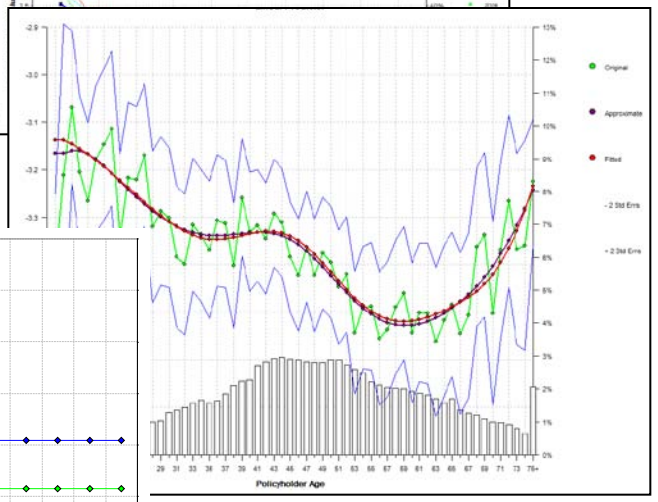
Price optimization

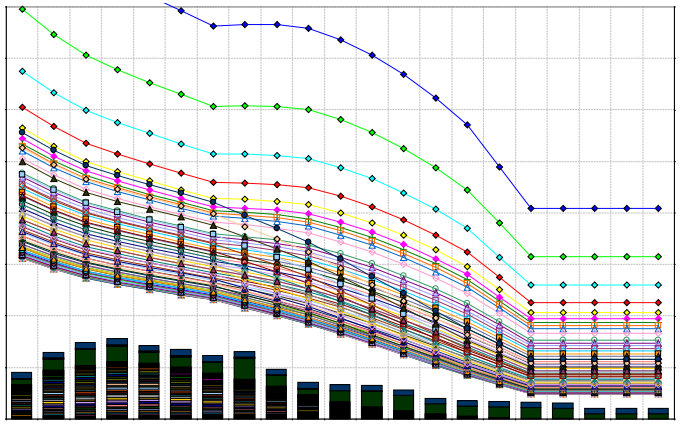


Risk premium models

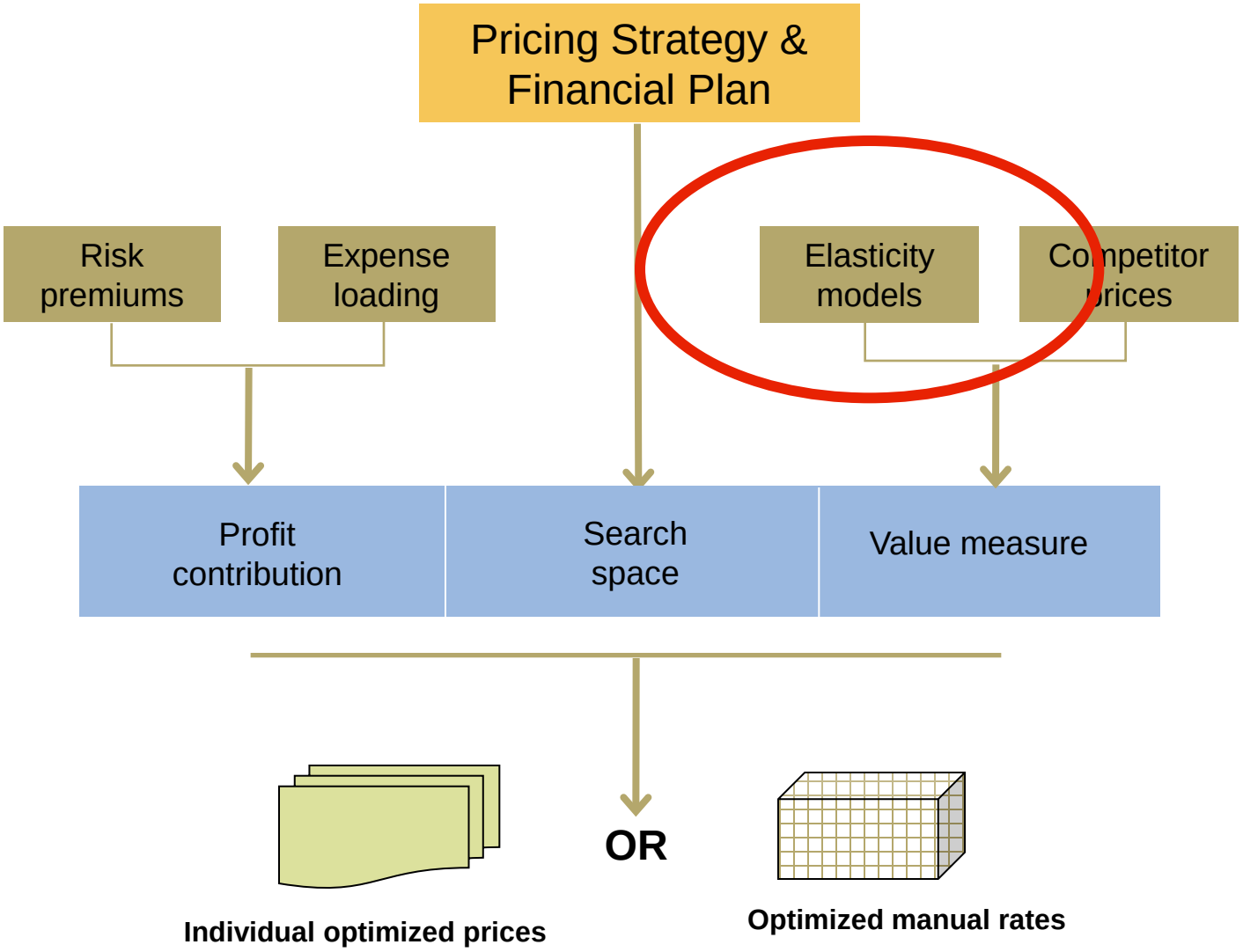
- GLM global industry standard; just using them is not enough - need to be used
  - with increased data
  - and high degree of sophistication
  - coupled with practical experience
- E.g…
  - multiple interactions
  - curve fitting within GLM framework
  - model validation
- Classification
  - geography
  - vehicle make/models



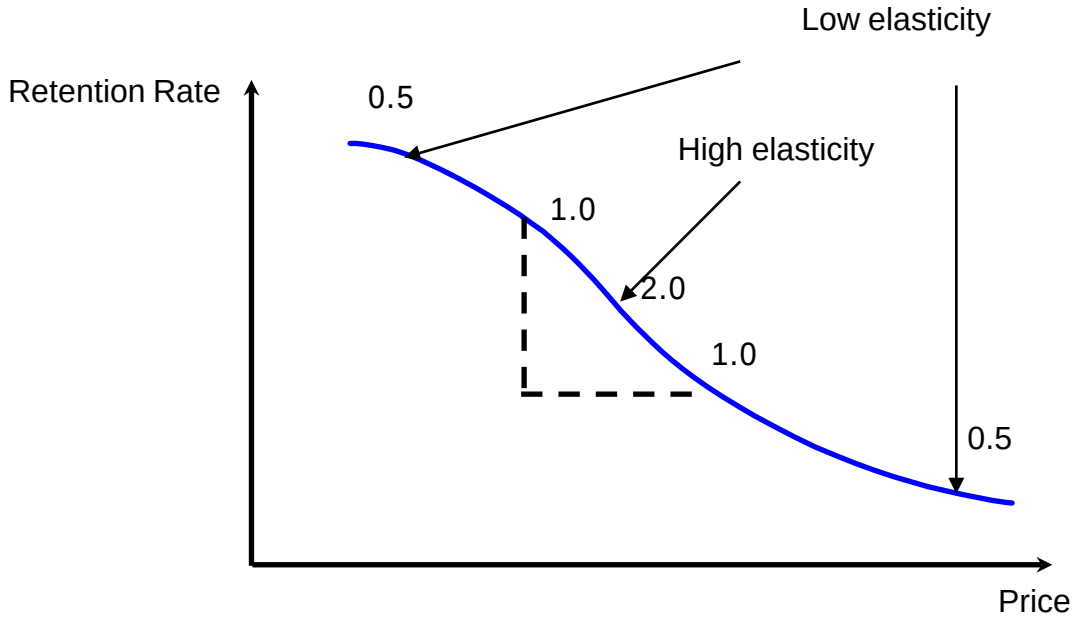




Price optimization

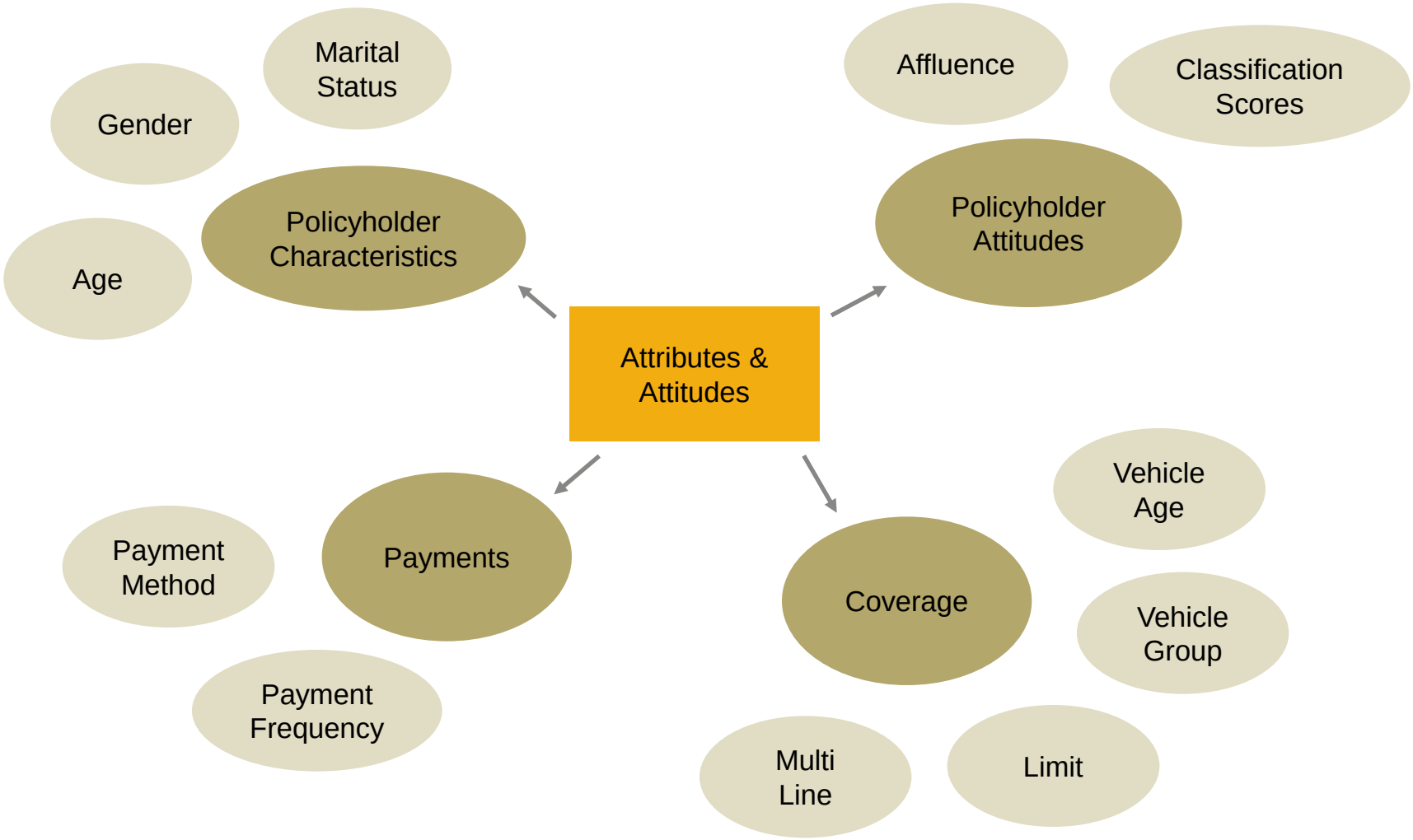


Elasticity



- There are different definitions of elasticity
- Common definition is % change in demand for % change in price
- Price elasticity varies by price and varies between new/renewal:
  - "Policyholder X has elasticity Y" ✖
  - Be wary of assuming straight lines (even in linear predictor space)

Customer characteristics



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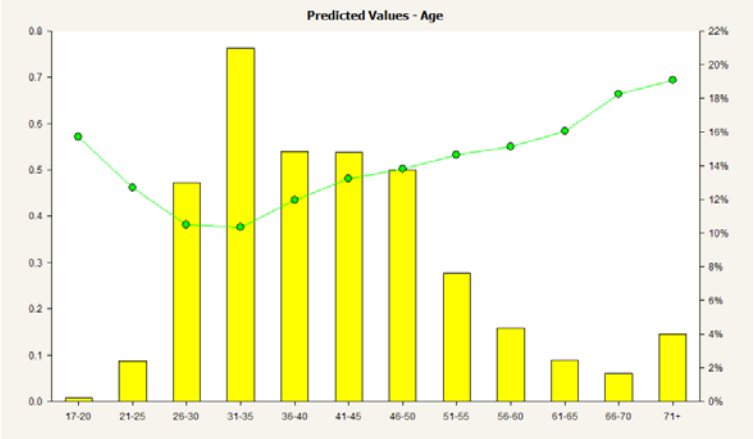
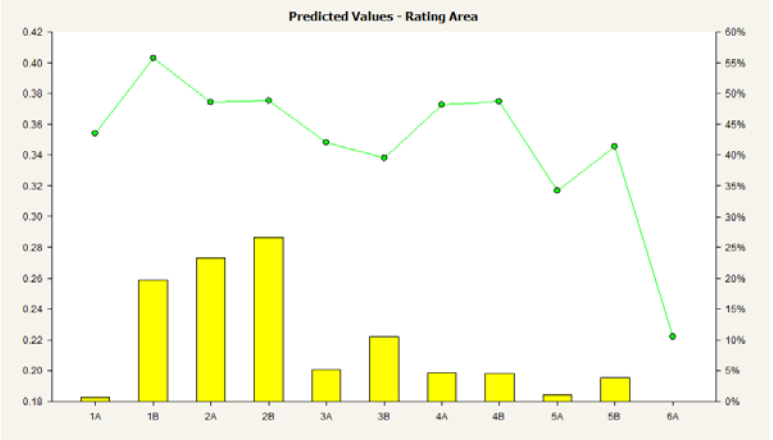
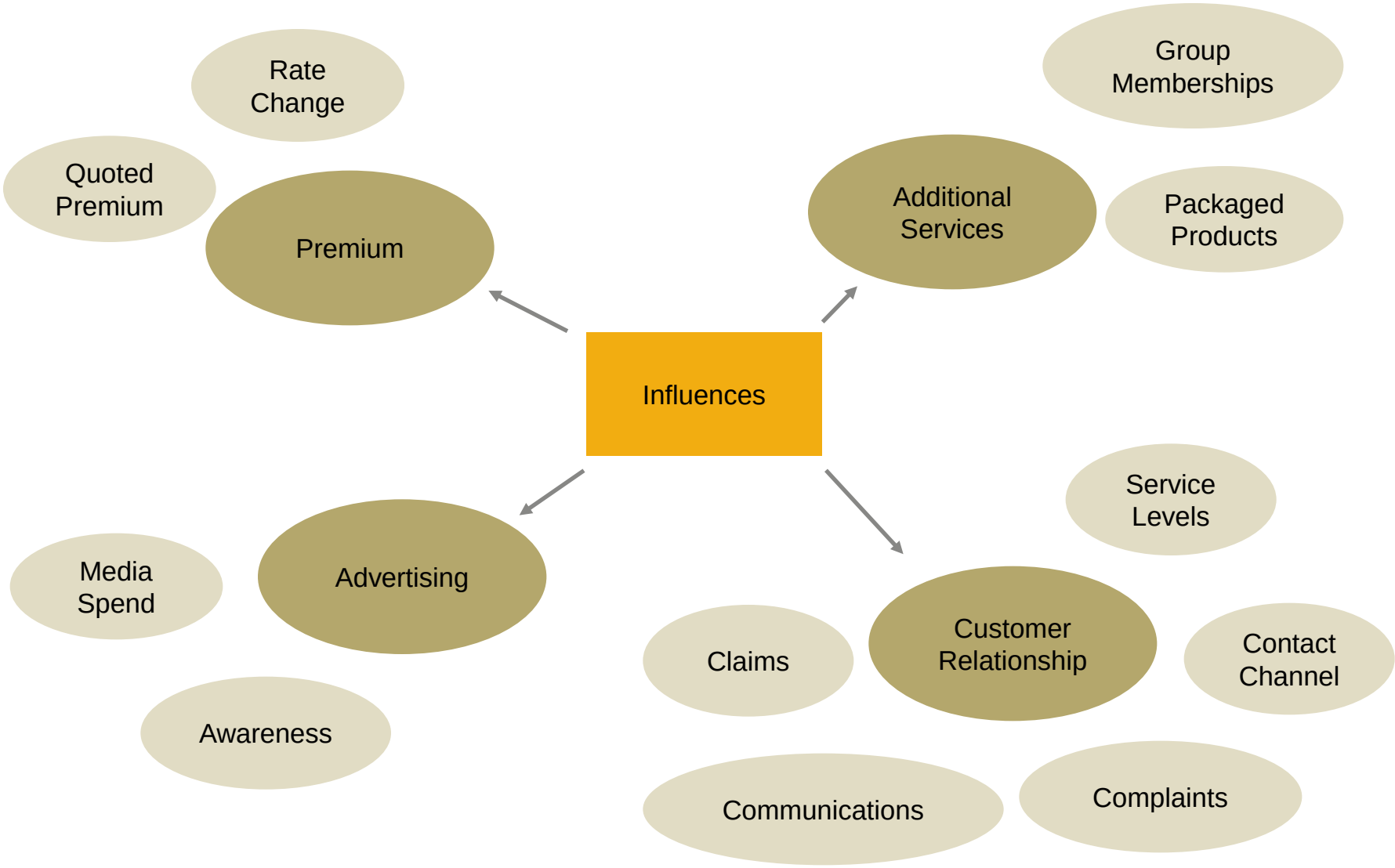


