



Global Advances in Pricing

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Global advances in pricing



Algorithms and the rise of the machine



Predictive modelling & algorithms in P&C insurance



Summary

Global advances in pricing

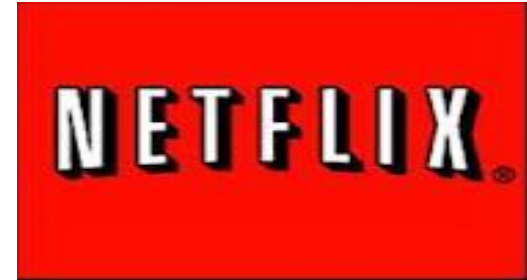


Algorithms and the rise of the machine

Predictive models are being used everywhere you look...



- Online dating services using predictive analytics to match potential couples
- Ranks the 3 key first date questions (a match improves the couples chances 7-fold) as:
 - Wouldn't it be fun to chuck it all and go live on a sailboat?
 - Do you like horror movies?
 - Have you ever travelled alone in a foreign country?



- Netflix awarded £1m prize for a predictive modelling algorithm that could out-predict (vs. current method) future user rating of movies based on past ratings made by the user
- Predictions then used in algorithm to make user recommendations

... and models are being deployed in “real time” algorithms



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Future – rise of the machines?

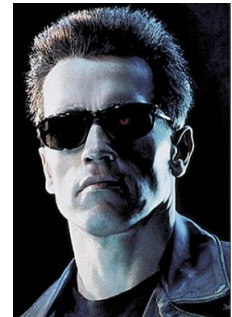
- Predictive models and algorithms seems to be becoming part of everyday life

Big data Cloud computing Distributed processing
Telematics **Connected world** Social media

- Does this mean predicted modelling will be increasingly automated?
 - But what did they say about the “paperless” office

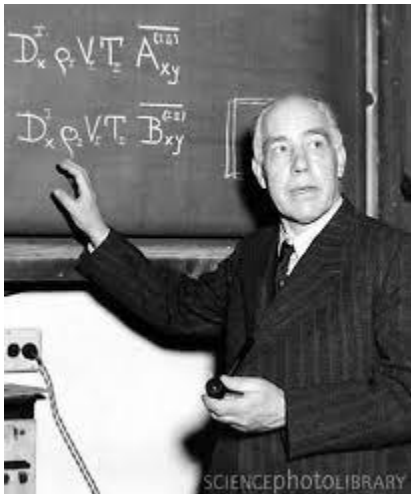


- Man with machine. Predictive modelling needs business knowledge:
 - Model design, factor creation, model interpretation, validation, trending into the future...



The problem with prediction

“It is exceedingly difficult to make predictions, especially about the future.”



Neils Bohr

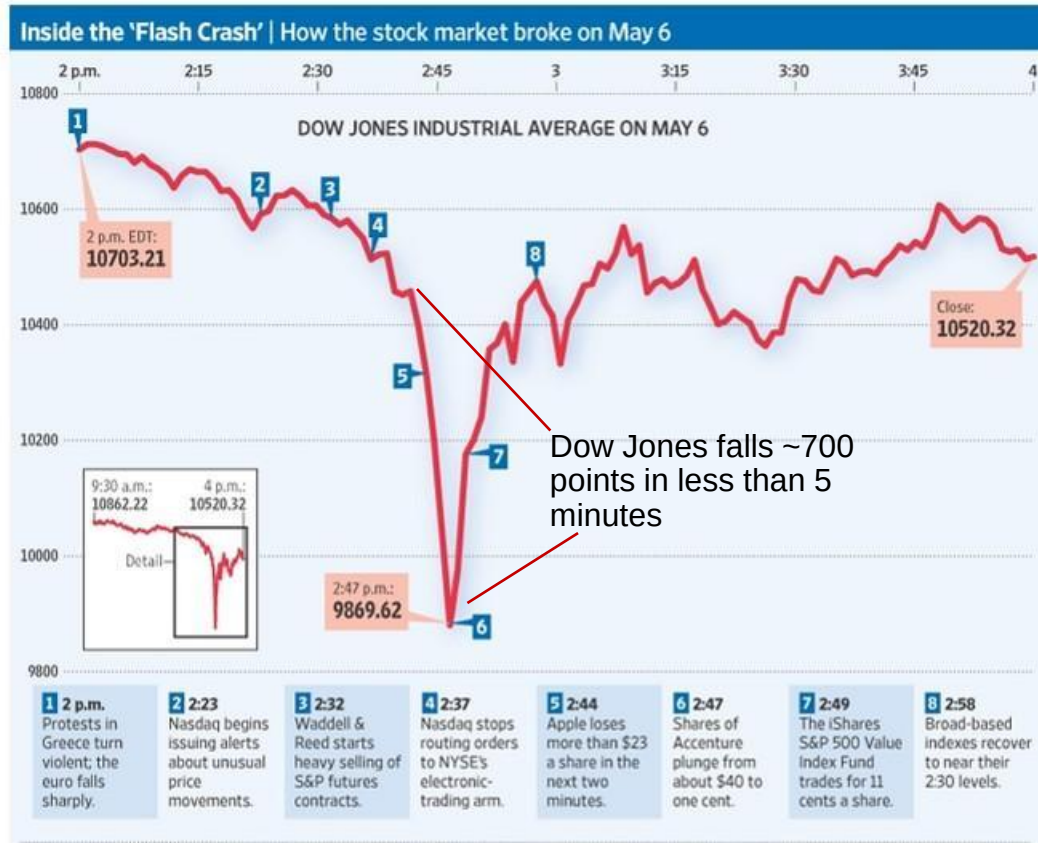
Nobel laureate in Physics



Bill Gates in 1981

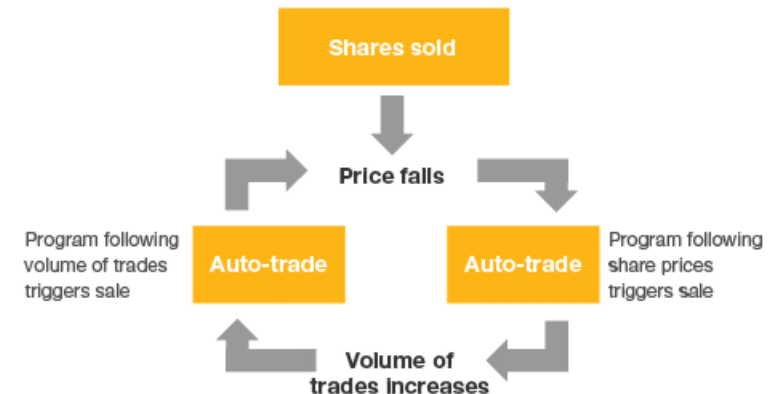
"640K ought to be enough for anybody."