- Retention varies by geographic region

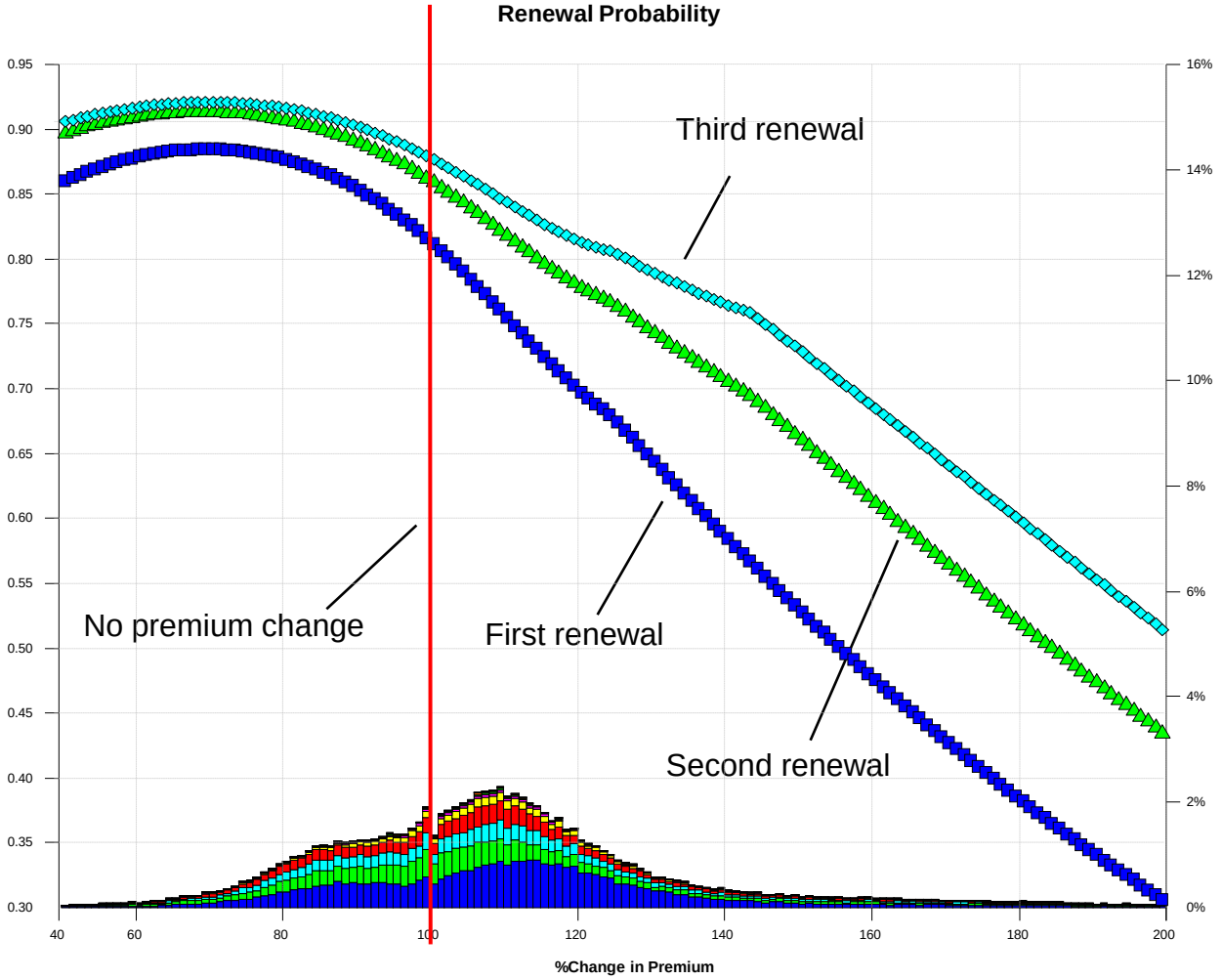
- Retention varies by named insured's age
- Young adults more likely to shop



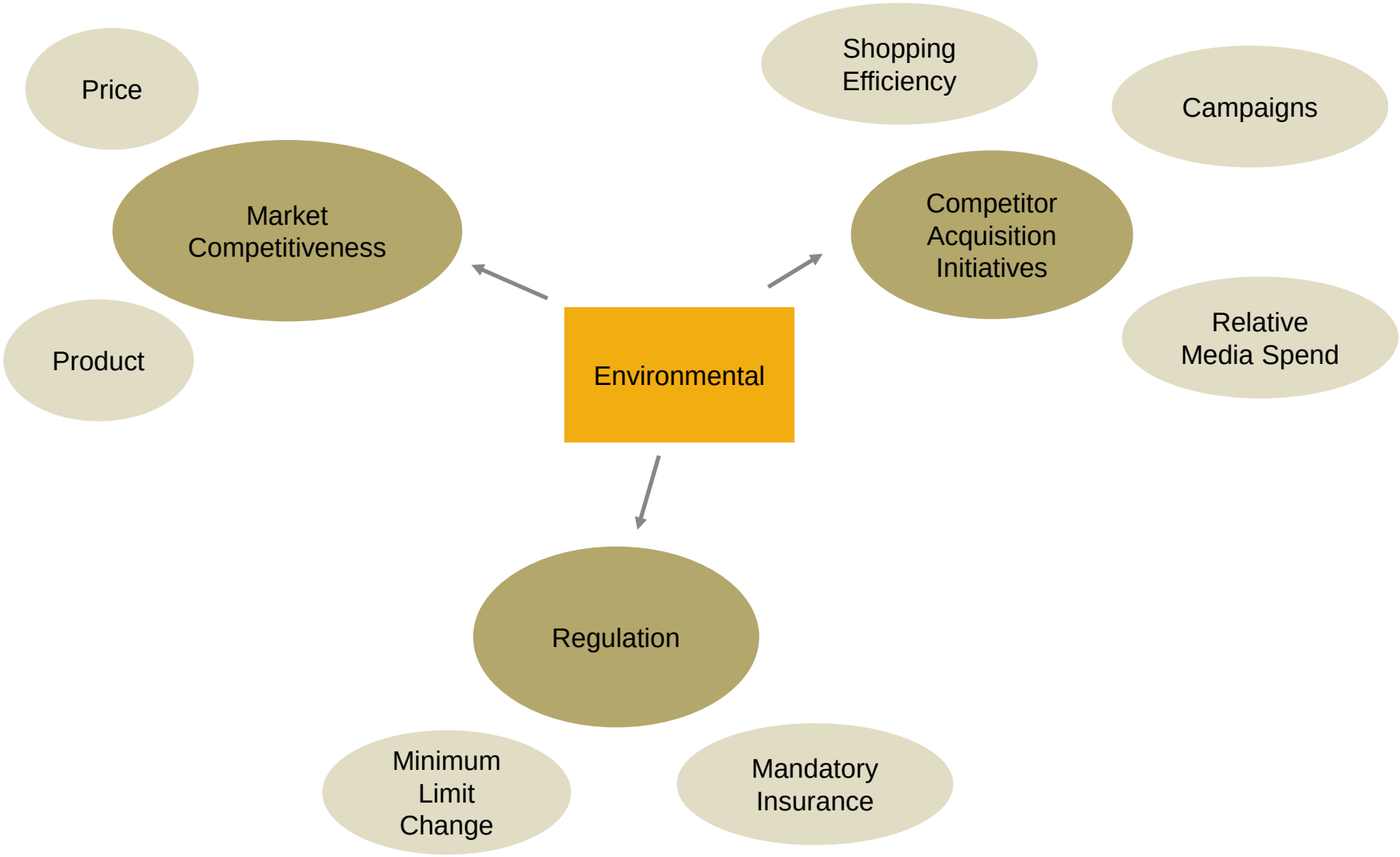
Company triggered changes



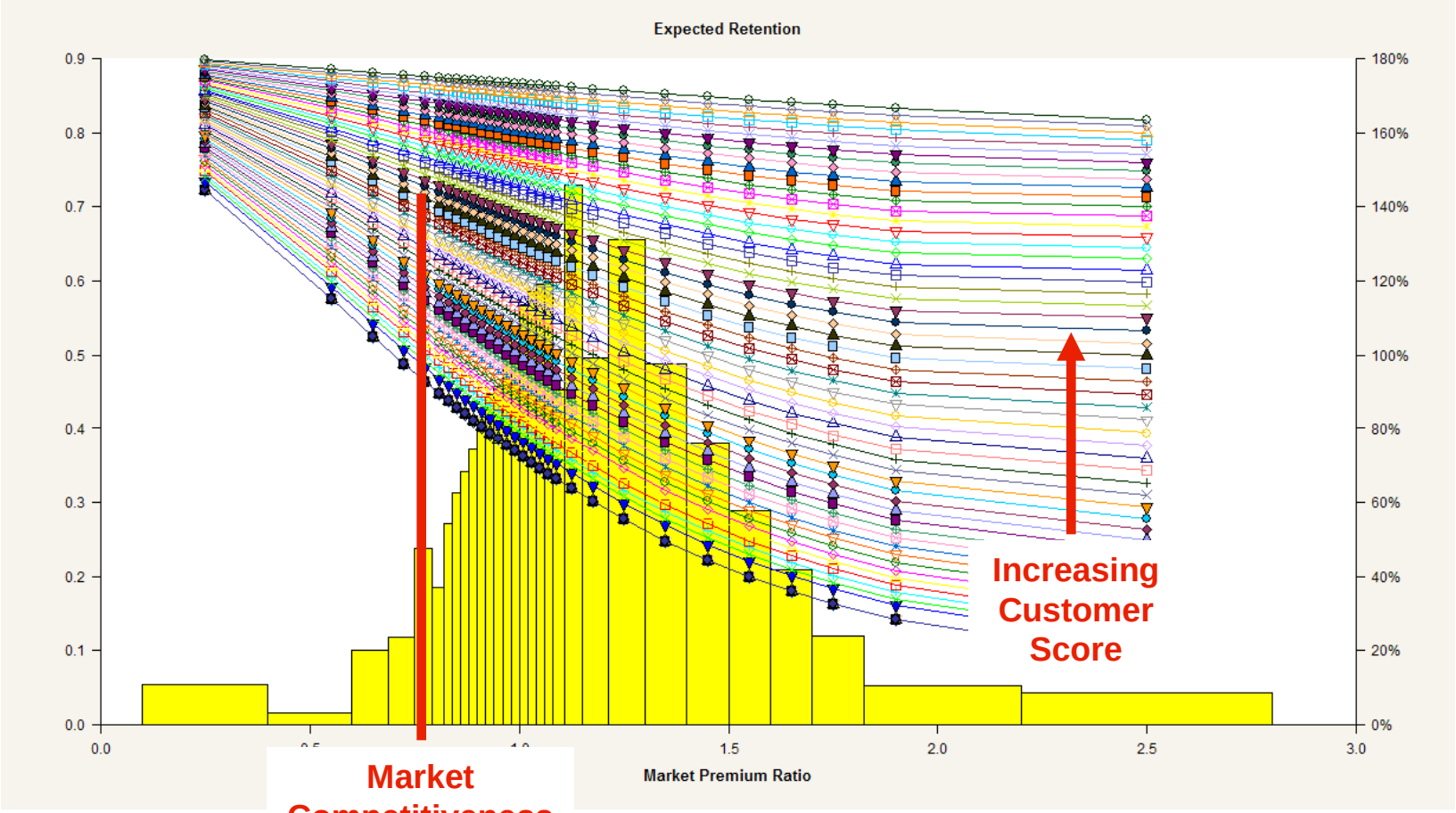
Change in premium



External influences



Environmental Factor



Brand

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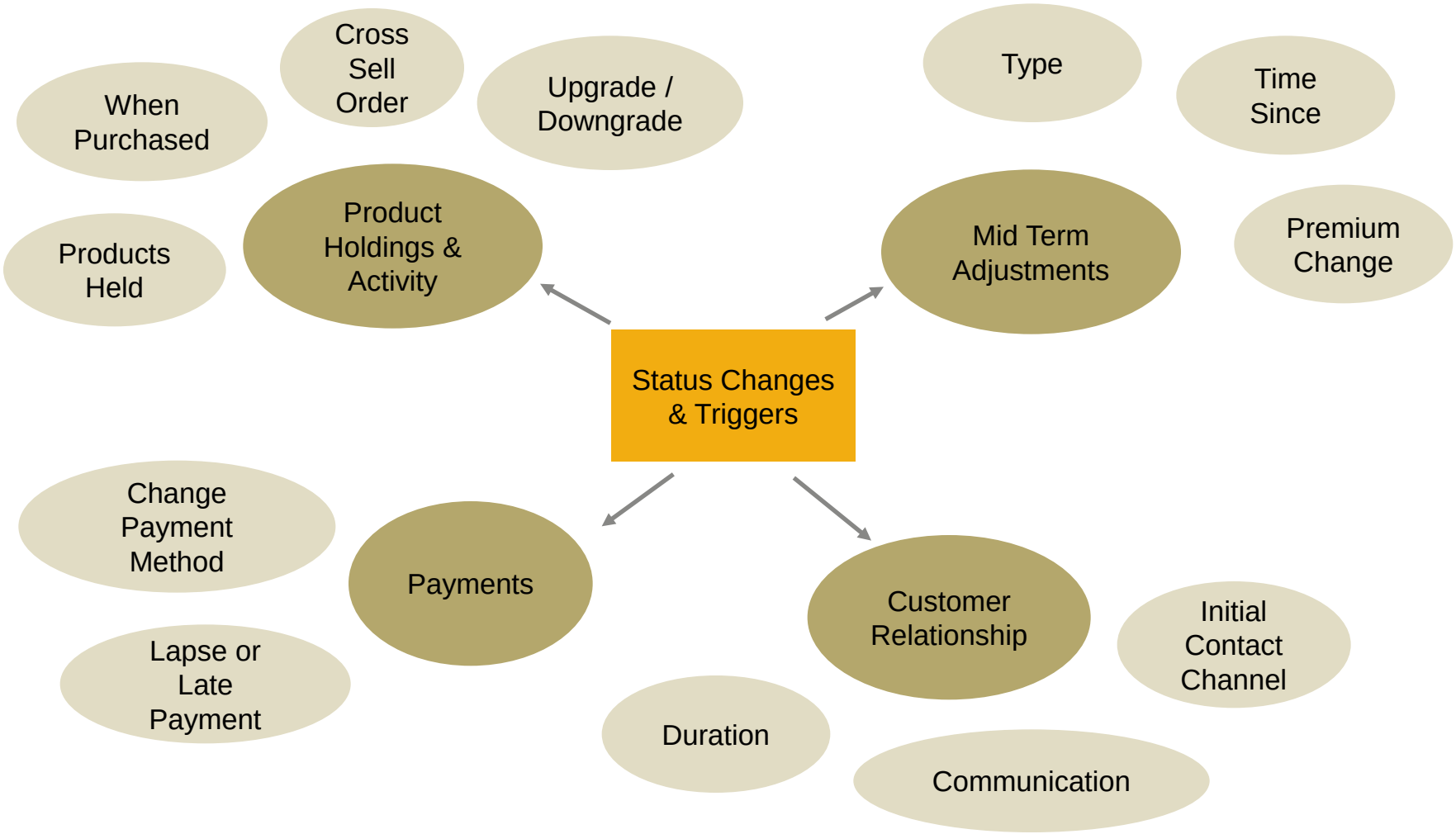
Customer triggered changes



Behavioral factors

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Behavioral analysis

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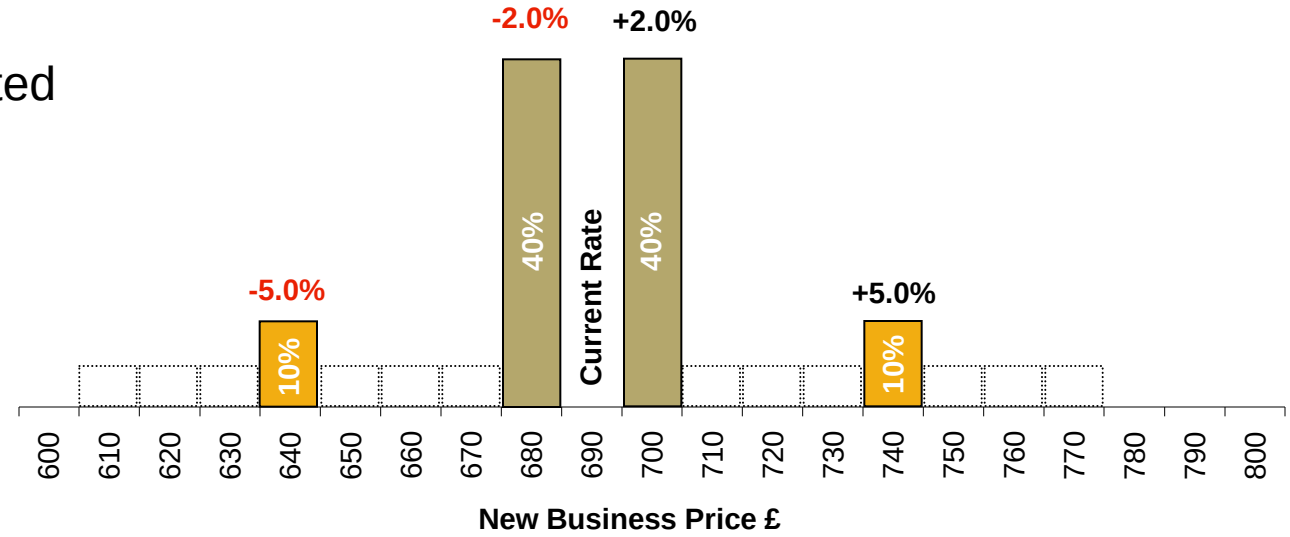
Price trials

- In deregulated markets, ideally vary random sample of quotes on an ongoing basis
- In regulated markets, filed rate changes need to act as a proxy
- Best to decorrelate from other factors as much as possible
- Geographical or vehicle reclassification can yield valuable elasticity understanding
- But, you have what you have!
- If range is limited, scope can be limited