Stock market “flash crash” of 6th May 2010

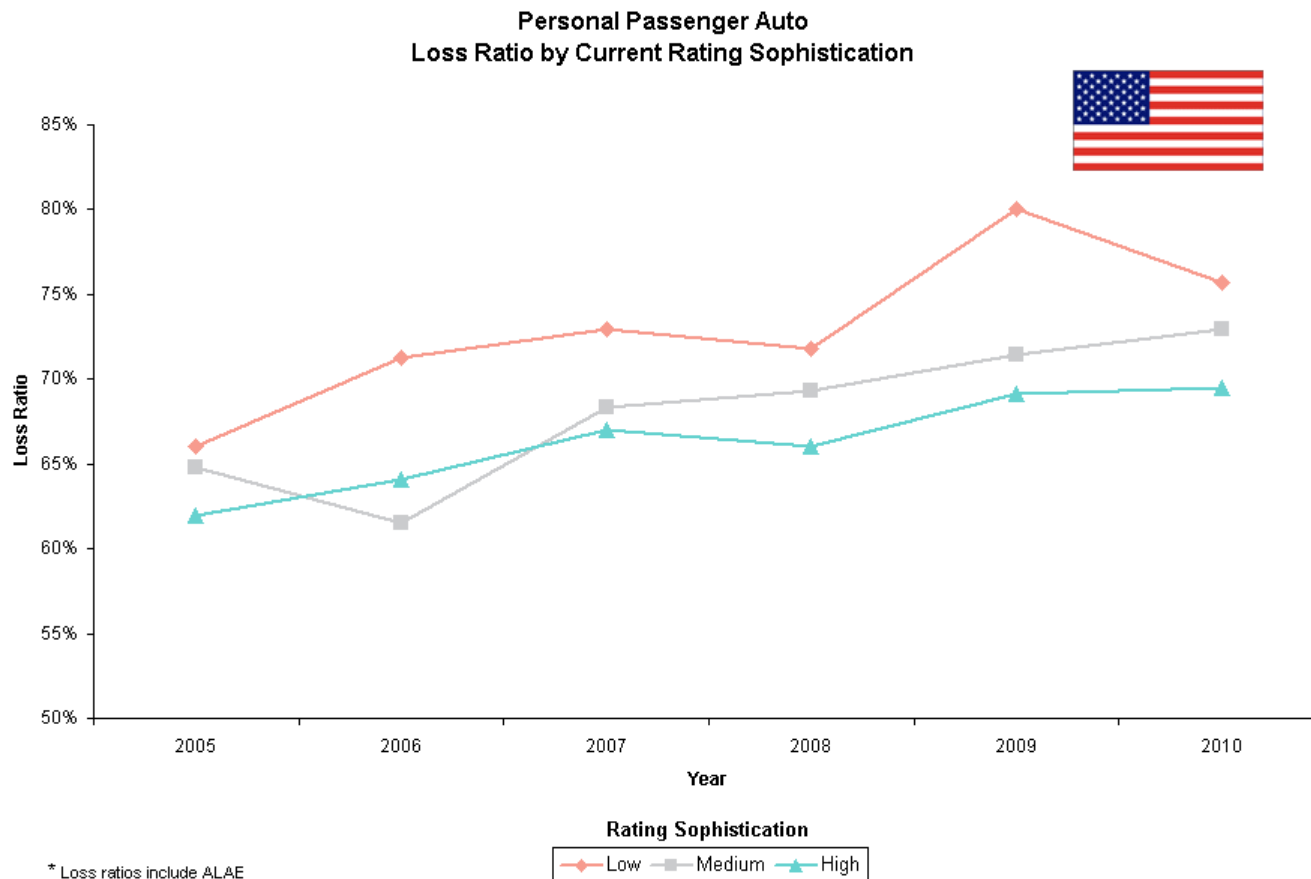


- Blamed on algorithmic trading programs known as high-frequency trading (HFT) - in which stocks can be held for just a matter of seconds
- Estimated that between a third and a half of all share trading in Europe, and more than two-thirds in the US is related to HFT

Trading feedback loop



Increased use of predictive modelling mirrored in P&C



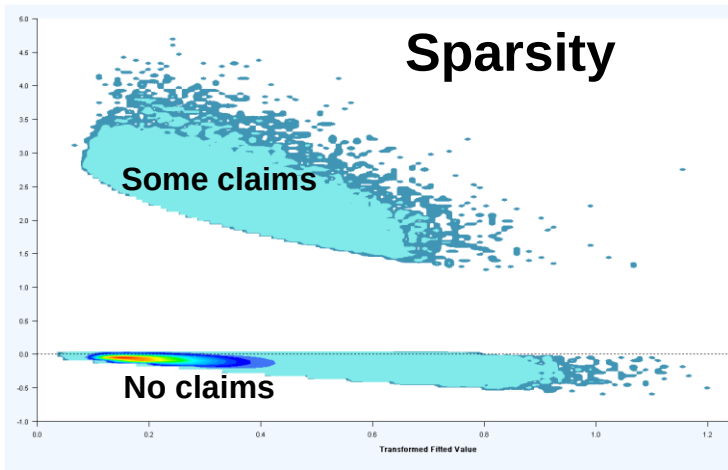
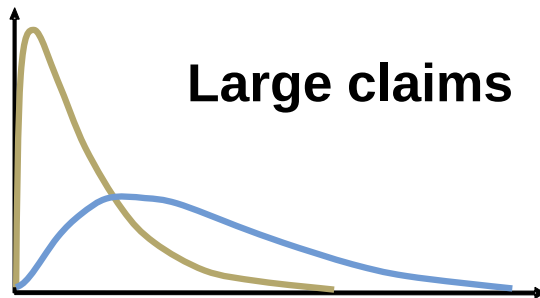
- Source: Towers Predictive Modelling Survey 2011

But you need to recognise P&C characteristics



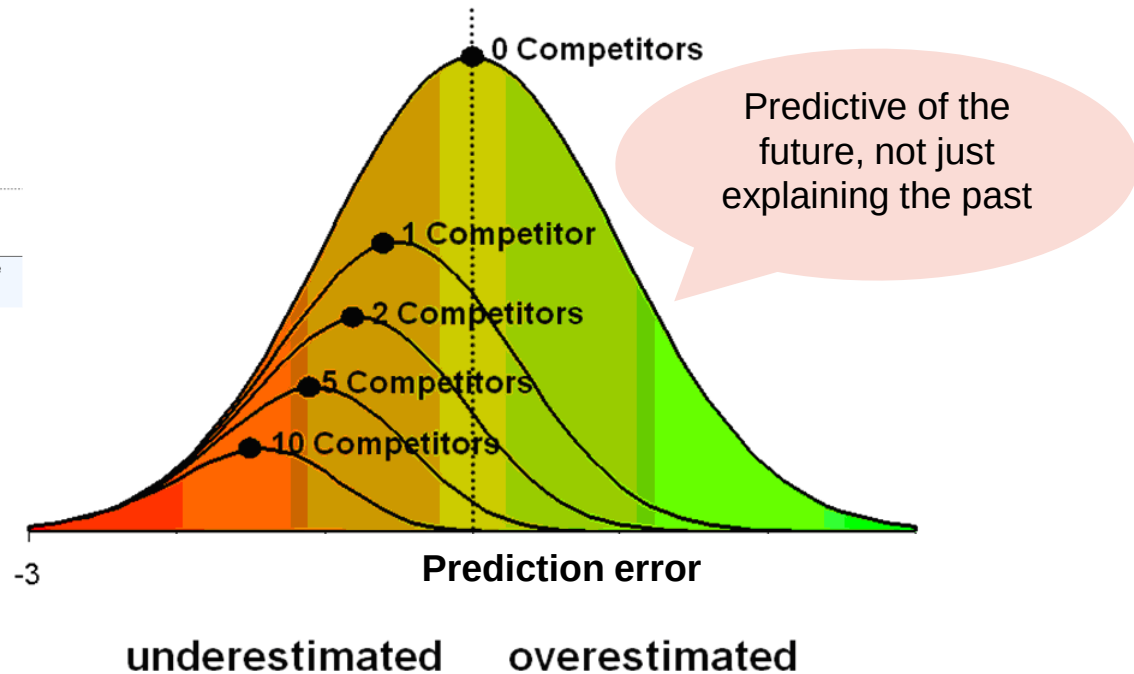
- Plenty of data with high “response rates”
- Penalty of prediction error is low