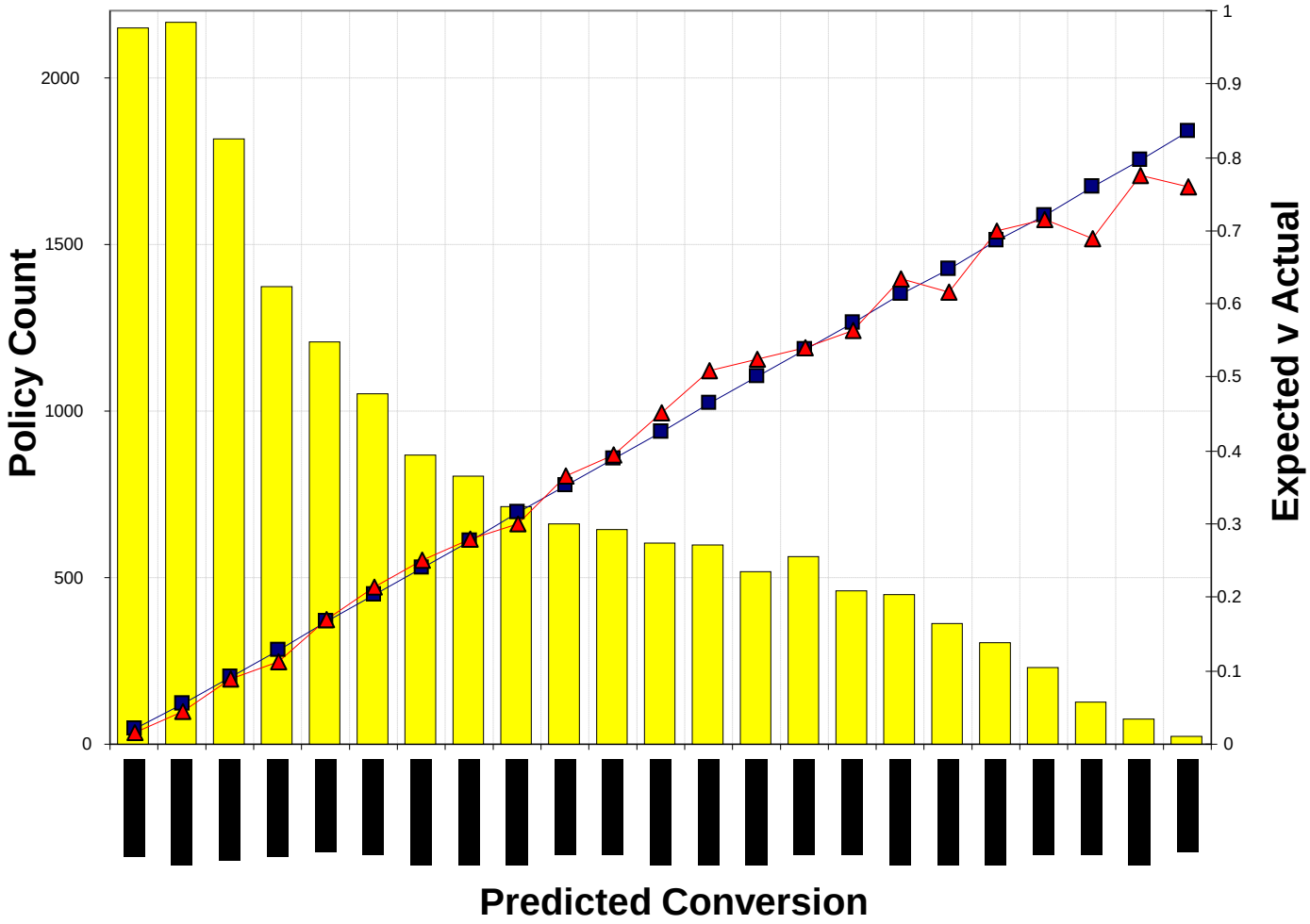


Modelling demand or elasticity?

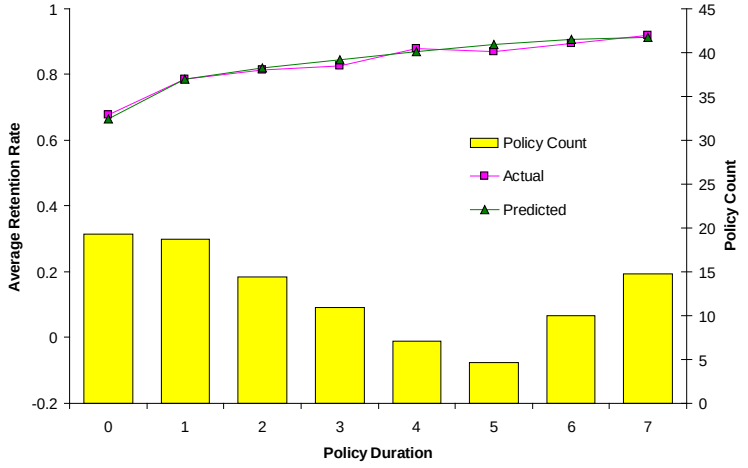
- Y-variate still “did they buy – yes/no”
- Focus on price-related explanatory variables in demand model
- Can re-express as elasticity by wobbling price explanatory variables after fitting model

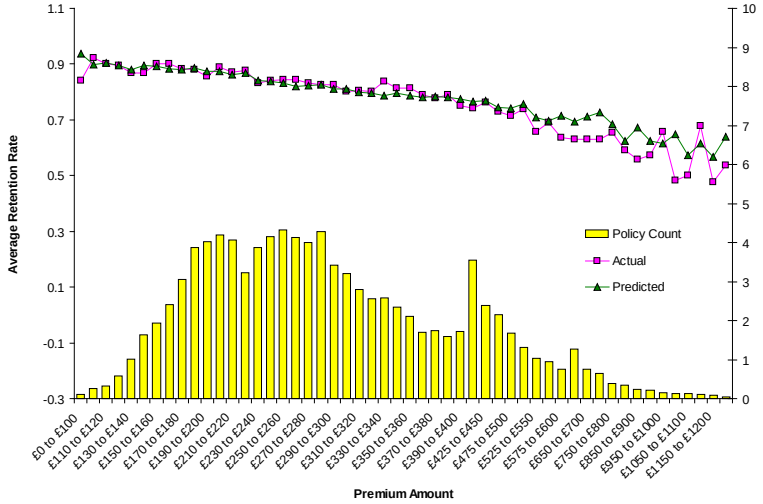
<Actual result cannot be disclosed in handout>