But you need to recognise characteristics



Noisy process

Winner's curse



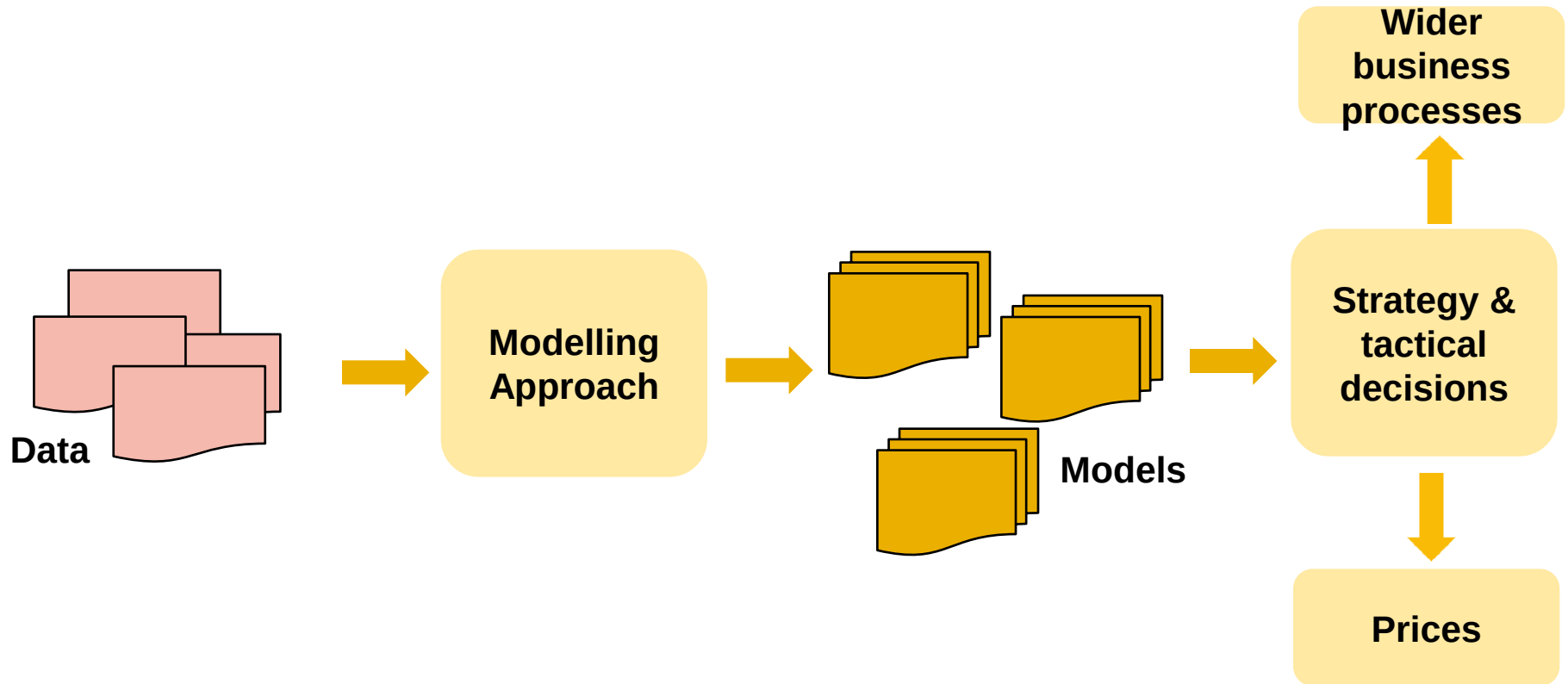
Penalties rise as competition increases

Global advances in pricing



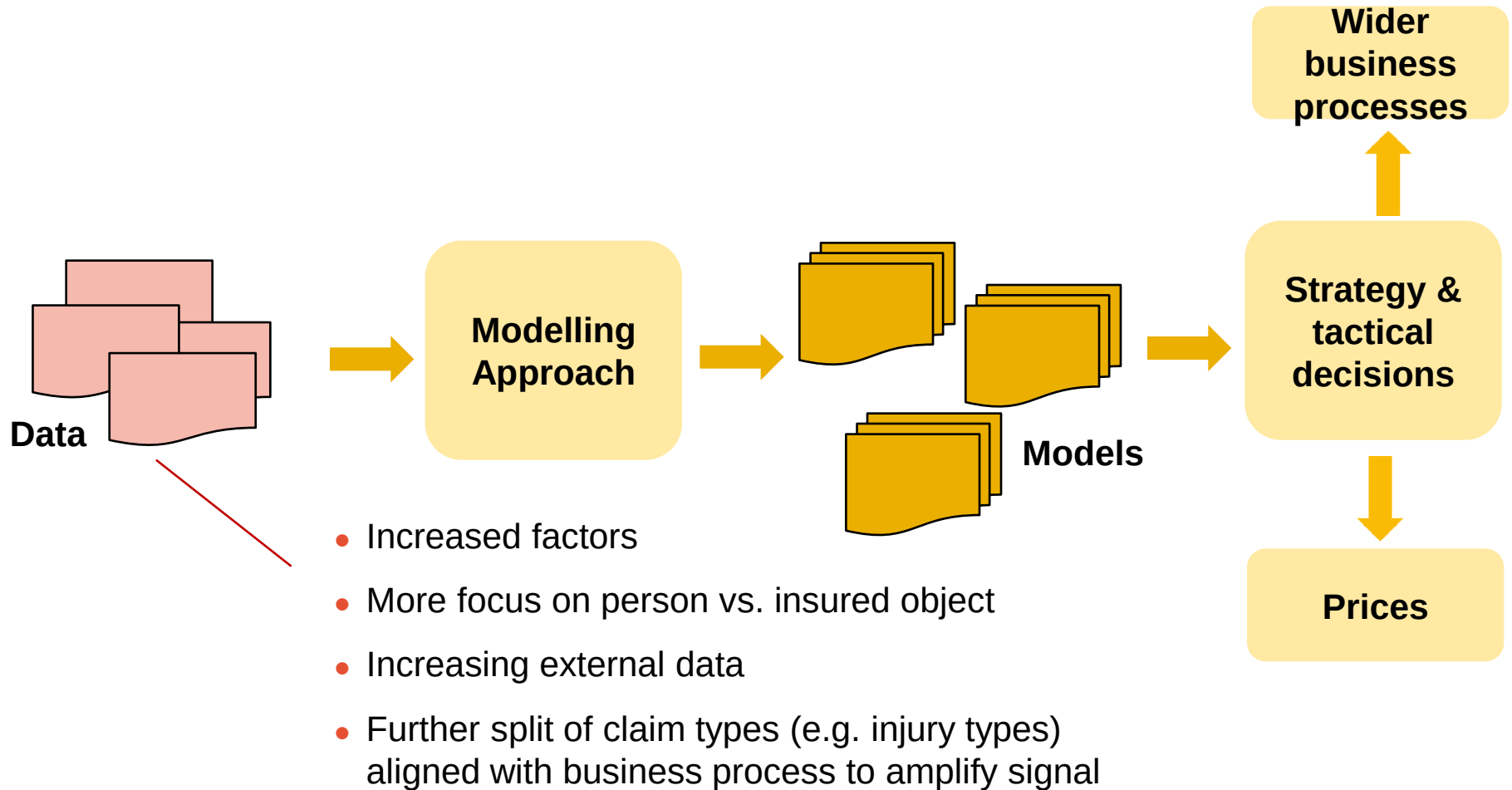
Predictive modelling &
algorithms in P&C insurance