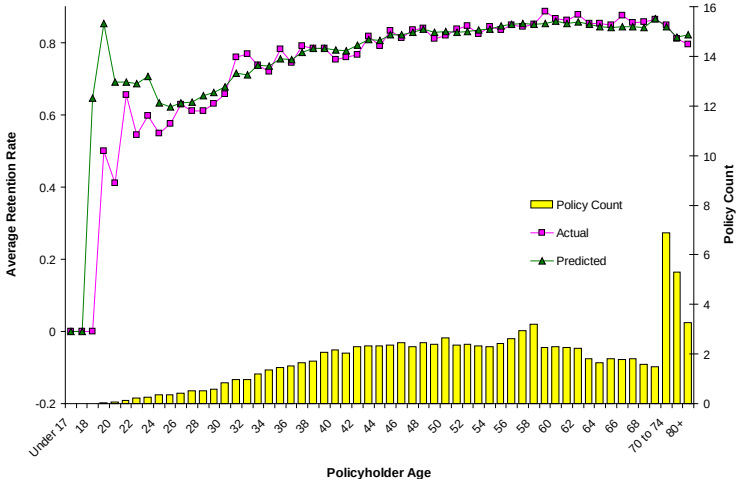
New business - out of time validation

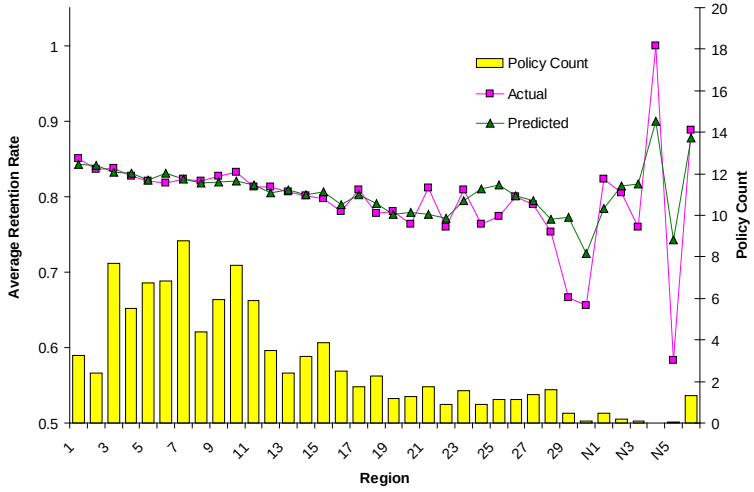


Renewals - out of time validation

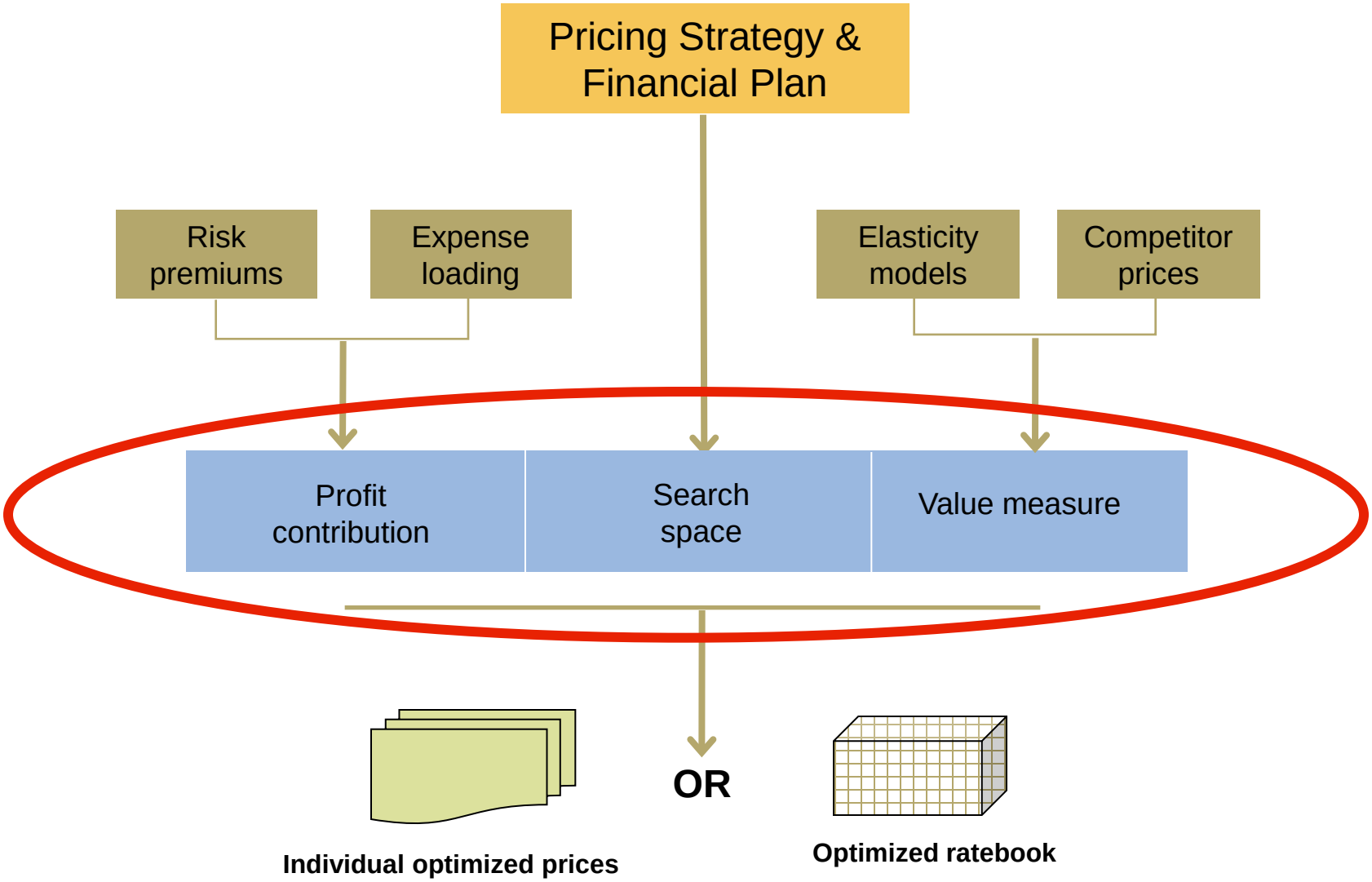




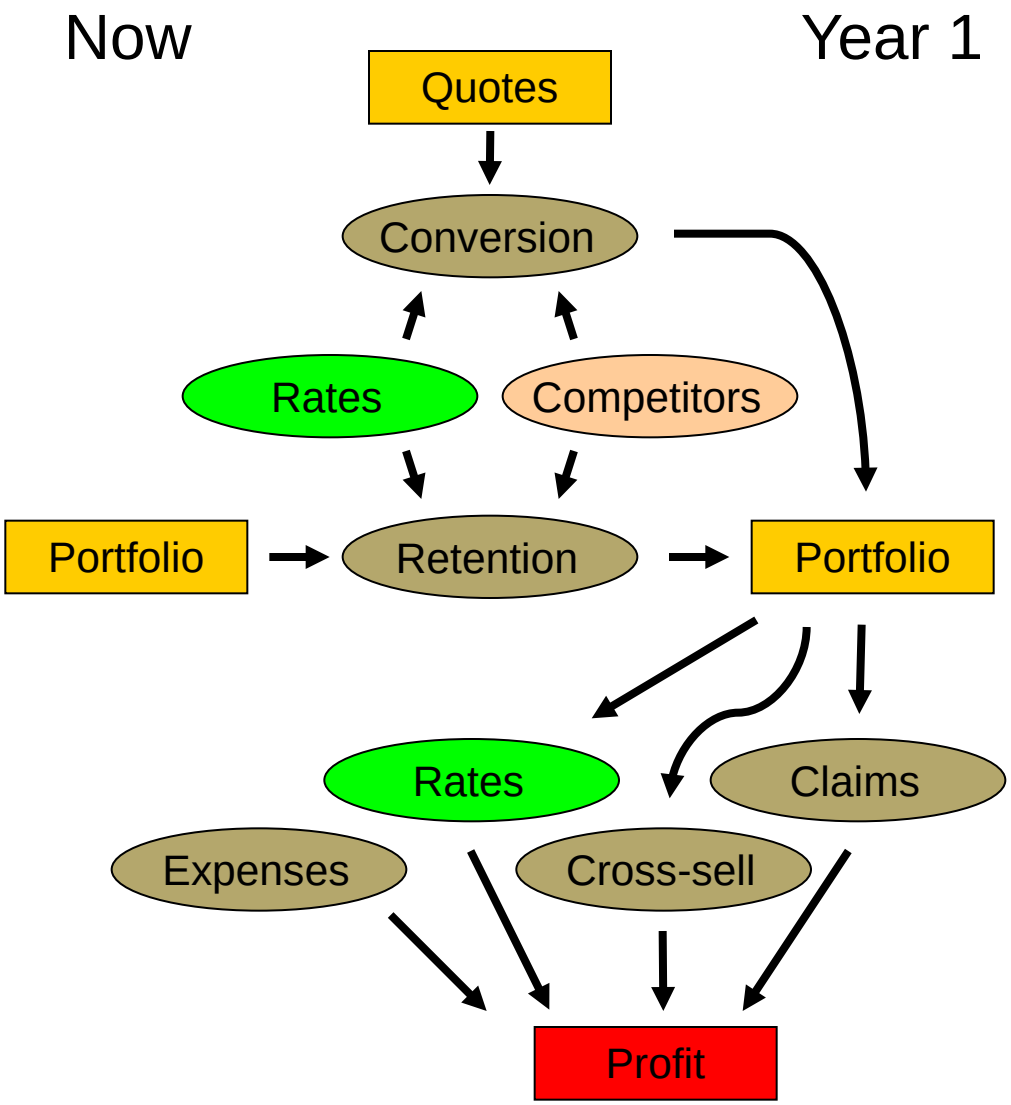




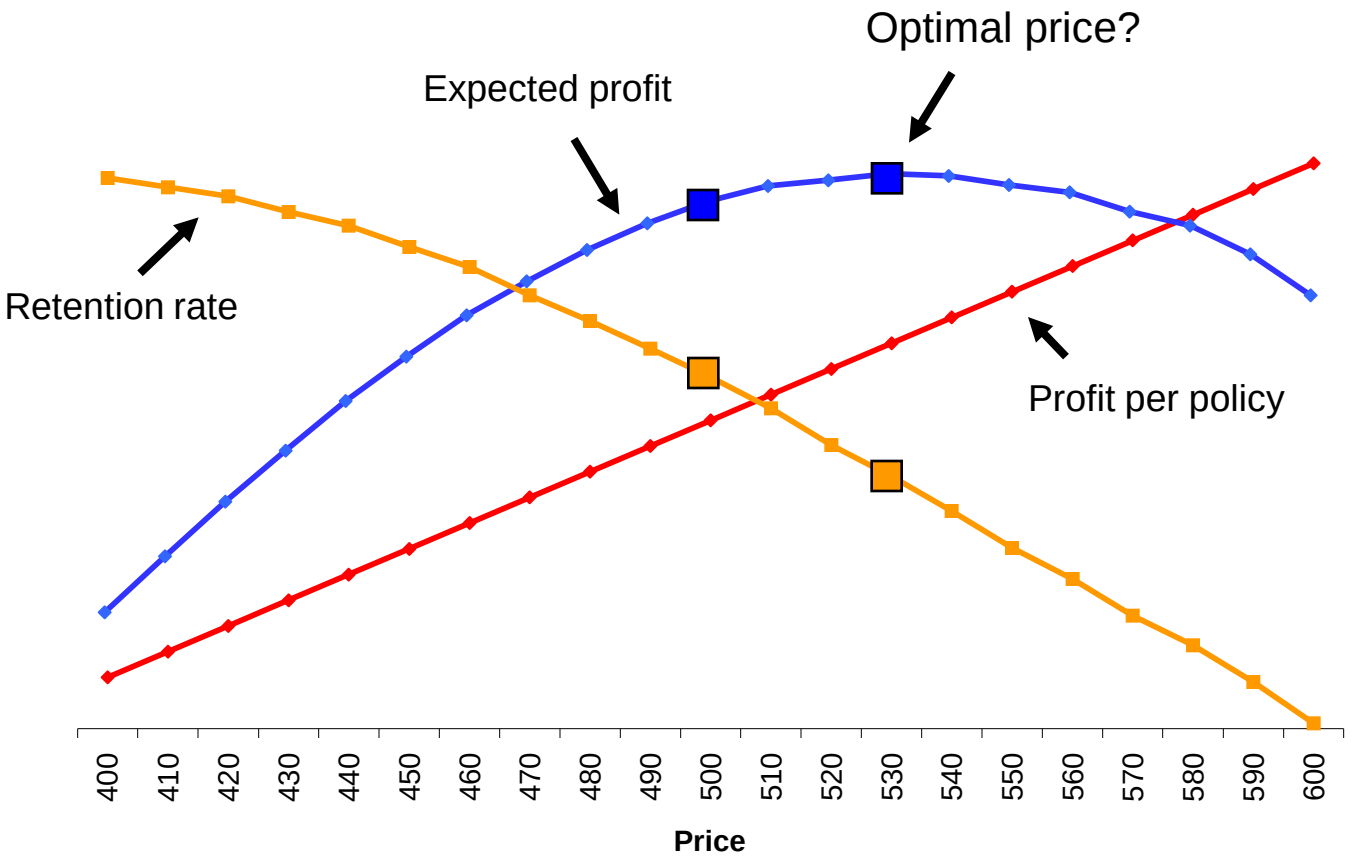
Price optimization



Projection

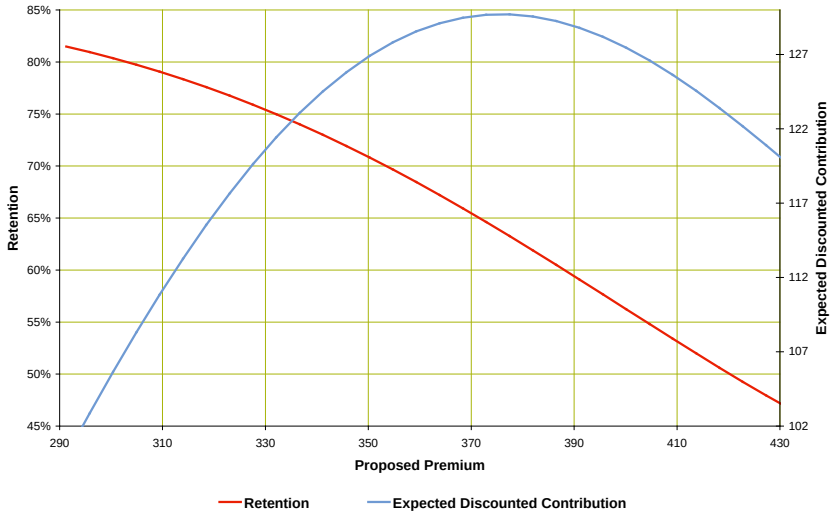


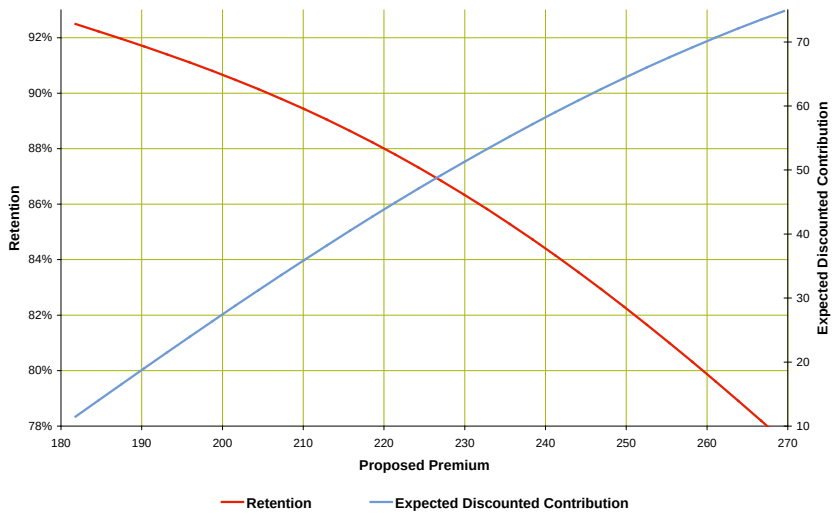
Results for one policy

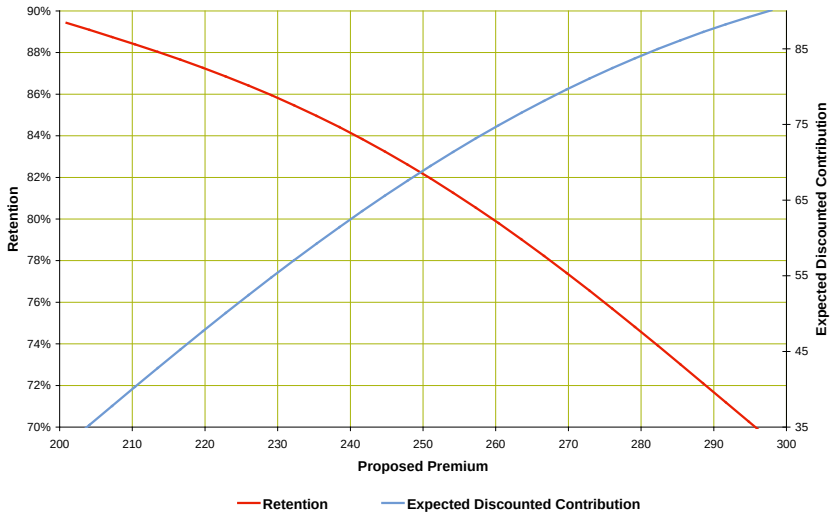


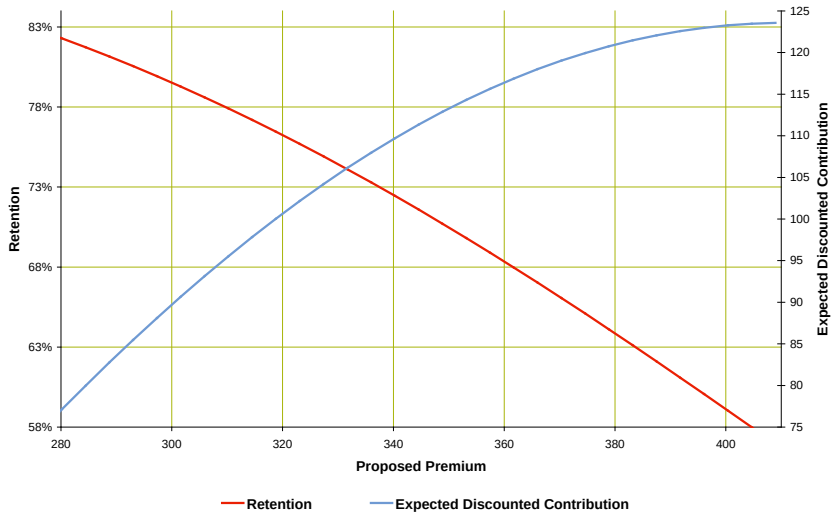
Premium for policy in question

Results for four policies







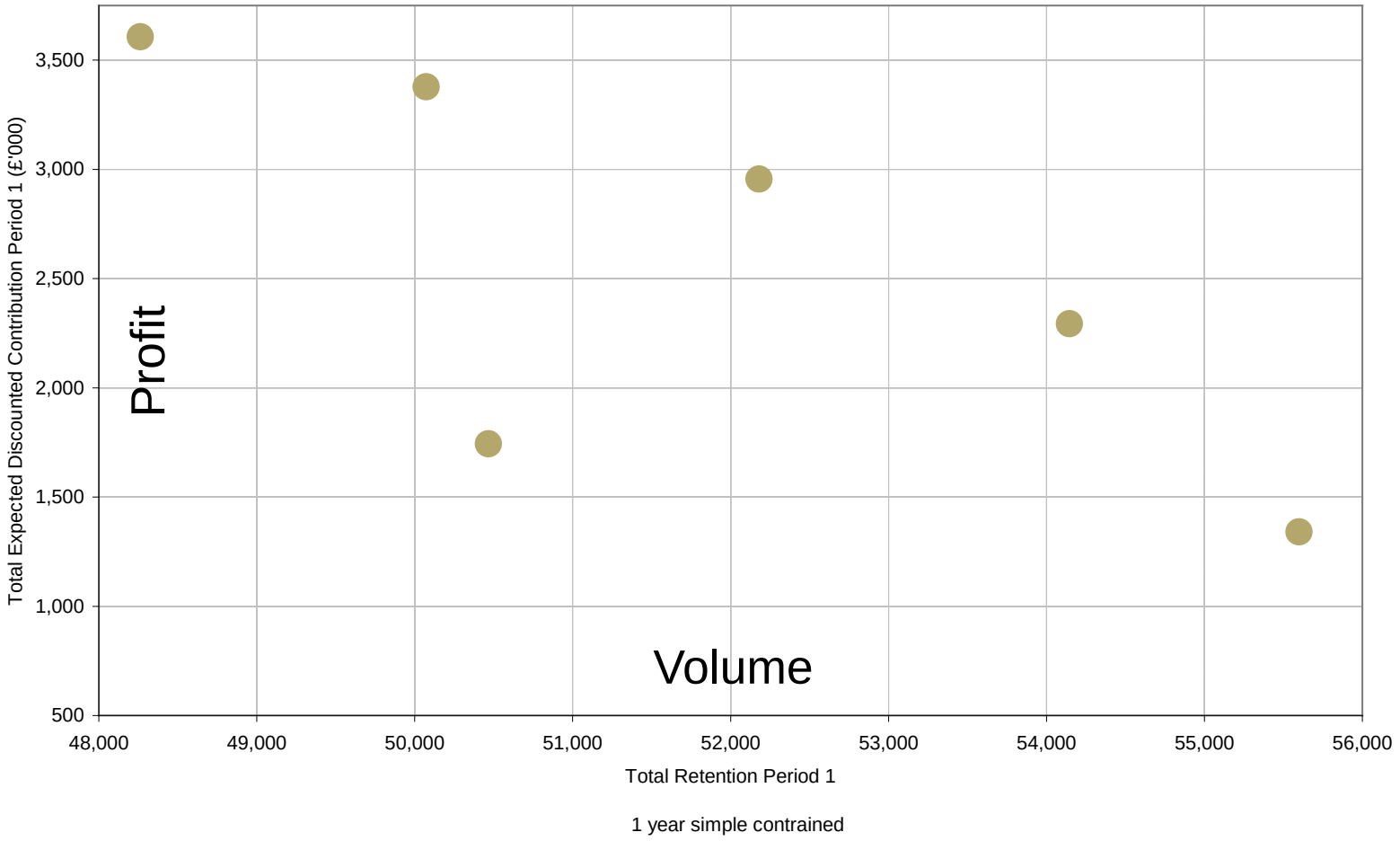


Balancing profit and volume

- Can optimize
  - profit for a particular volume, or
  - volume for a particular profit

  over a defined time horizon
- Try different options to understand different balances available
- Generates efficient frontier which aids understanding of target selection

One year efficient frontier



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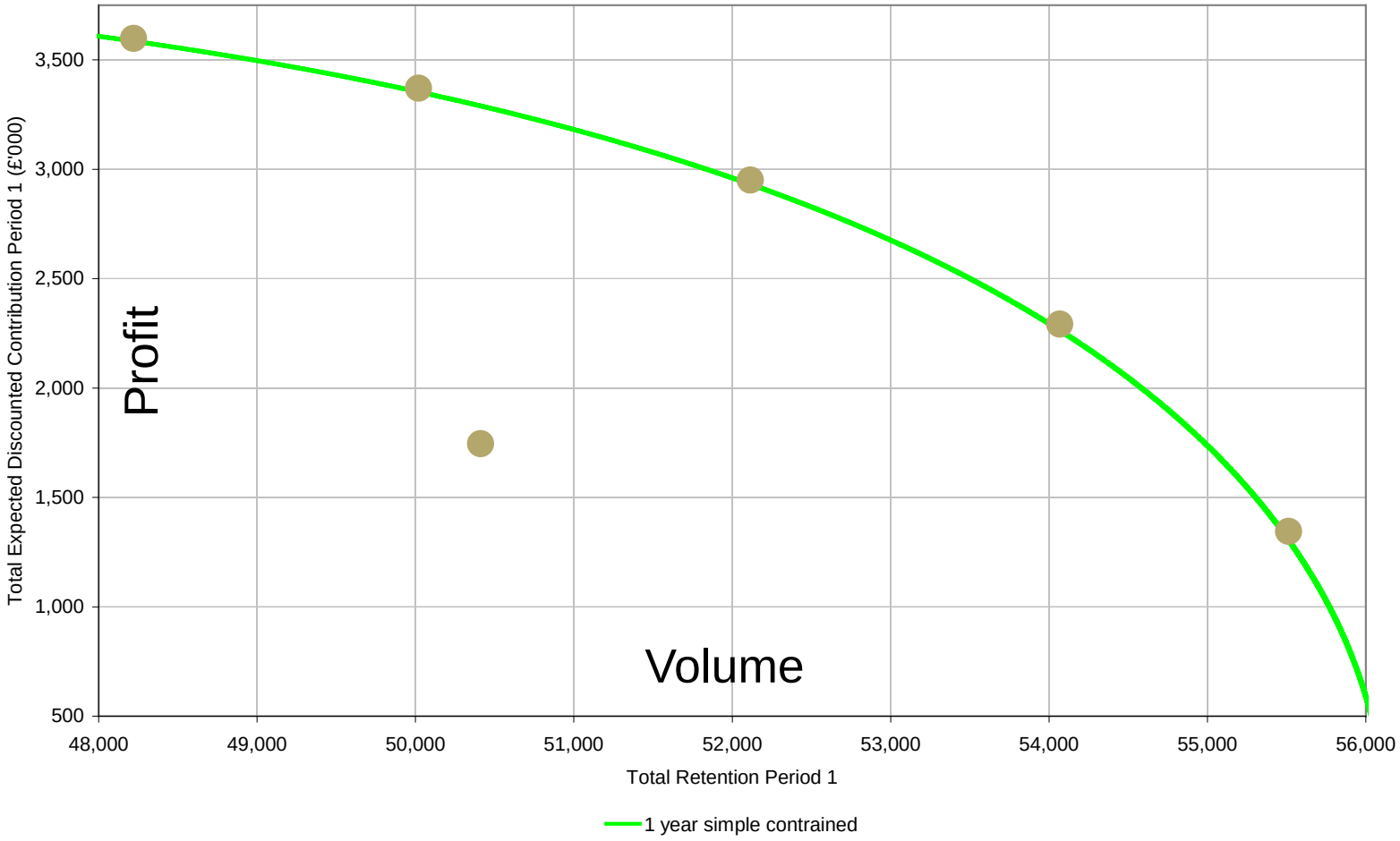
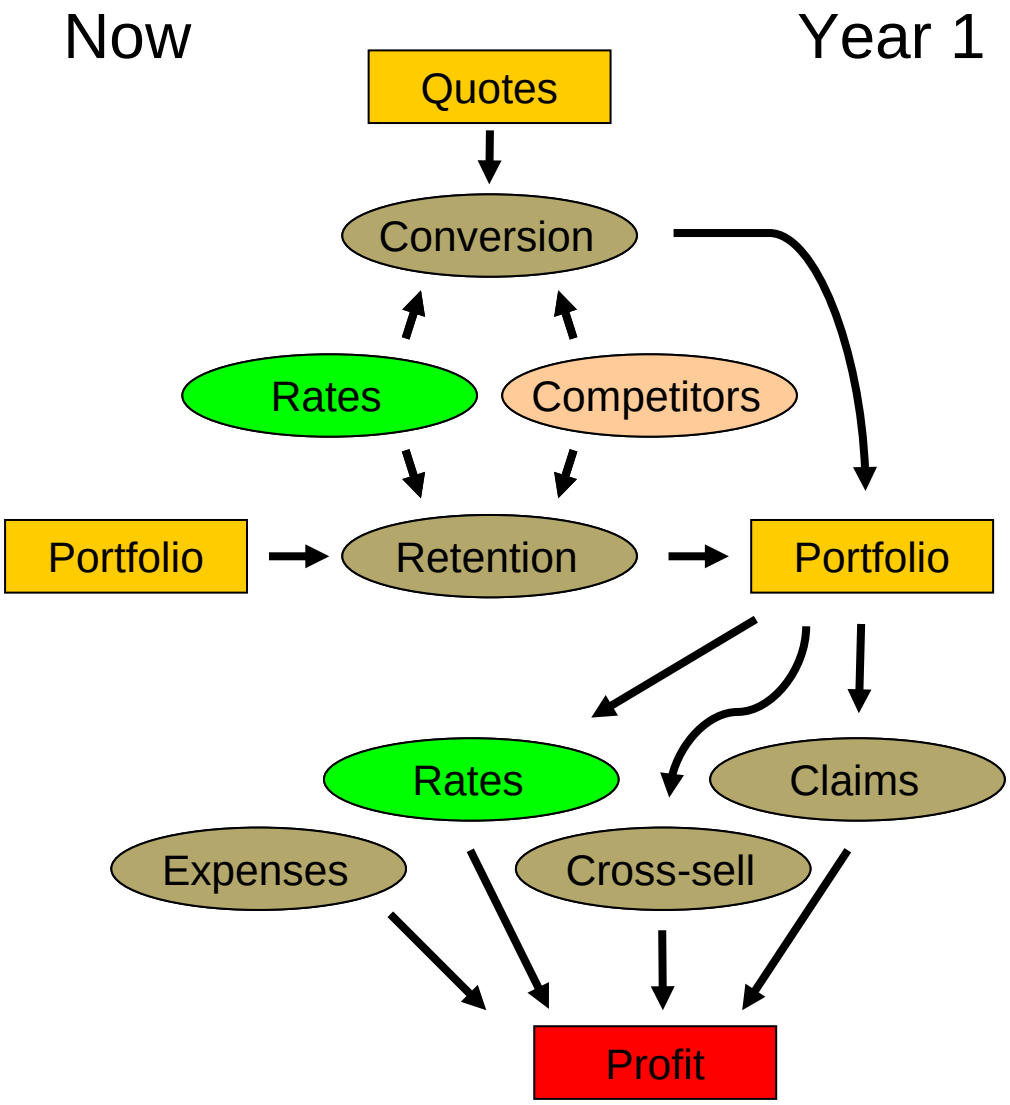


Time horizons

	Short	Long
Advantages	More certain short-term profitability	Protects long-standing customers
Disadvantages	"Milks" the most inelastic customers leads to a reducing quality portfolio	Profits anticipated in future years may be "illusory" (predicting future market prices?)

Projection



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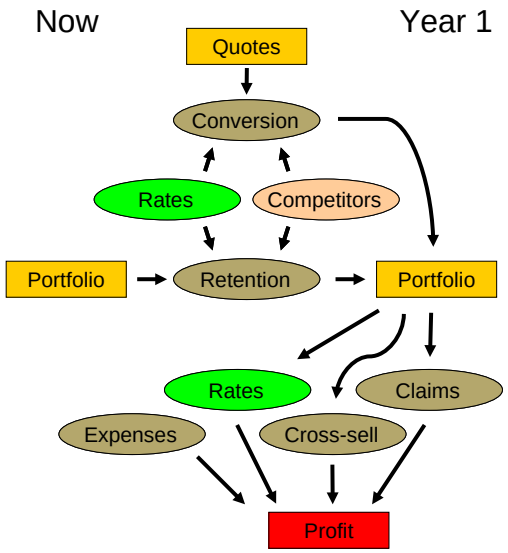

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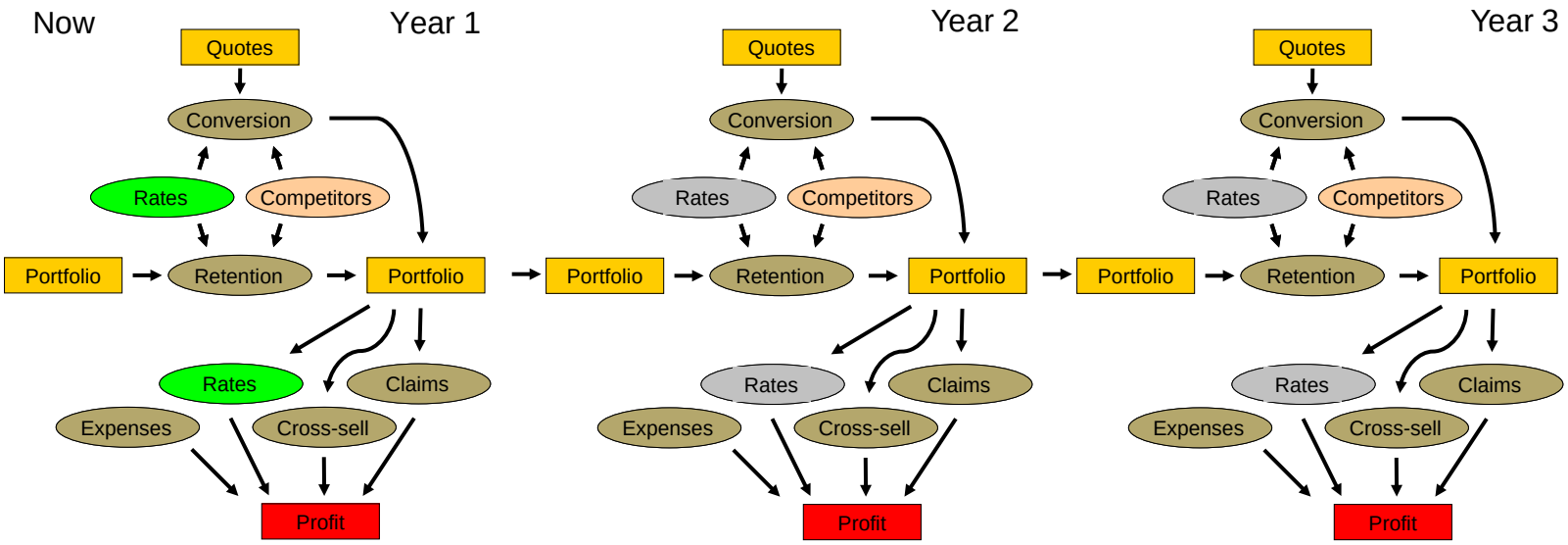

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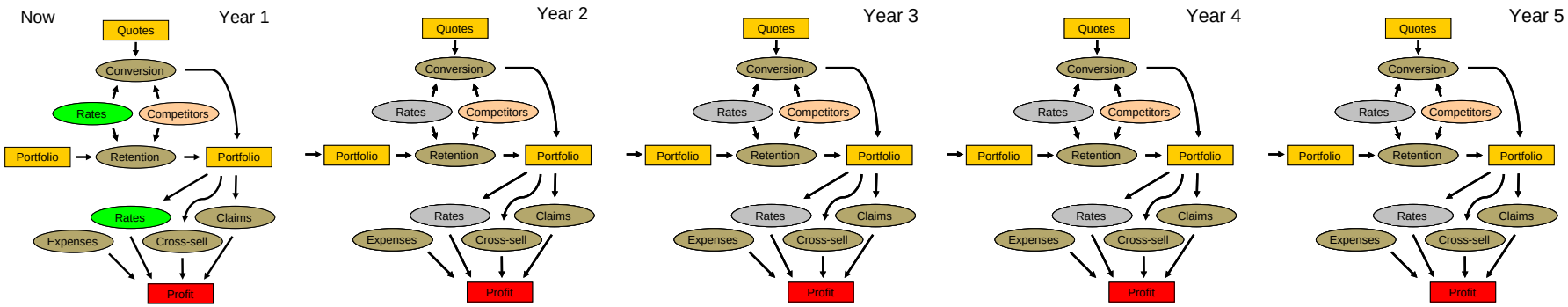
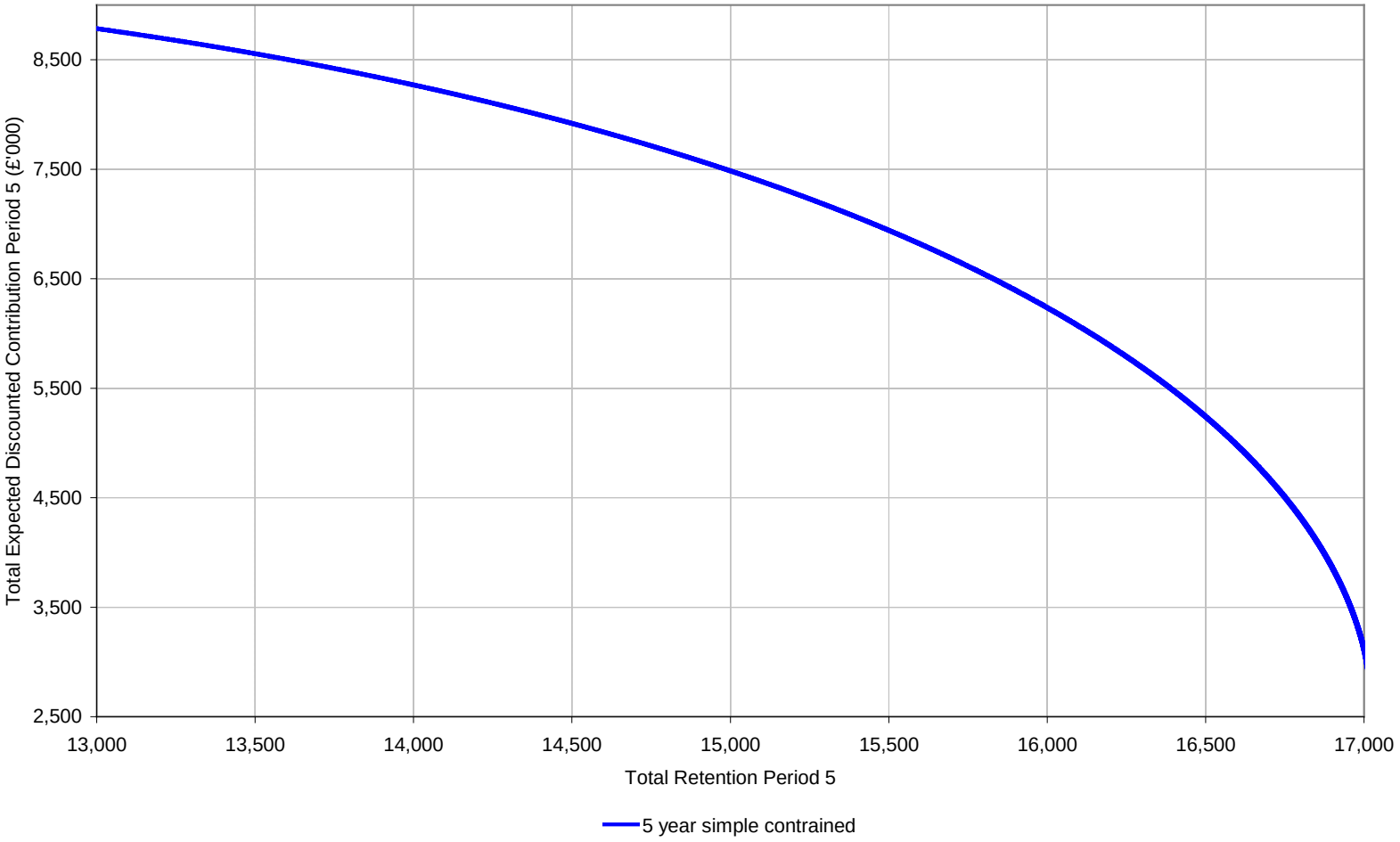


Five year efficient frontier



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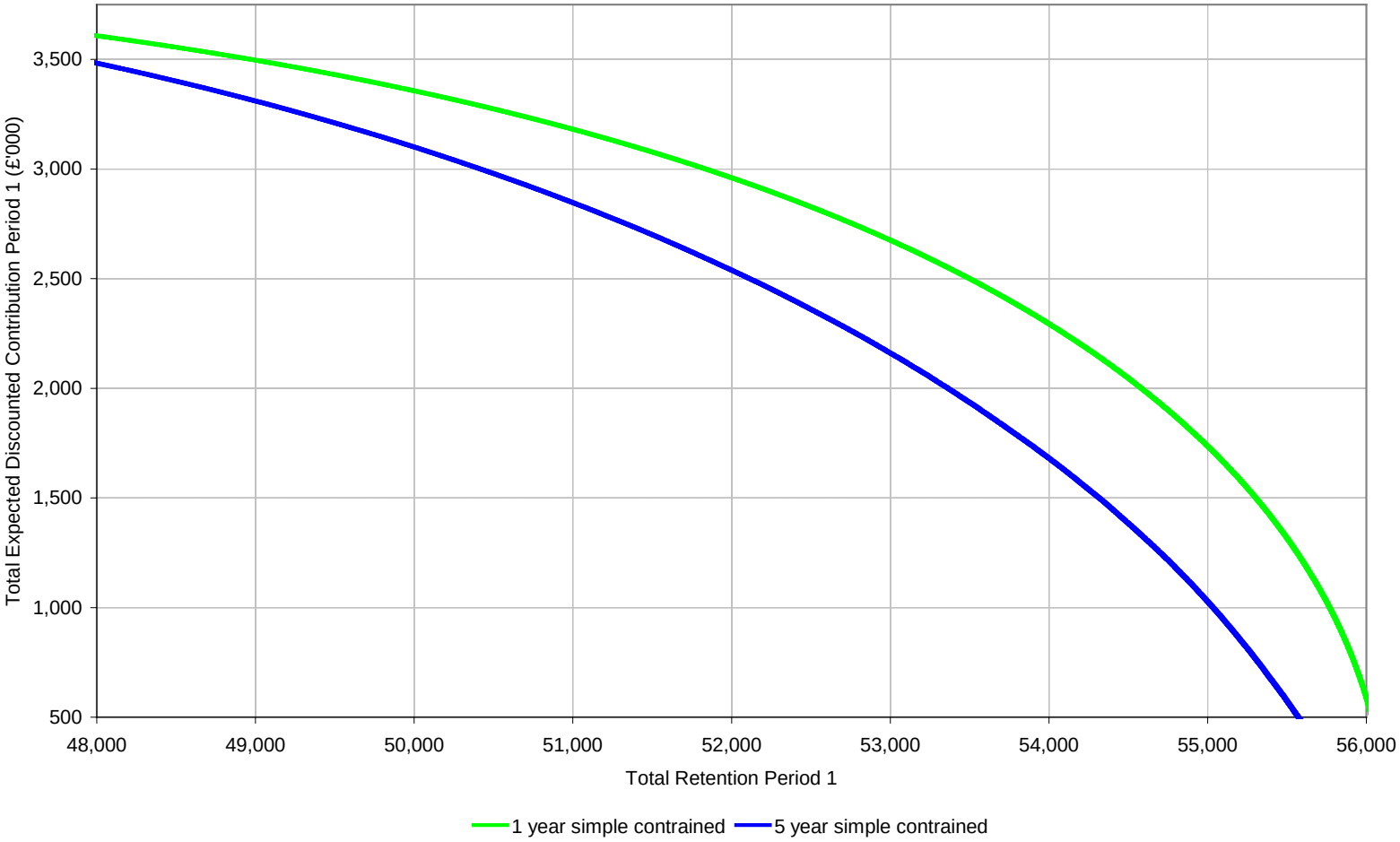

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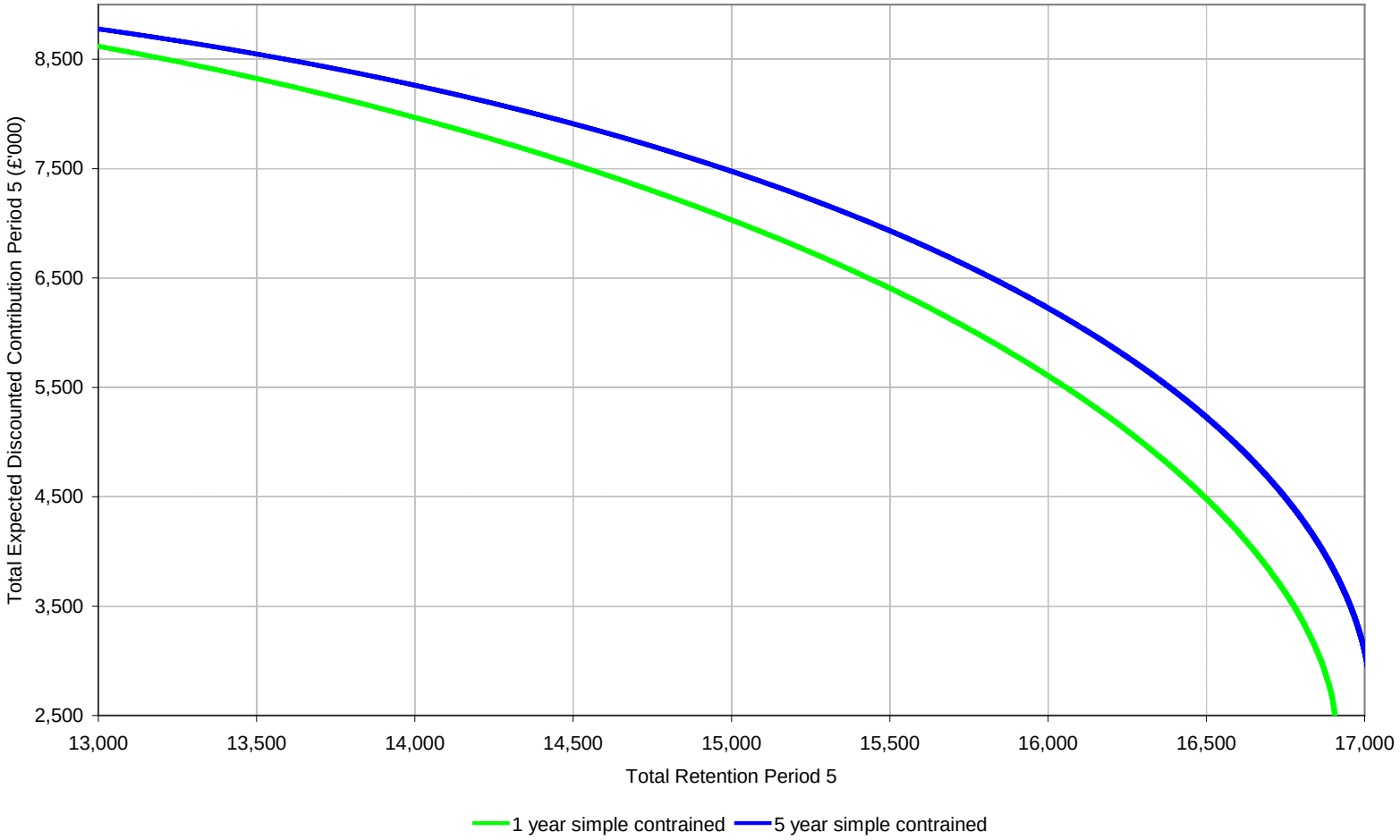