Predictive modelling in pricing

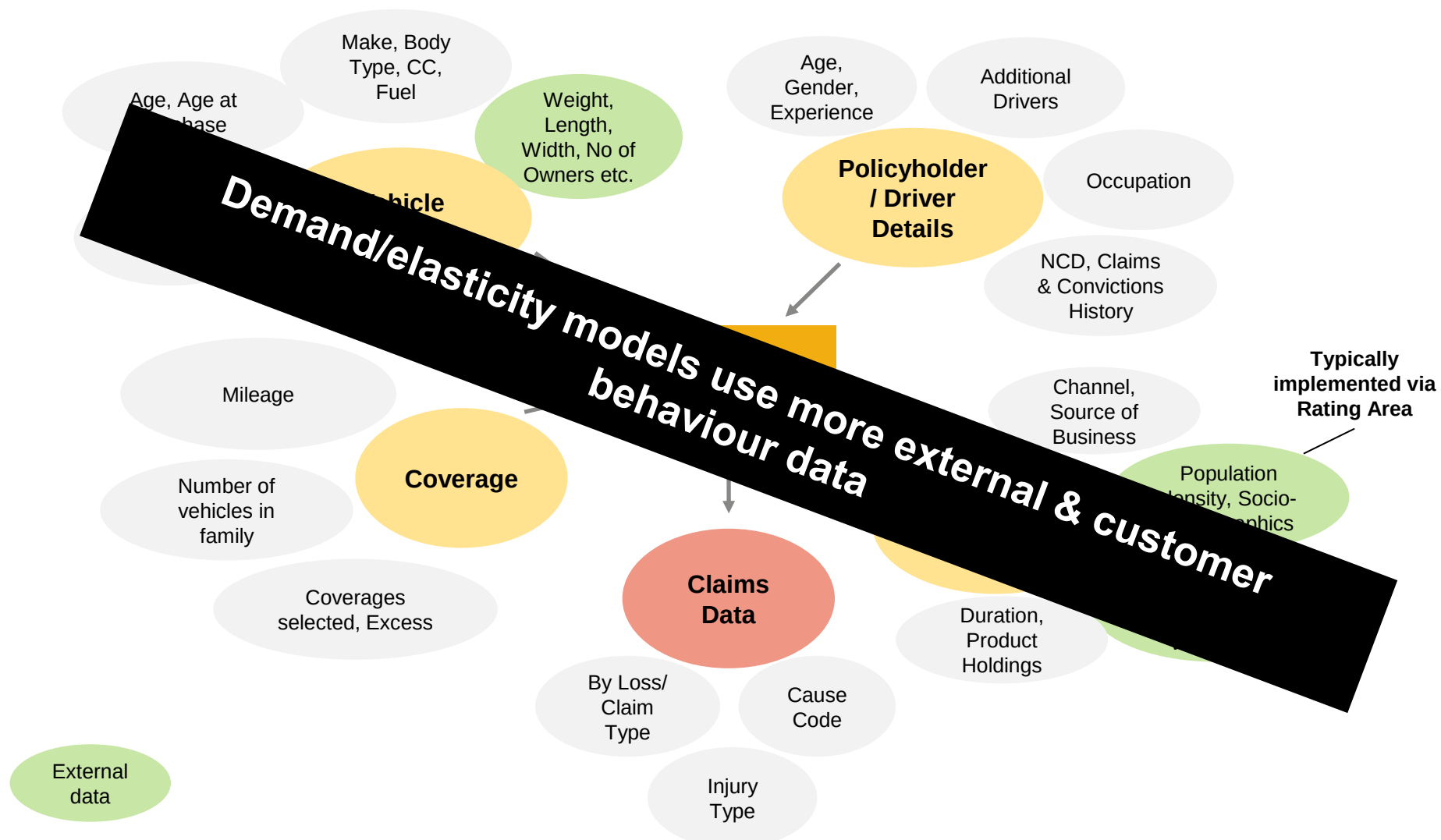


Insurance & underwriting insight still required!

Global advances in pricing - Data



Extending data for analysis – motor example



Increasing customer behaviour proxies

Environmental

- › Population / vehicle density
- › Distance to services (ports, motorways, etc.
- › Claims management companies

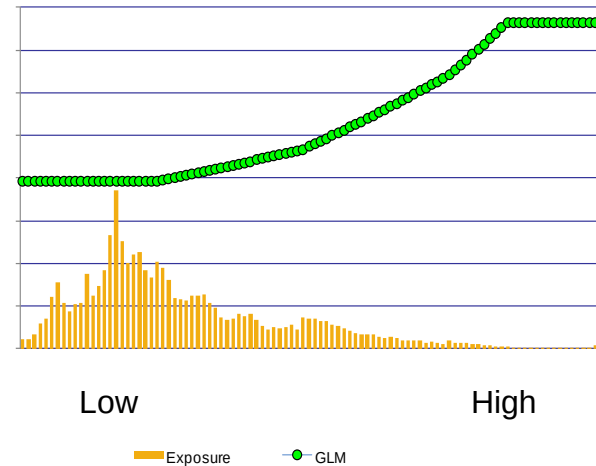
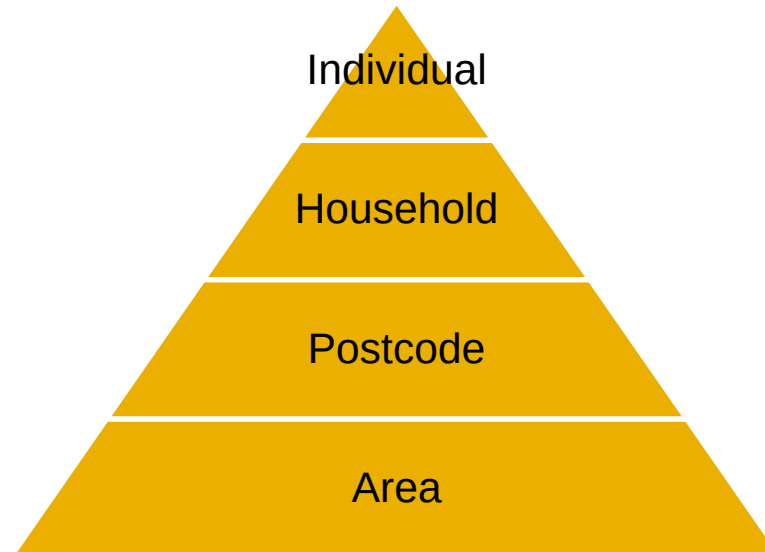
Socio demographic

- › Population mix
- › Unemployment, crime
- › County court judgements
- › Social groups
- › Affluence
- › Credit rating

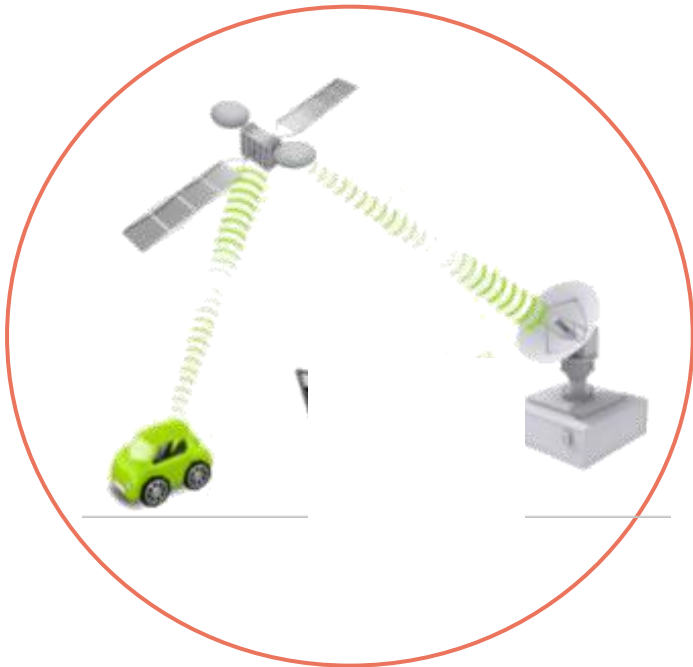
Behavioural

- › Quote behaviour
- › Shopping propensity
- › Product holdings
- › Contact history