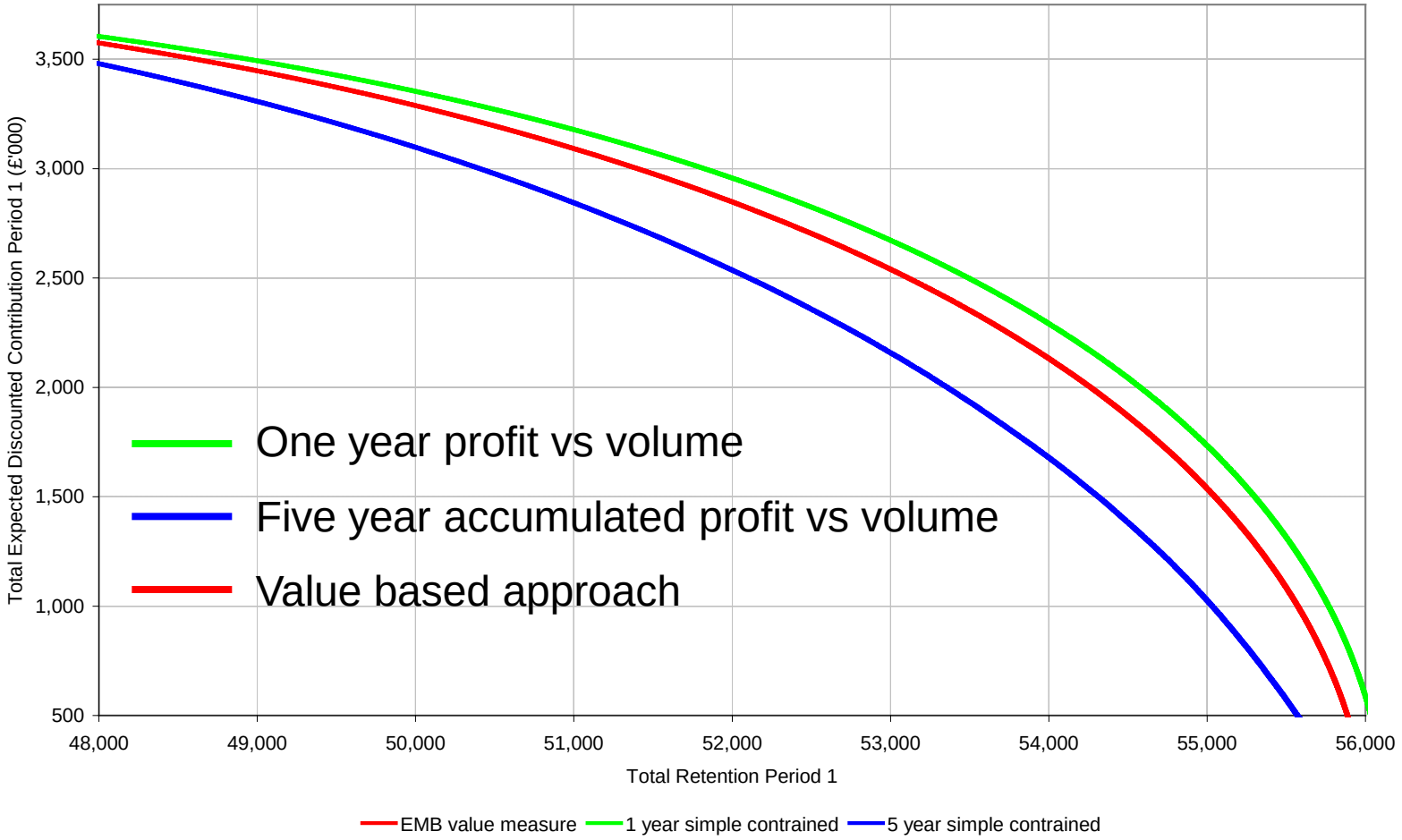
Value based approach

One year profit vs volume

Five year accumulated profit vs volume

Alternative method of constraining, giving regard to type of policyholder

One year efficient frontier



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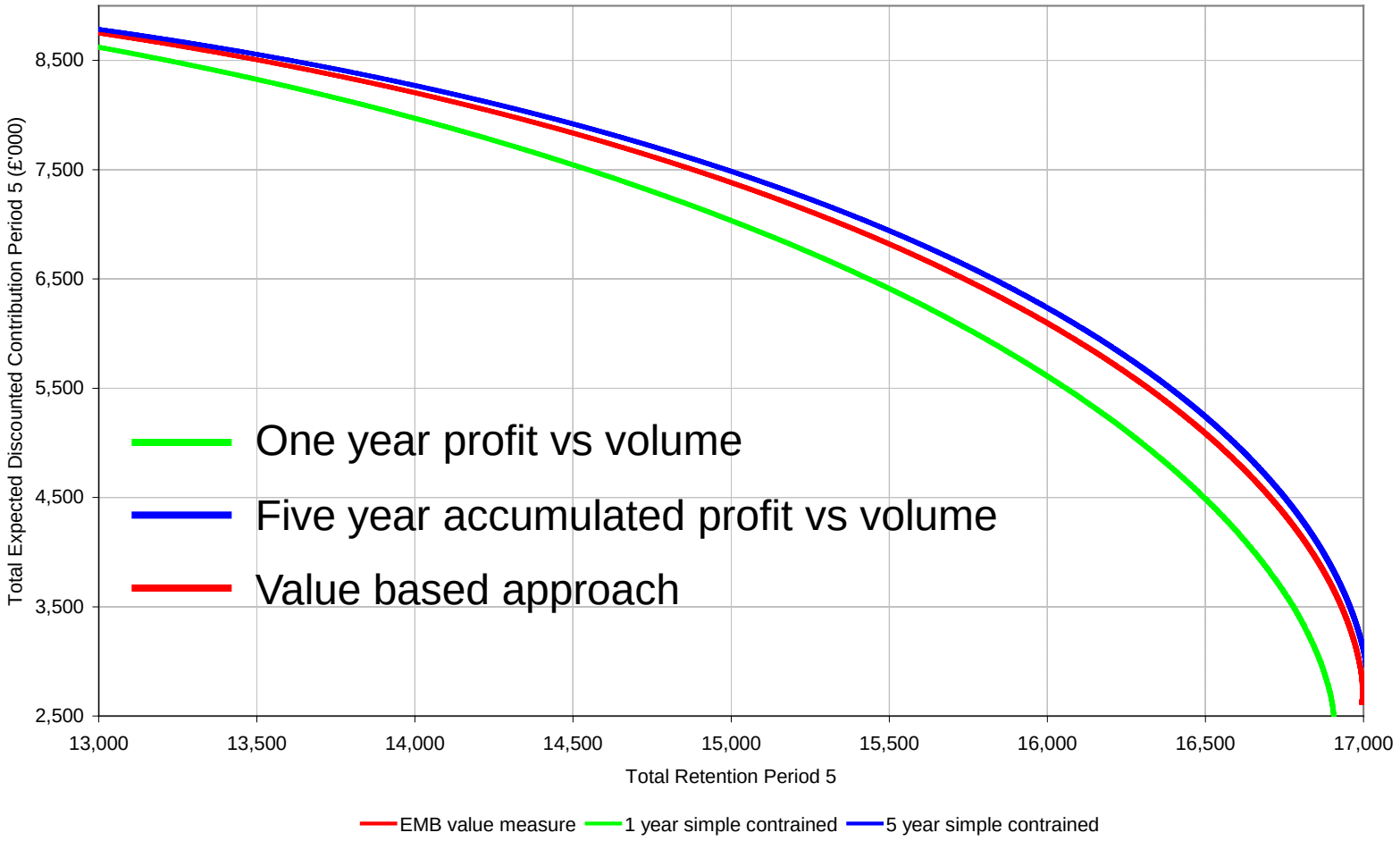
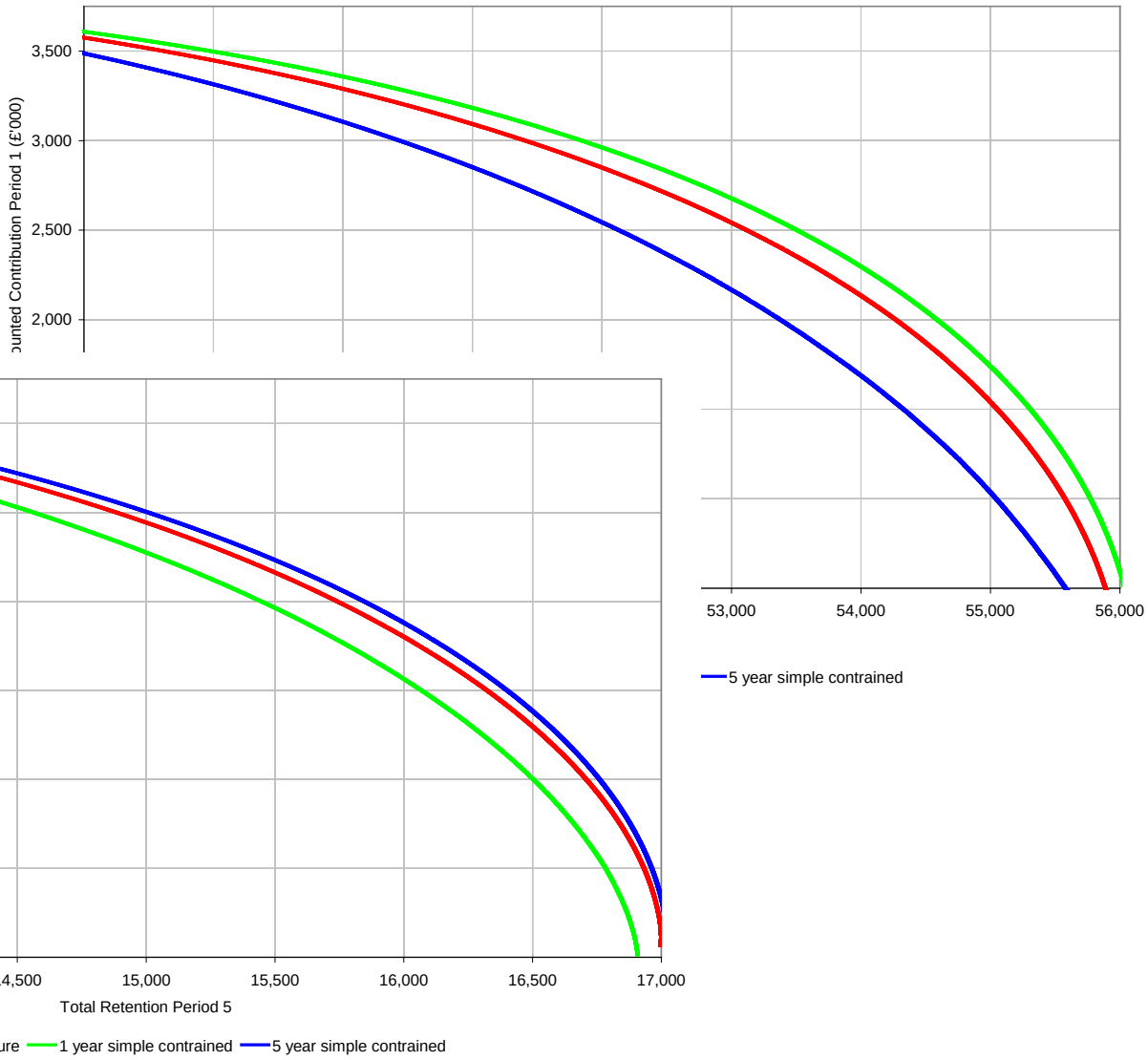


Almost the best of both worlds

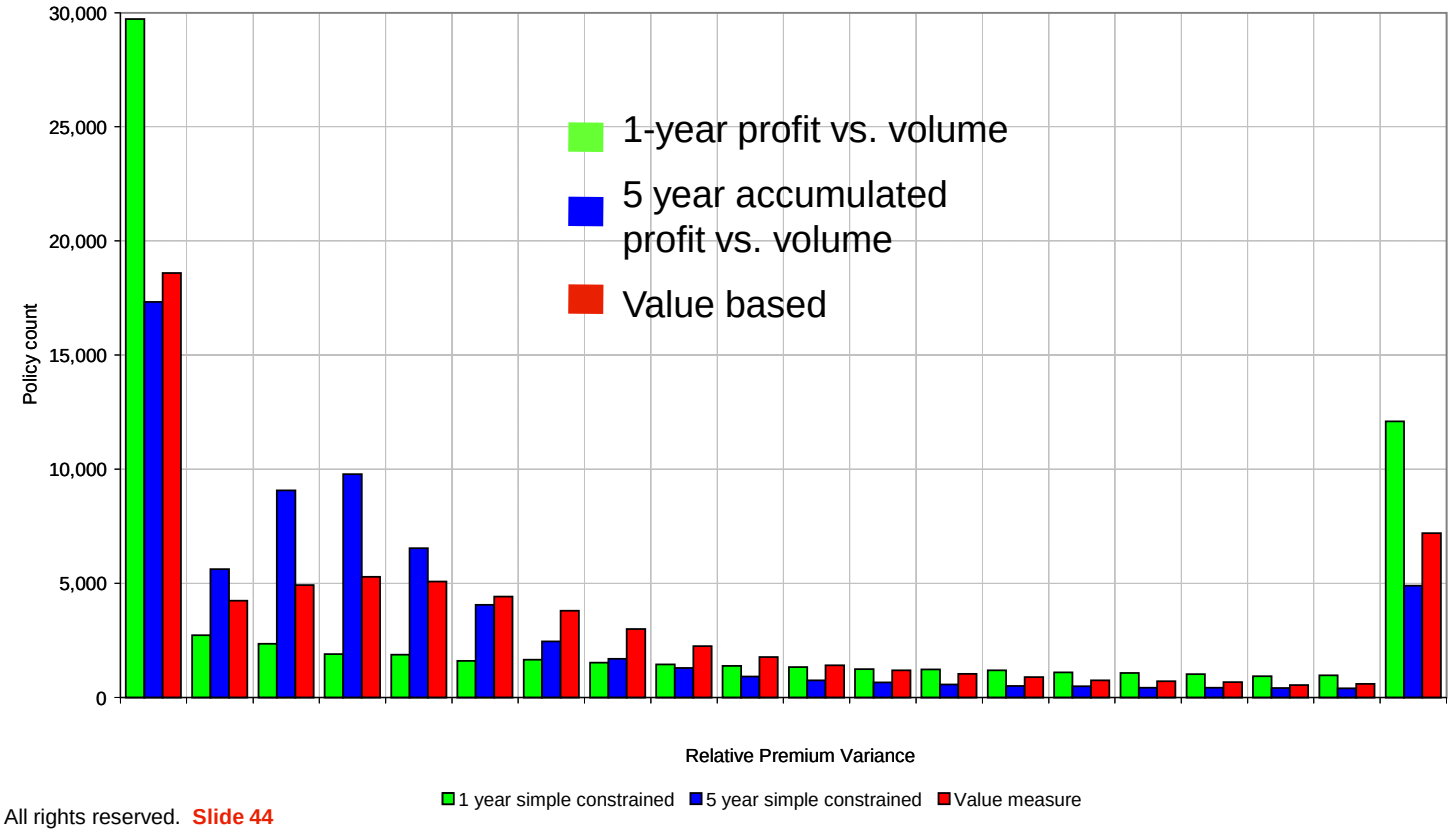
- 1-year profit vs. volume
- 5 year accumulated profit vs. volume
- Value based



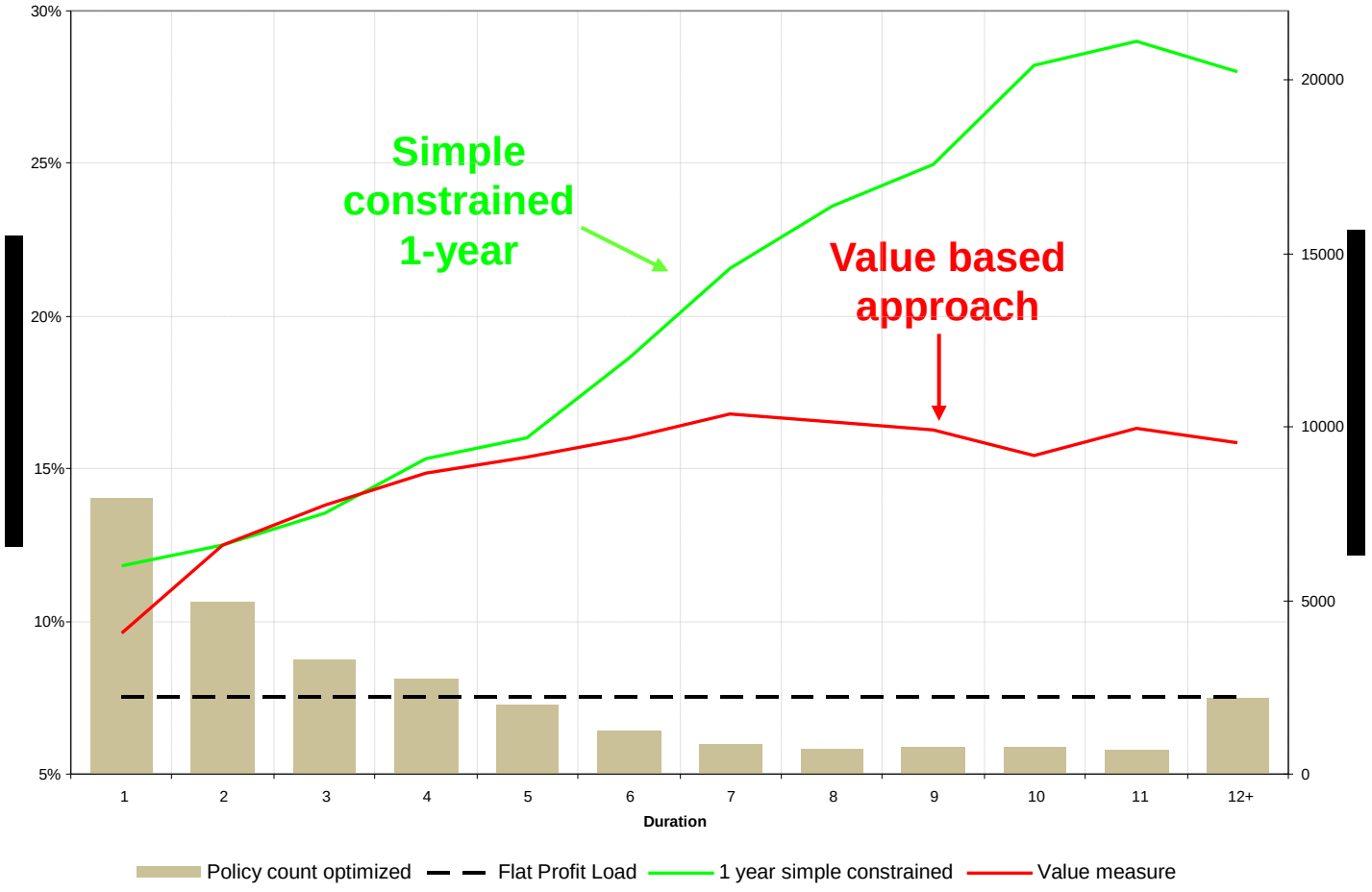
Value based approach - premium variances

Value based approach avoids concentration of profit loads at extreme values which…

- Extracts large profits from a small customer group
- Maximizes degree of price differentiation
- Relies on predictive accuracy of models at their extremes