Unemployment Rate

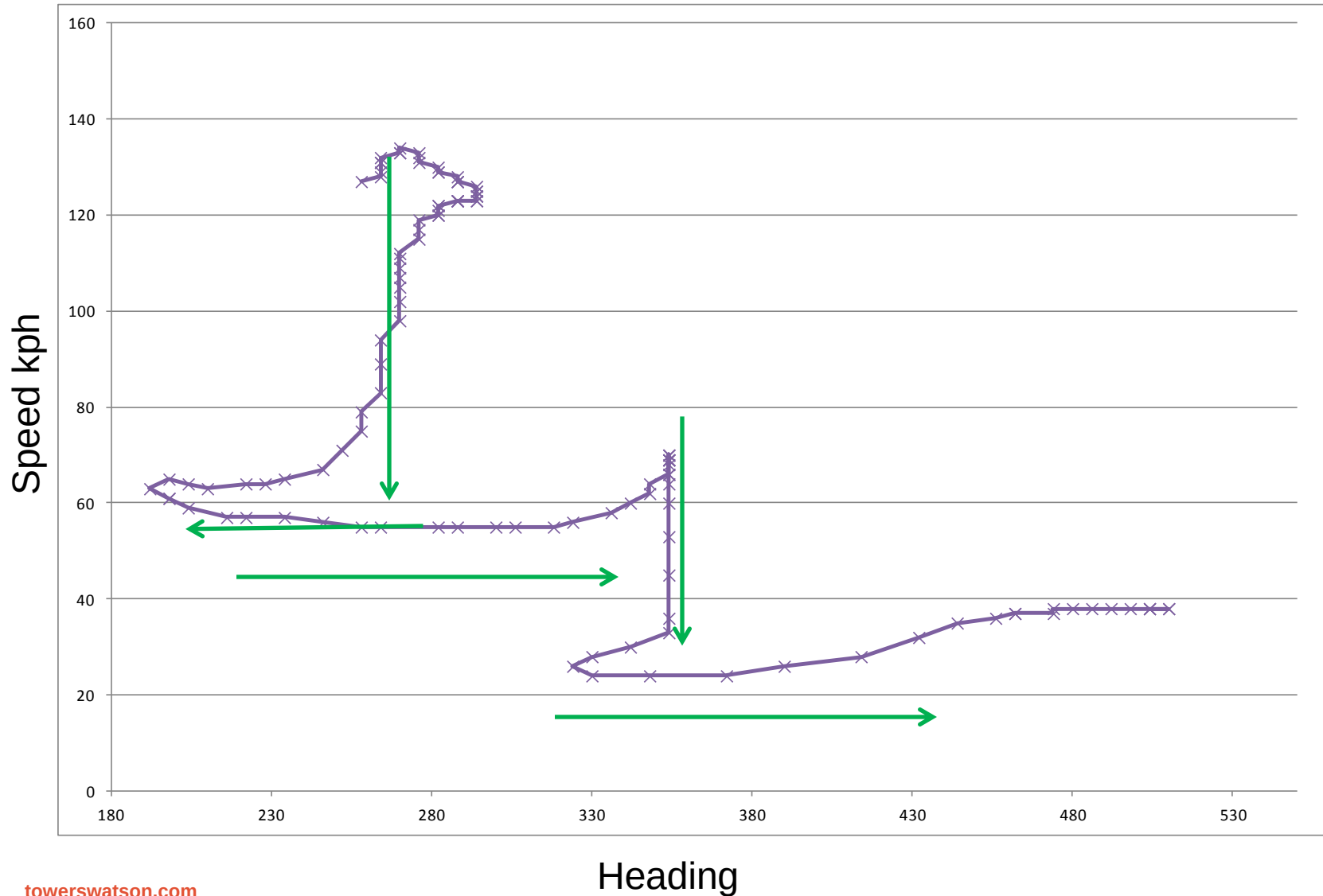


Usage-based insurance - moving away from proxies

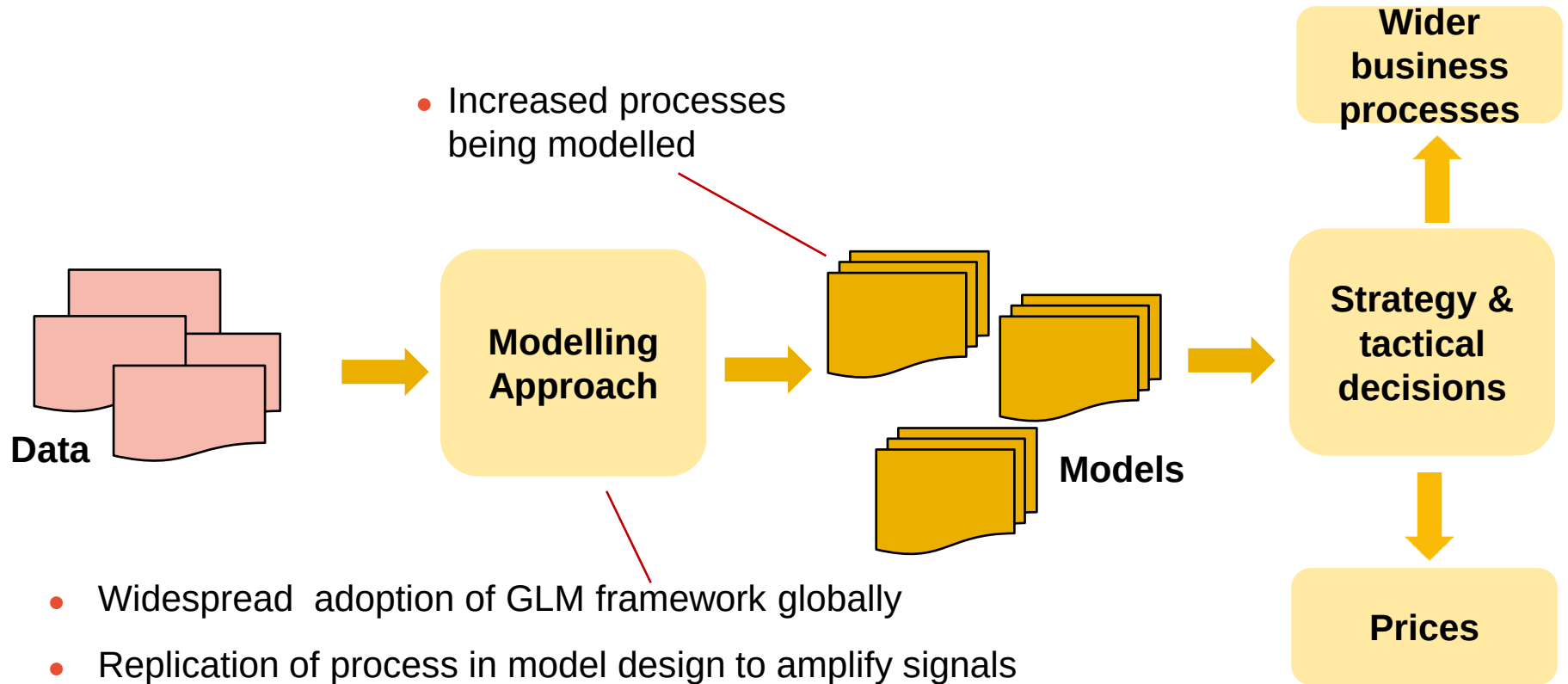


Local time	Latitude	Longitude	Heading (degrees)	Speed (kph)	RPM
02/02/2012 08:43:53	36.15050	-94.09869	0	0	900
02/02/2012 08:43:54	36.15051	-94.09870	0	0	1000
02/02/2012 08:43:55	36.15050	-94.09870	50	4.8	900
02/02/2012 08:43:56	36.15051	-94.09872	40	6.4	800
02/02/2012 08:43:57	36.15051	-94.09873	40	3.2	800
02/02/2012 08:43:58	36.15051	-94.09874	40	1.6	800
02/02/2012 08:43:59	36.15052	-94.09875	30	3.2	800
02/02/2012 08:44:00	36.15052	-94.09876	30	1.6	800
02/02/2012 08:44:01	36.15052	-94.09877	24	0	800
02/02/2012 08:44:02	36.15052	-94.09878	24	0	800
02/02/2012 08:44:03	36.15052	-94.09879	14	3.2	1000
02/02/2012 08:44:04	36.15052	-94.09881	-86	4.8	900
02/02/2012 08:44:05	36.15051	-94.09883	-106	3.2	800
02/02/2012 08:44:06	36.15051	-94.09884	-106	0	800
02/02/2012 08:44:07	36.15050	-94.09885	-106	0	1500
02/02/2012 08:44:08	36.15051	-94.09885	34	6.4	1700
02/02/2012 08:44:09	36.15053	-94.09884	4	12.8	2100
02/02/2012 08:44:10	36.15057	-94.09885	-6	17.6	2500
02/02/2012 08:44:11	36.15062	-94.09885	4	22.5	2800
02/02/2012 08:44:12	36.15069	-94.09885	4	27.3	3000
02/02/2012 08:44:13	36.15077	-94.09885	4	32.1	2500
02/02/2012 08:44:14	36.15086	-94.09885	4	35.3	2300
02/02/2012 08:44:15	36.15095	-94.09884	4	37	1600
02/02/2012 08:44:16	36.15104	-94.09884	4	35.3	1300
02/02/2012 08:44:17	36.15113	-94.09883	4	33.7	1300
02/02/2012 08:44:18	36.15122	-94.09883	4	35.3	1400
02/02/2012 08:44:19	36.15131	-94.09883	4	33.7	1200
02/02/2012 08:44:20	36.15140	-94.09883	4	32.1	1300
02/02/2012 08:44:21	36.15148	-94.09883	4	33.7	1200
02/02/2012 08:44:22	36.15157	-94.09882	4	32.1	1000

UBI - manoeuvring example



Global advances in pricing - modelling



- Widespread adoption of GLM framework globally
- Replication of process in model design to amplify signals
- Automated multi-factor effect detection
- Increased model validation
- Spatial smoothing techniques for high dimension variables (e.g. zip code)
- Likely increased “discovery” phase for new processes with extensive data

GLM enhancements



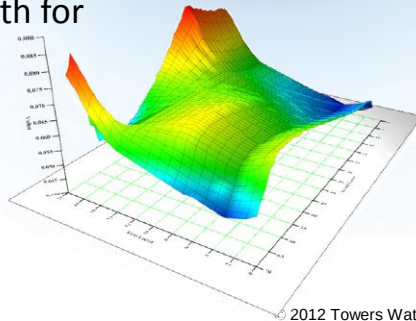
Impart business knowledge

- Models focused on purpose and designed around underlying processes to maximise signals
- Increased transparency to maximise use of business insight and engage underwriters & other stakeholders into modelling process



Automated procedures

- Features like saddles used to rapidly & automatically detect multiple factor effects
- Variable importance allows both for correlations and in “so what” business context



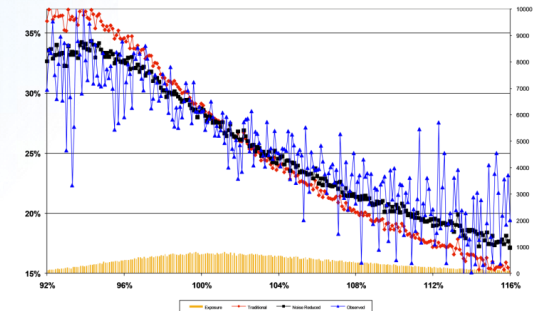
Speed and scalability

- Software & hardware to cope with 100's variables and millions observations in minutes
- Models can incorporate scores and segments modelled from subsidiary processes (e.g. pre-analysis)



Validation & cross-validation

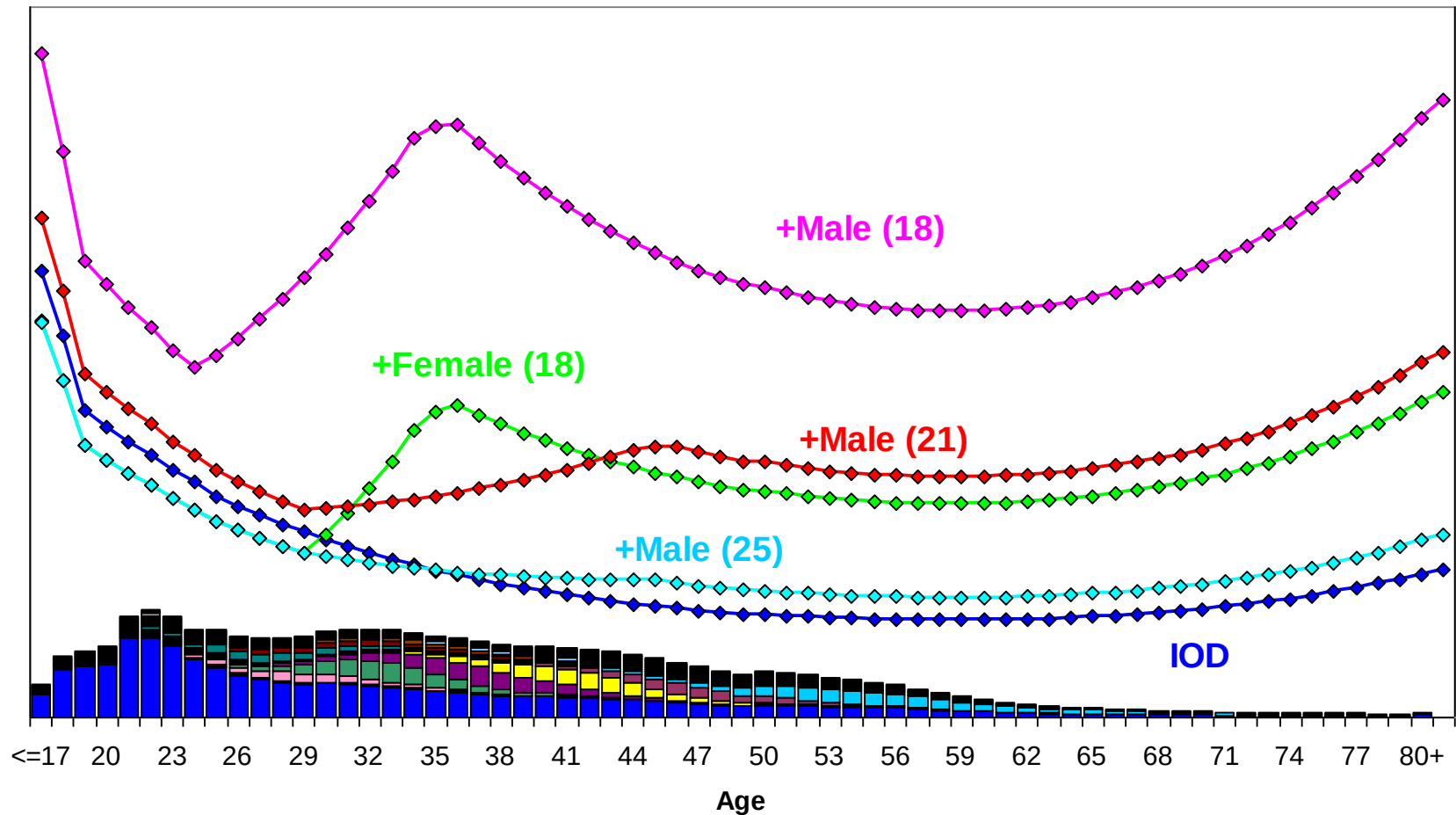
- Validation and cross-validation incorporated into modelling process
- Prediction performance of models monitored