Value based approach - premium variances by tenure



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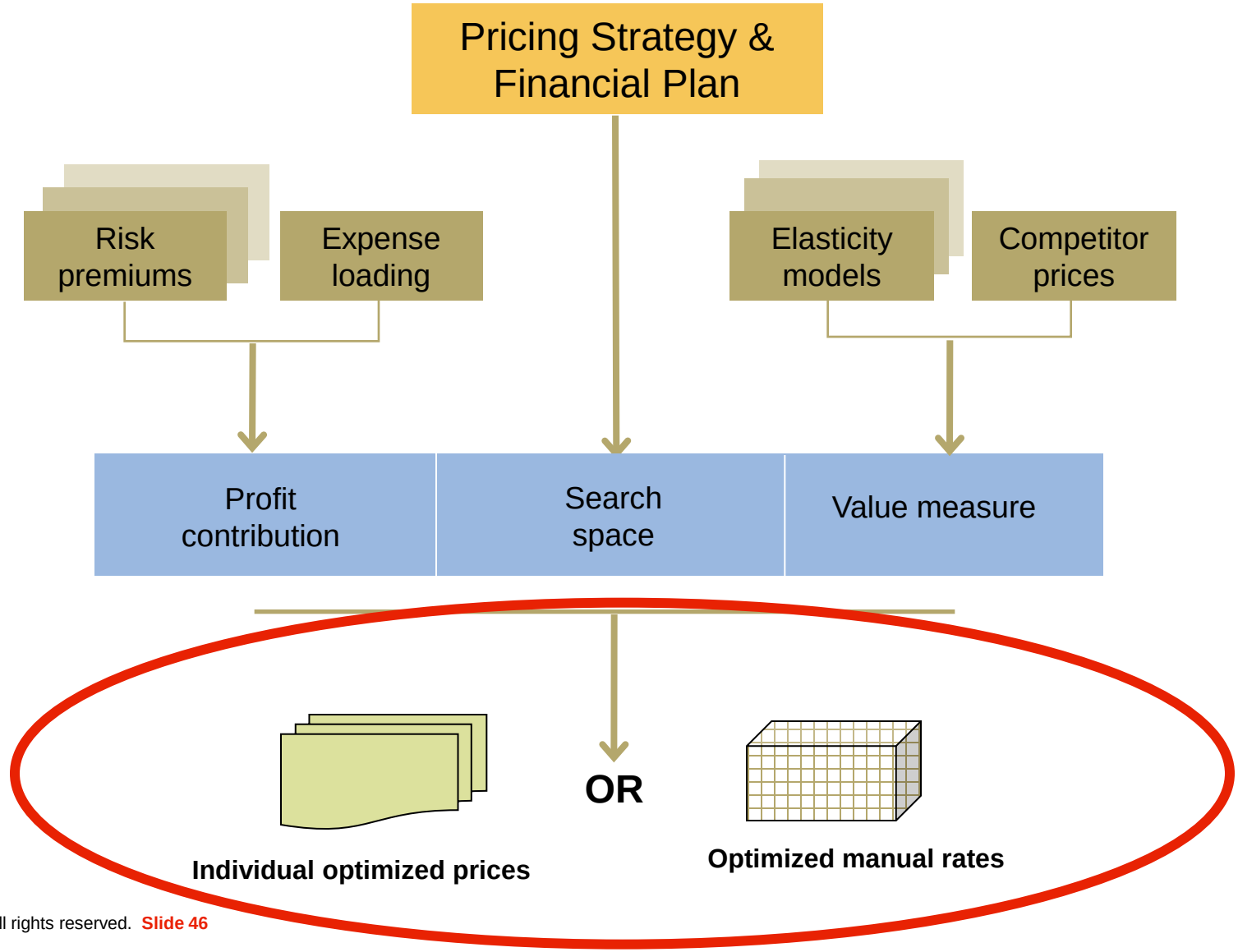
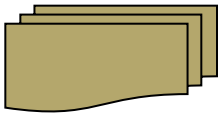


Implementation

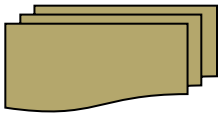


Individual optimized Prices

Policy no.	Premium
PEL009759458	327
UQJ408808153	555
KZH964999642	261
DDU700866747	349
VUQ391058119	334
YUM718736198	331
GBQ270981530	279
CSR303293030	188
XTB008693907	175
TJJ330632016	319
MFD704472553	349
ZVI955030095	277
ZJY528736252	372
VRF026498810	647
BIN297260627	555
SXT608697514	203
JAE716278042	163
XUS991829954	633
IVN822320056	641
FOD690200573	232
DCI071346826	325
SEL511154881	538

- Output of analysis so far is a list of individually optimized rates
- In deregulated markets these can be applied directly as part of business-as-usual process
  - one rating factor: policy number!
- In US, alternative methods required

Implementation



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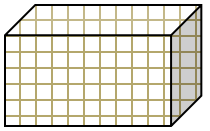
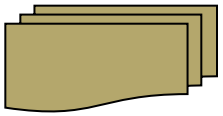
Can fit GLM to results to yield multiplicative structure using standard rating factors

GLM



Multiplicative structure

Implementation



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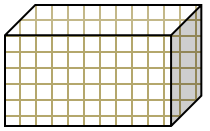
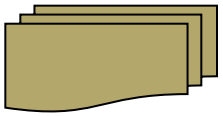
Can fit GLM to results to yield multiplicative structure using standard rating factors **plus alternative factors**

GLM



Multiplicative structure with extra factors

Implementation

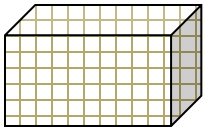


Individual optimized Prices

Policy no.	Premium
PEL009759458	327
UQJ408808153	555
KZH964999642	261
DDU700866747	349
VUQ391058119	334
YUM718736198	331
GBQ270981530	279
CSR303293030	188
XTB008693907	175
TJJ330632016	319
MFD704472553	349
ZVI955030095	277
ZJY528736252	372
VRF026498810	647
BIN297260627	555
SXT608697514	203
JAE716278042	163
XUS991829954	633
IVN822320056	641
FOD690200573	232
DCI071346826	325
SEL511154881	538

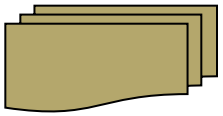
Can use moderators (caps and floors) in conjunction with multiplicative structure

Model



Multiplicative structure with moderator

Implementation



Individual optimised Prices

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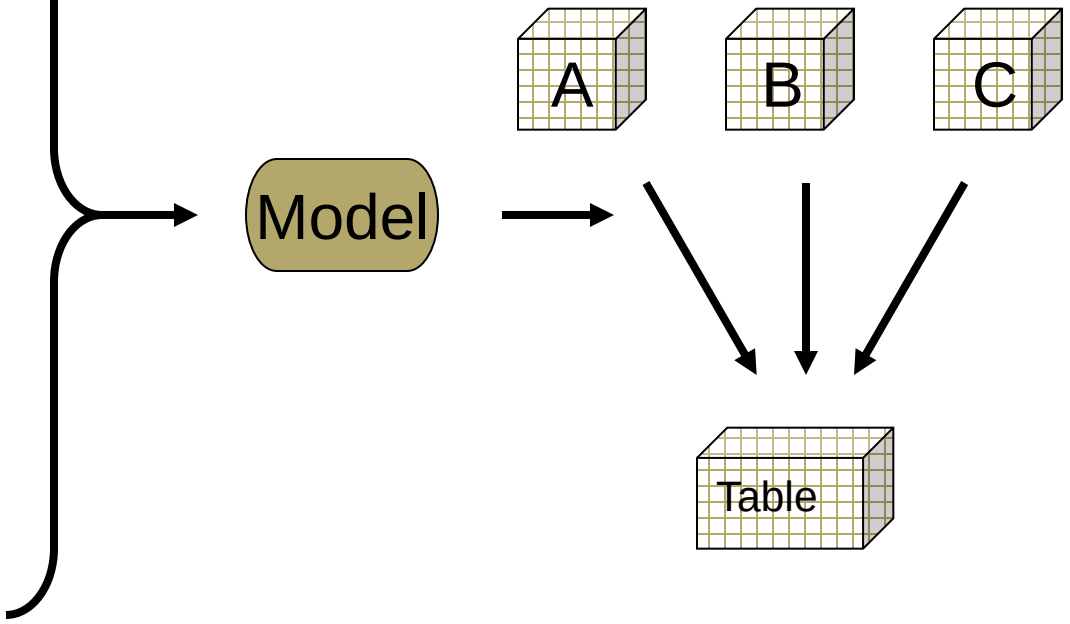
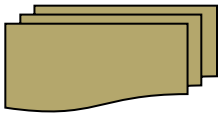
Can use factors in combination, or secondary models, to derive score factors which feed into traditional table form



Implementation



Individual optimized Prices

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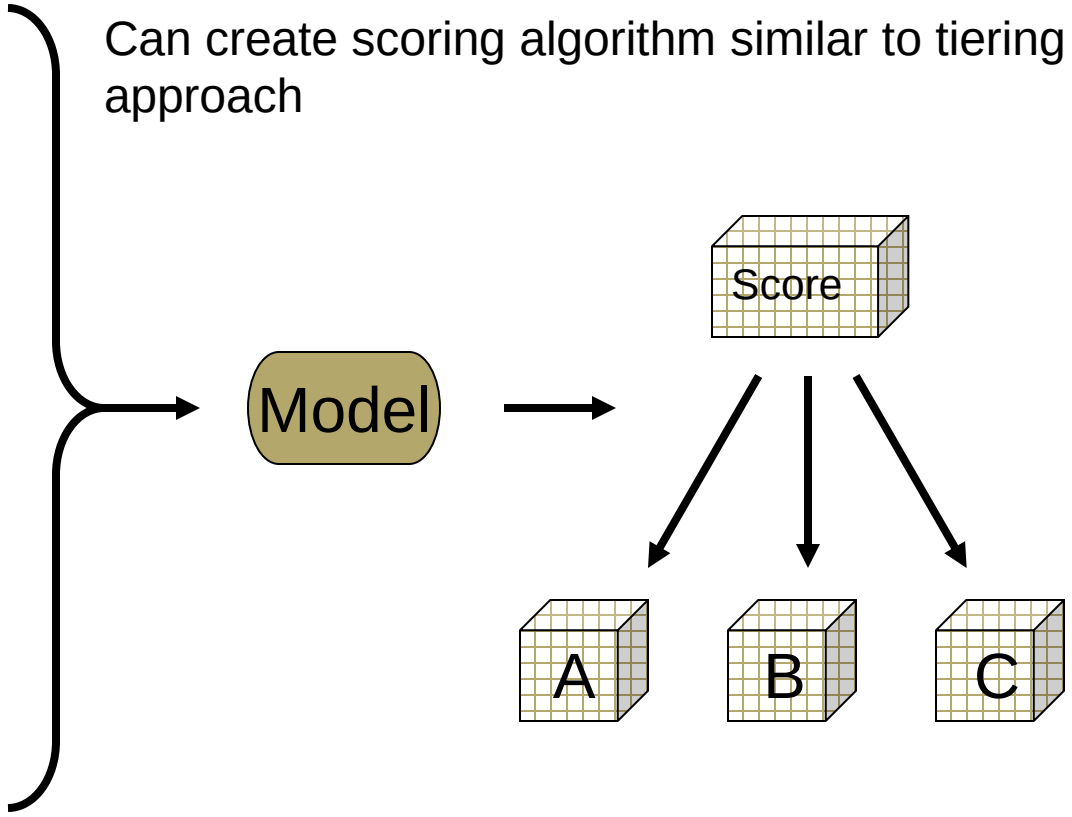
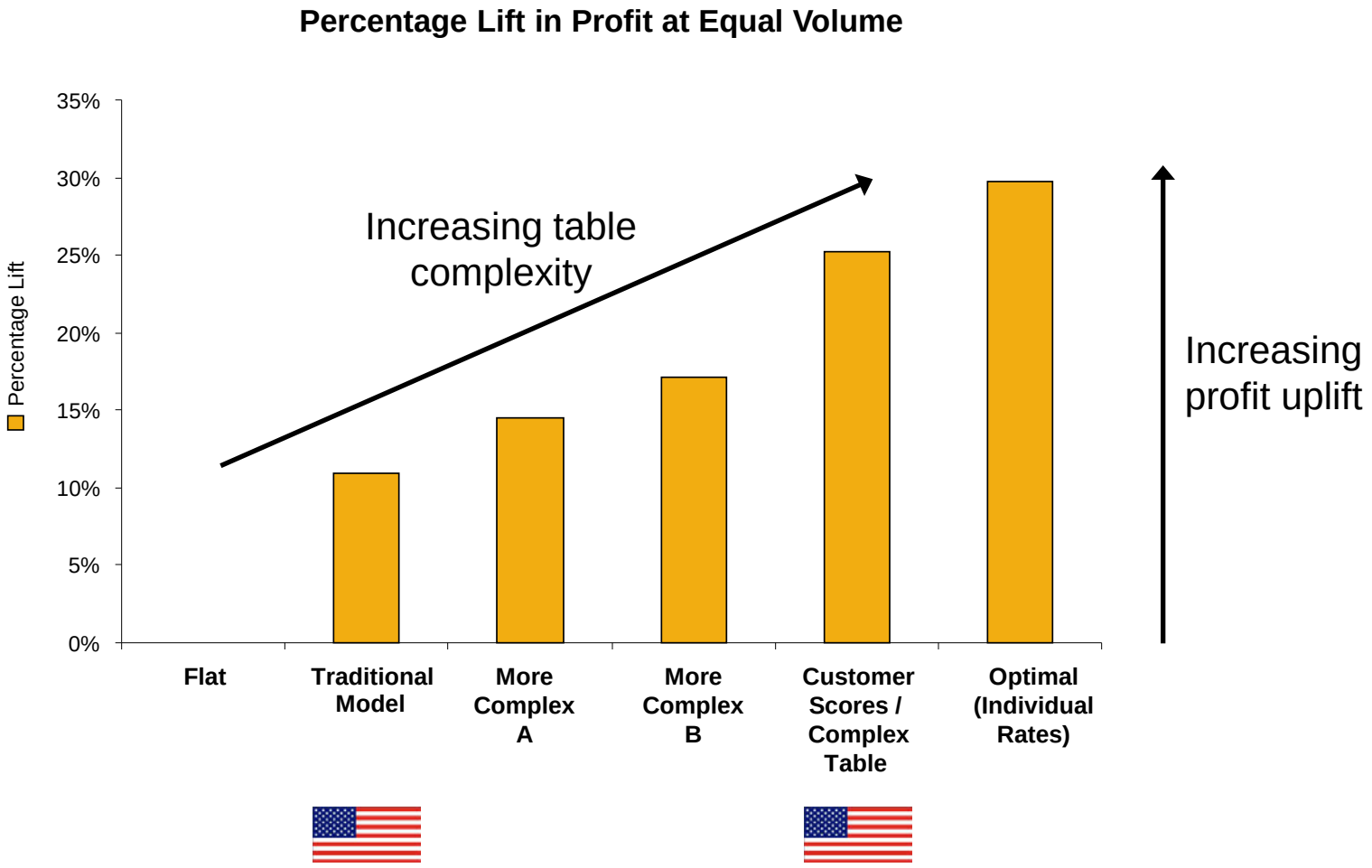
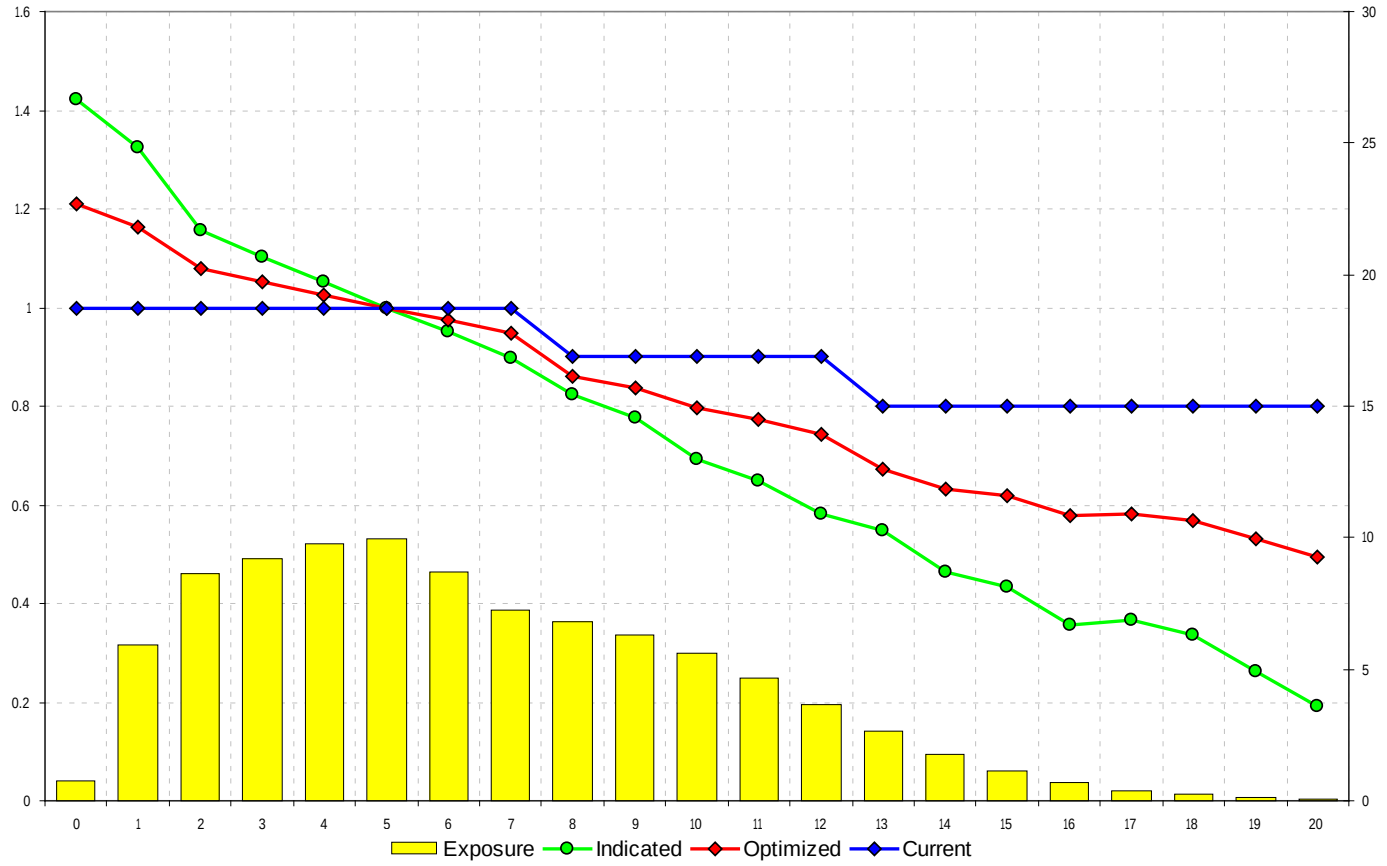
Can create scoring algorithm similar to tiering approach