GLMs can detect complex signals

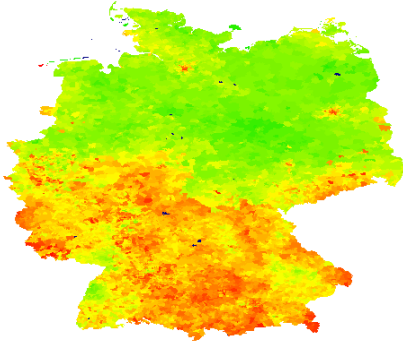
- example risk premium interactions

Bodily Injury Frequency - Age x Additional Driver



Improvements in technical modelling

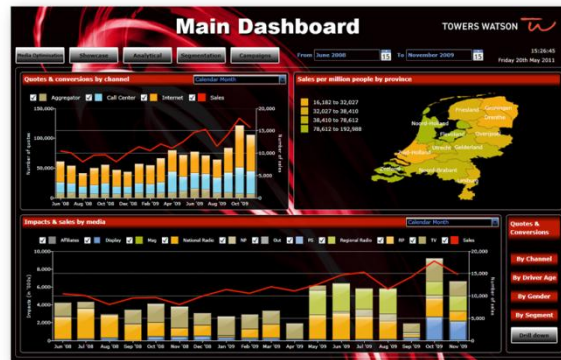
- Geographical classification



- Vehicle classification



- Building models into management information dashboards

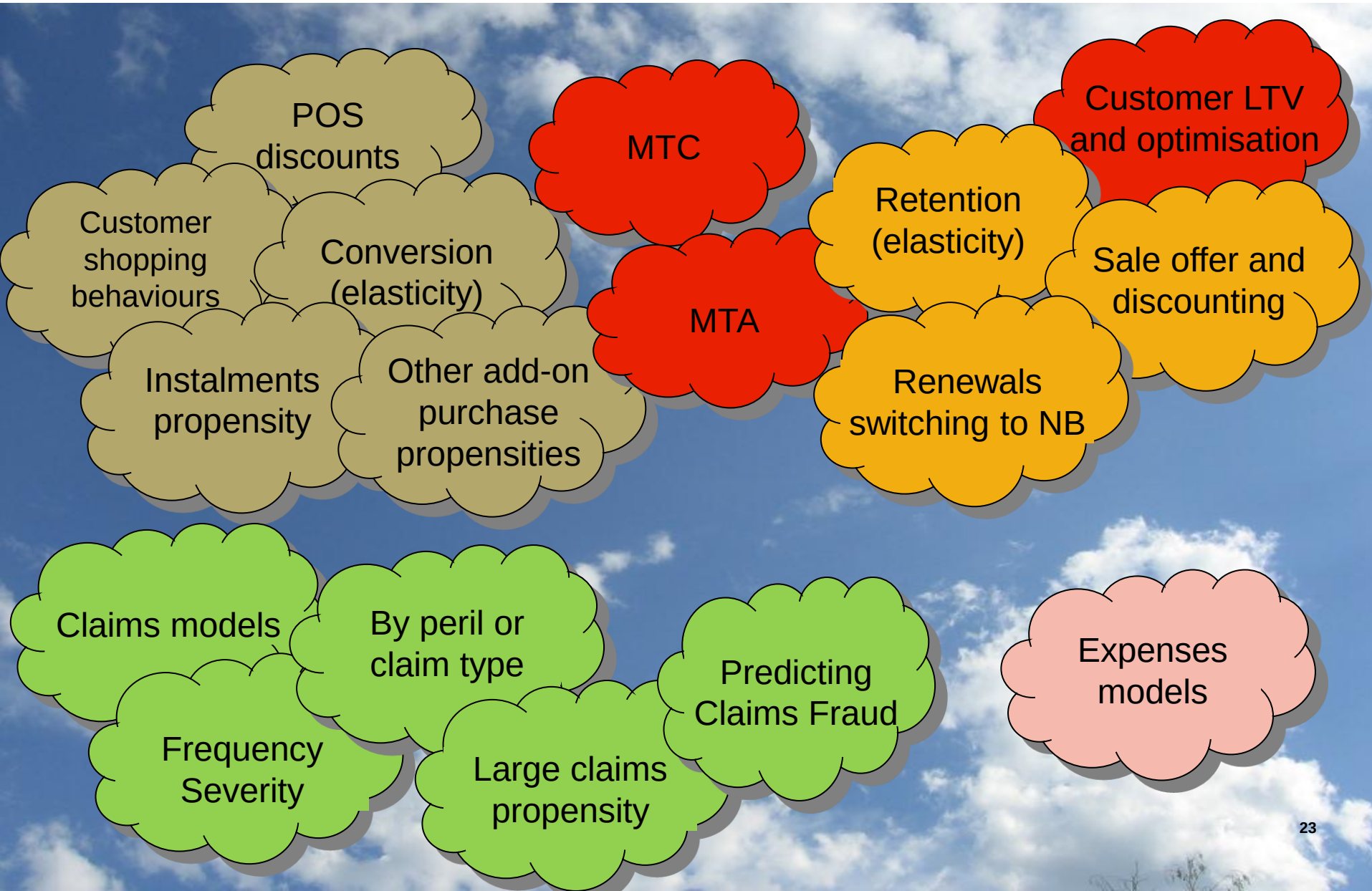


- Use models to understand consistency of risks for automated underwriting

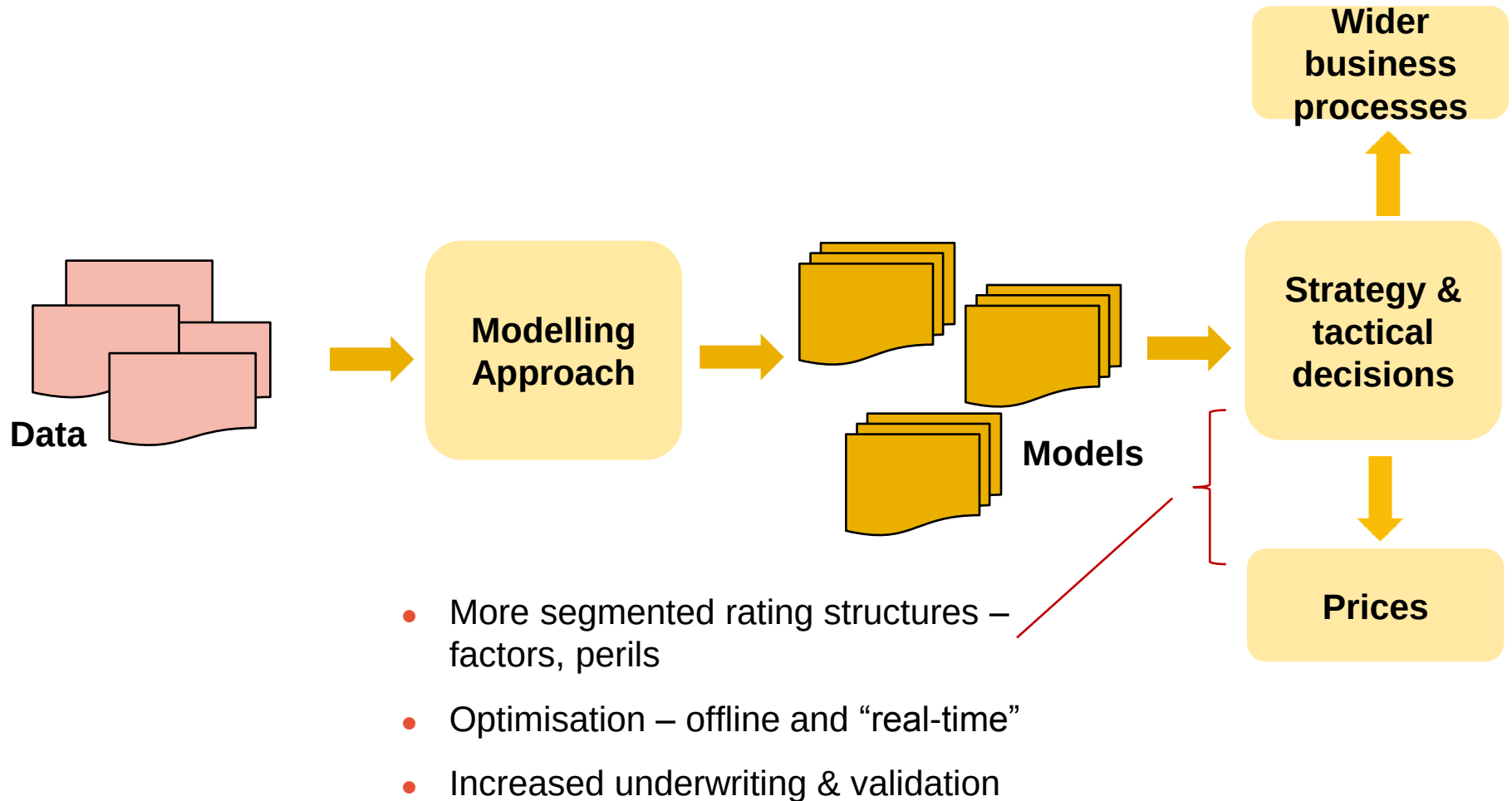
Age	Vehicle Type					Budget				
	Cheap	Small	Family Large	MPV	Sports	Small	Saloon	Large	4x4	Coupe Roadster
17 - 20										
21 - 24										
25 - 34										
35 - 49										
50 - 64										
65 - 74										
75+										

New techniques are not a replacement for the use of business insight but enhance/inform it