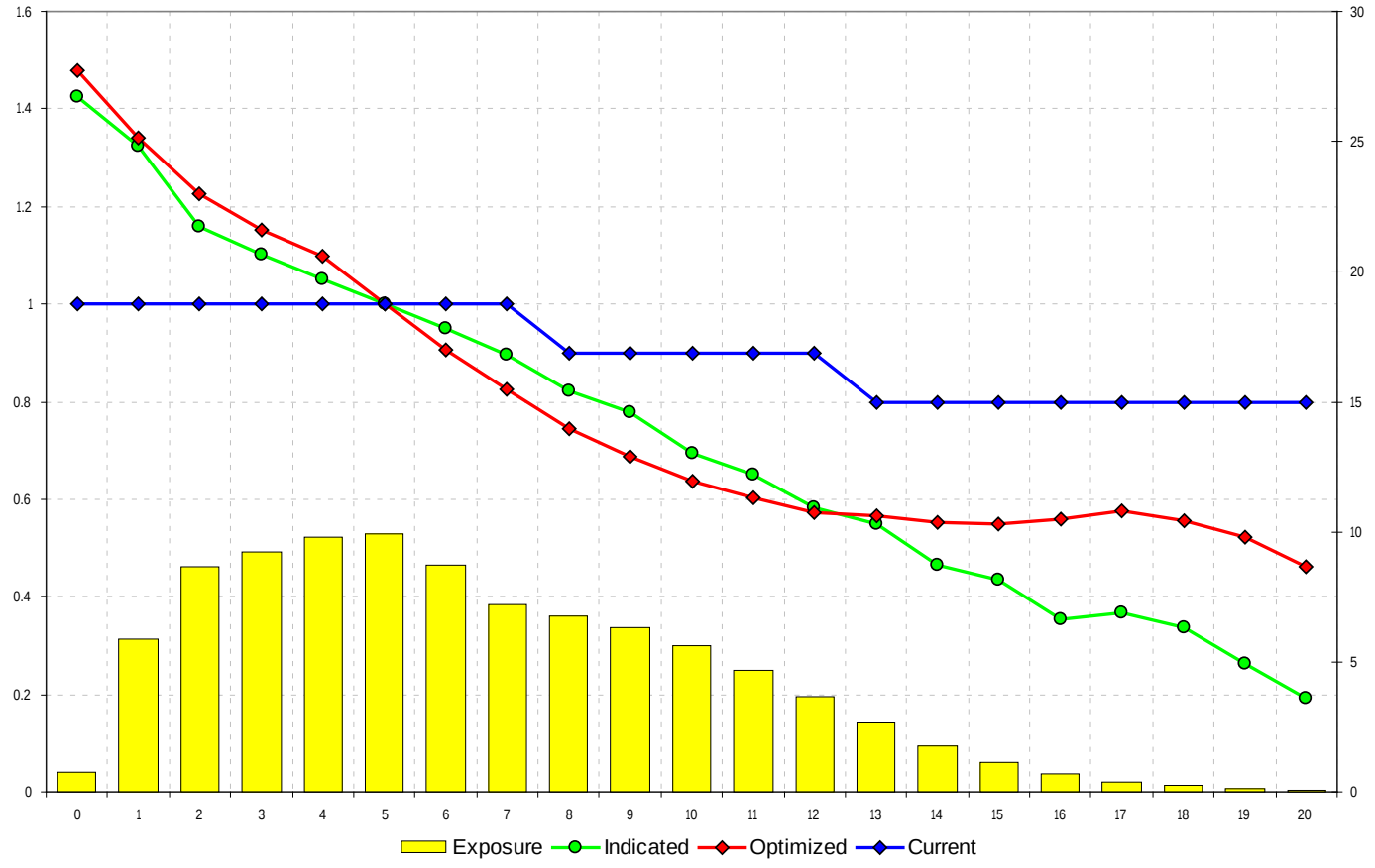
Profit uplift comparison
Real example (UK auto renewals optimization)



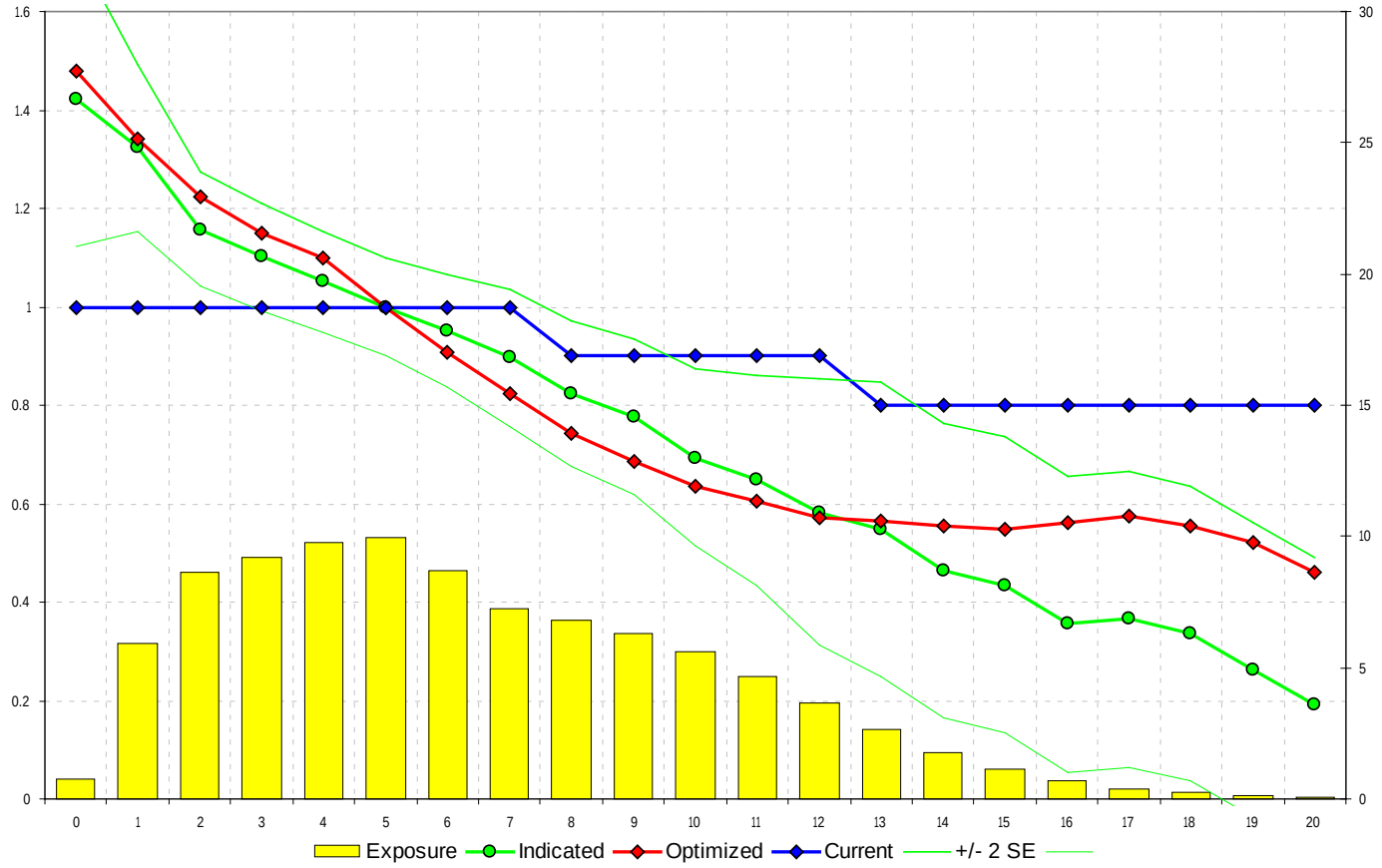
Regulatory constraints



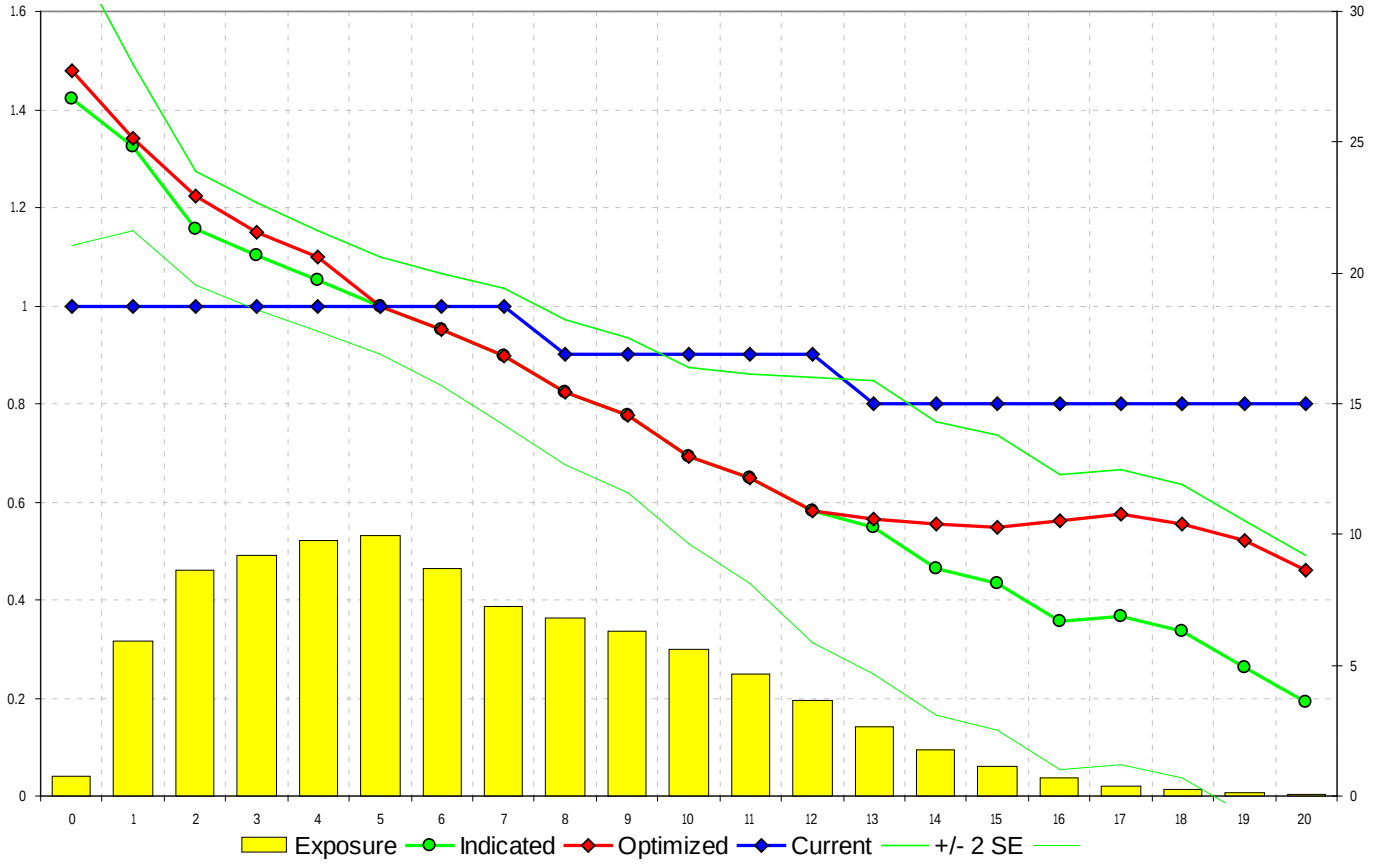
Regulatory constraints



Regulatory constraints



Regulatory constraints



Regulatory constraints

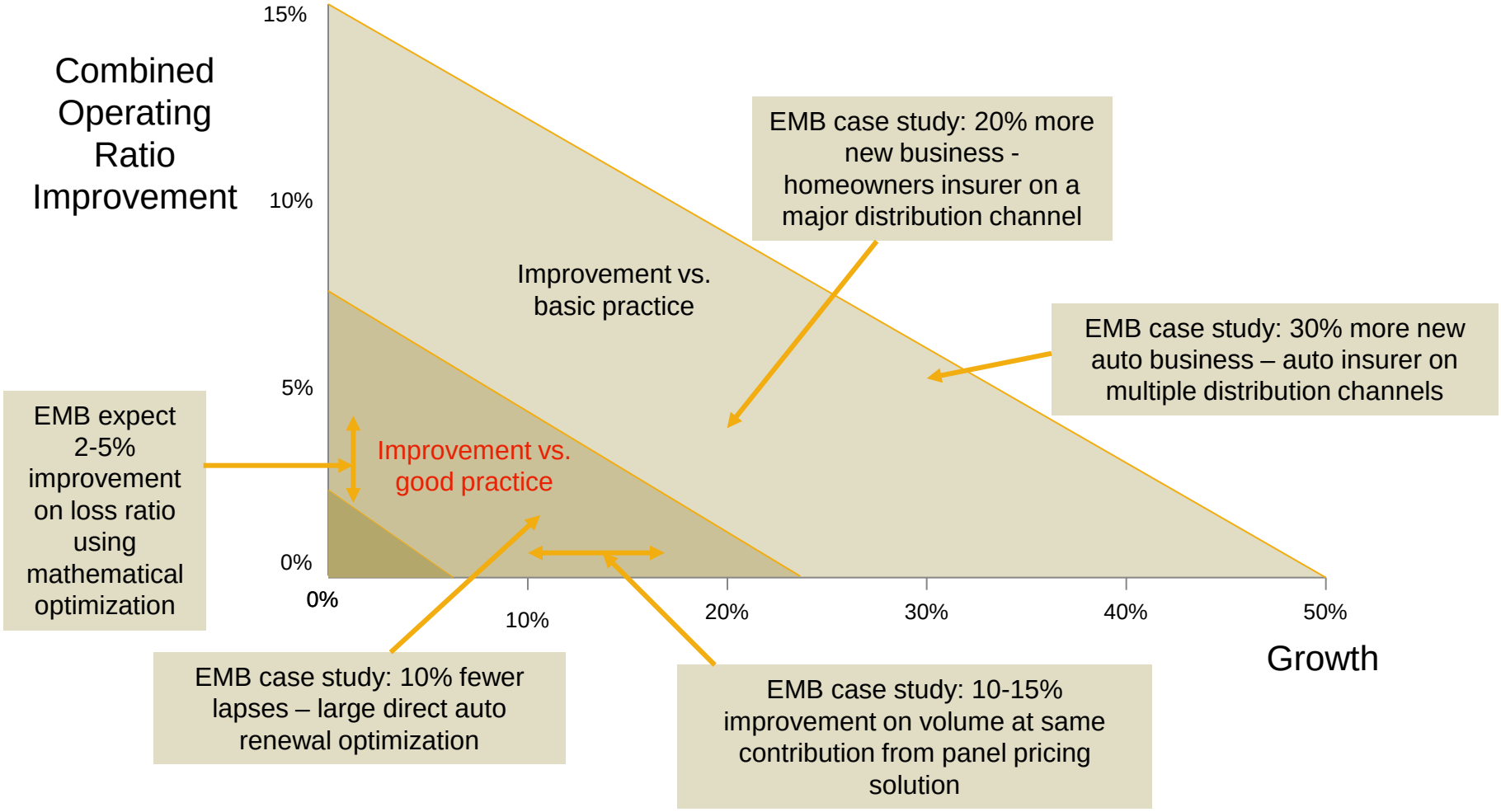
- "There's no point in optimizing individual rates in the US" ✖
- "Fitting a simple model to individually optimized premiums solves all the problems" ✖

Agenda

- What is price optimization?
- Key aspects
  - inputs
  - algorithm
  - implementation
- Business benefits and wider implications

EMB Case Studies

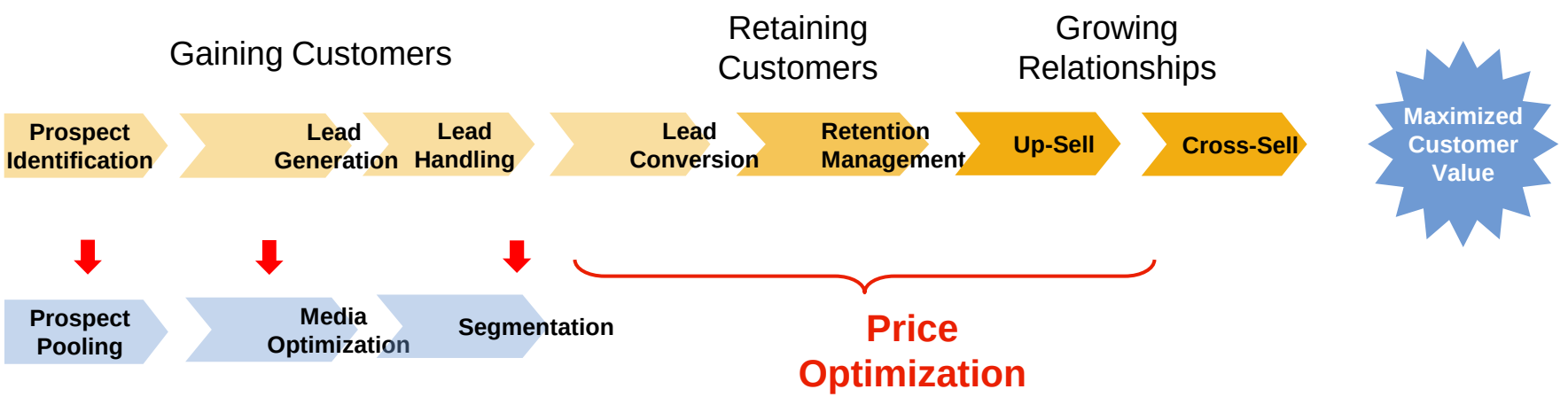
Impact of Price Optimization



Insights into further benefits

- Expected improvement in loss ratio widens over time
- Incorporating cross-sell propensity further improves profitability (as much as 10%!)
- Helps companies re-evaluate constraints (e.g., marketing messages that may be penalizing true profit potential)
- Aligns whole organization towards customer value management

The Customer Value Chain



What is Price Optimization?

Price optimization is a reflection of your corporate vision

Price Optimization IS…

- Determining prices to achieve performance goals
- A range of approaches varying from simple to complex
- Applicable to new and renewal business
- Being successfully used in the US

Price Optimization is NOT…

- A one-time study that replaces the need for pricing strategy
- A complex “Black Box” tool only applicable to large insurers
- Exploitation of loyal members
- Impossible due to rate regulation

Price Optimization

CAMAR Fall 2010 Meeting
December 2, 2010
Claudine Modlin, FCAS, MAAA