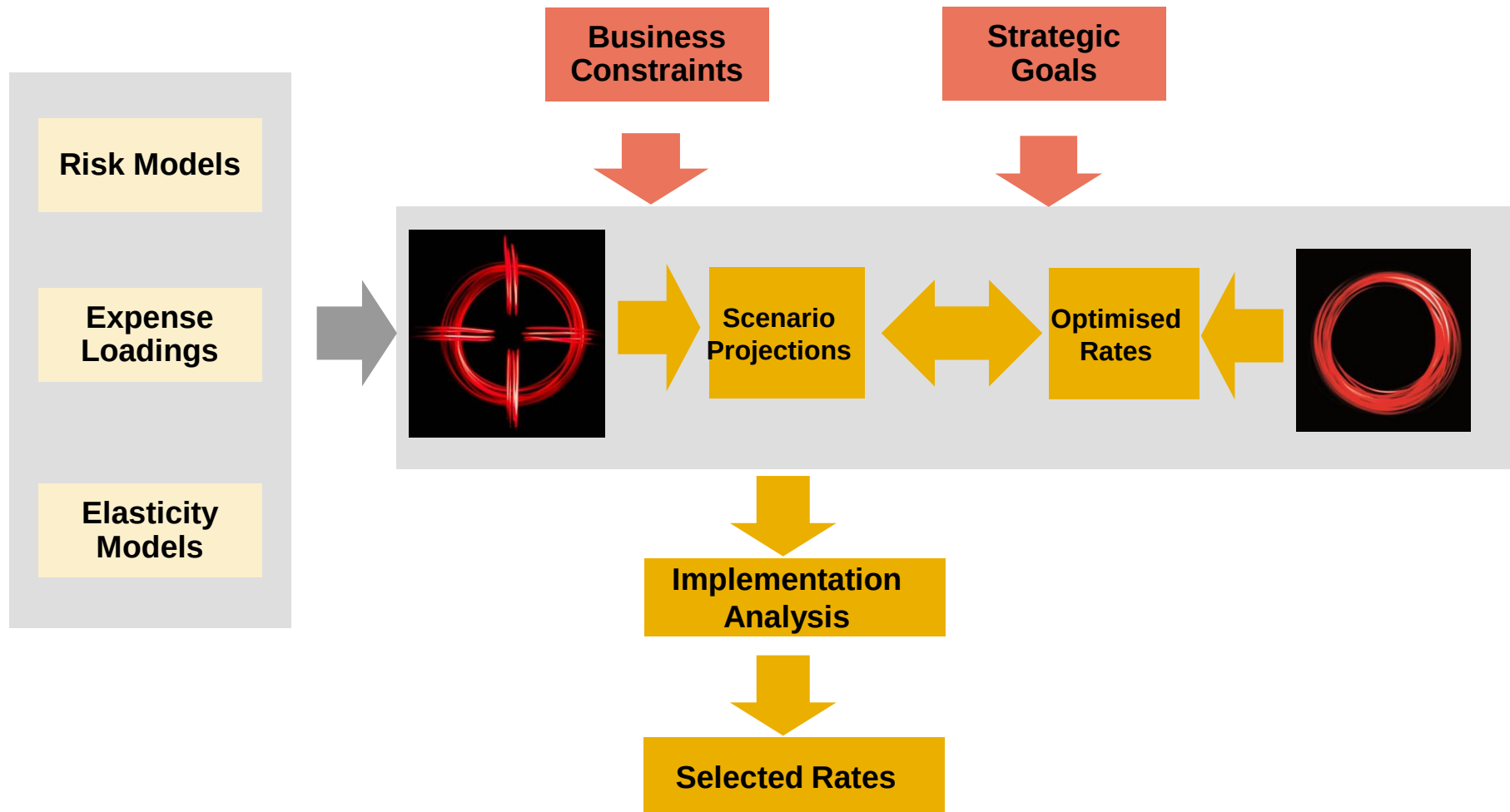
The number of technical models used in pricing is increasing



Global advances in pricing - implementation

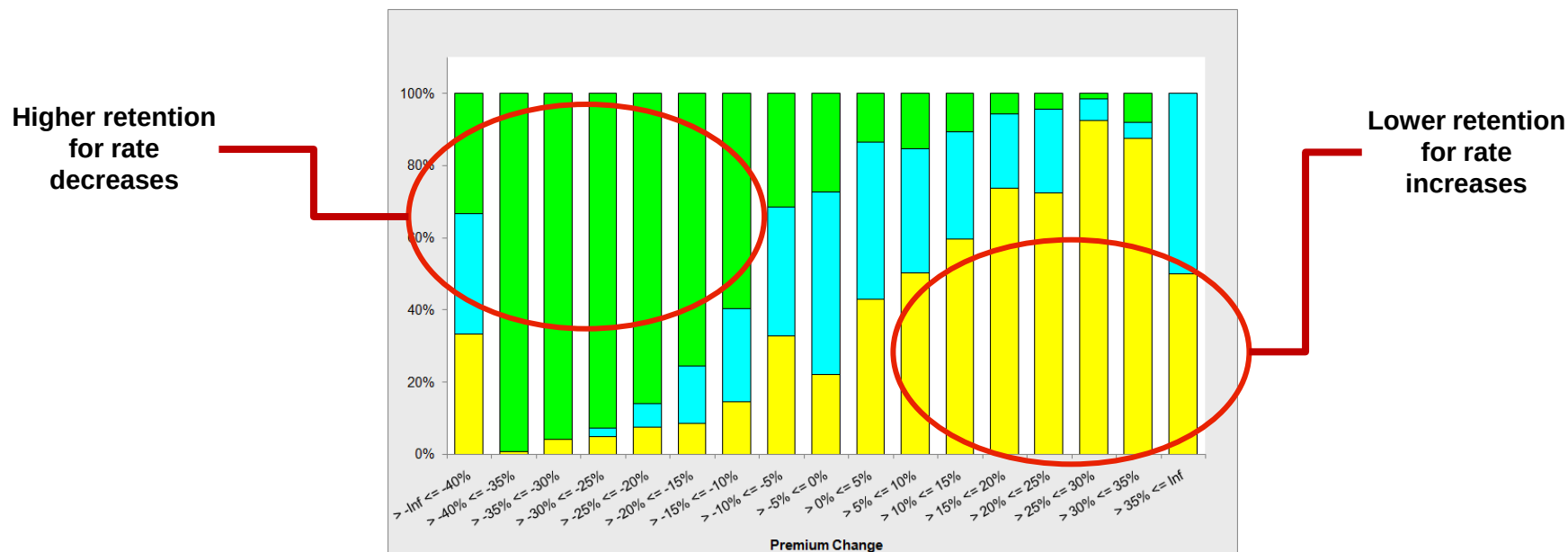


Optimisation process - Overview



Scenario Analysis — Enhance analysis

- Reflect retention and conversion effects in scenario test using models



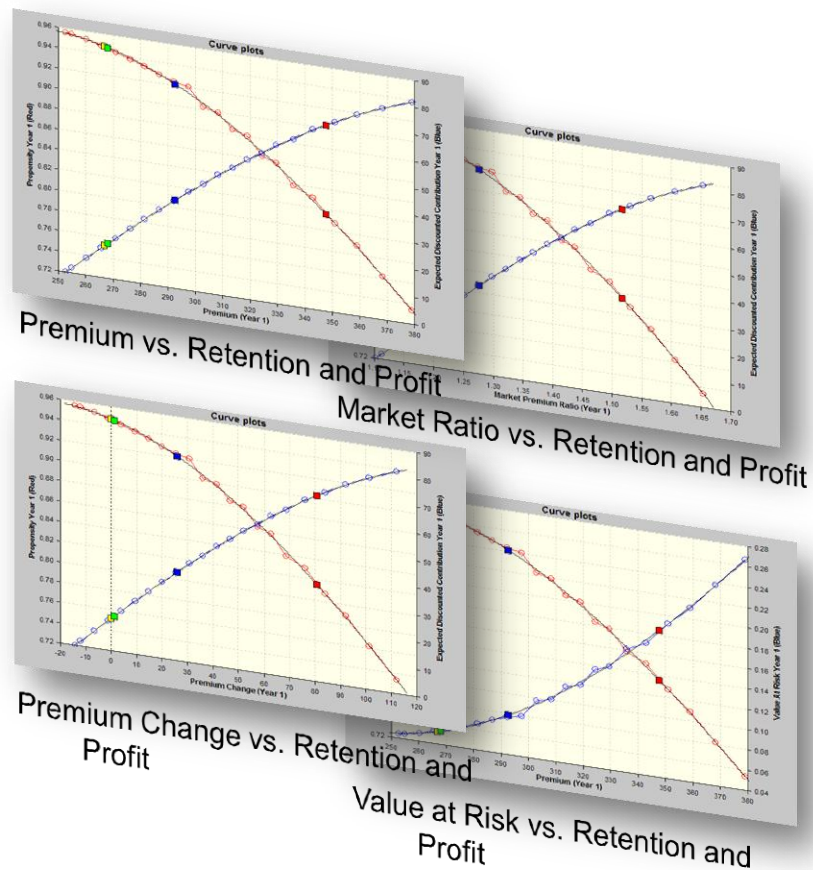
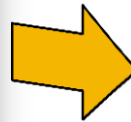
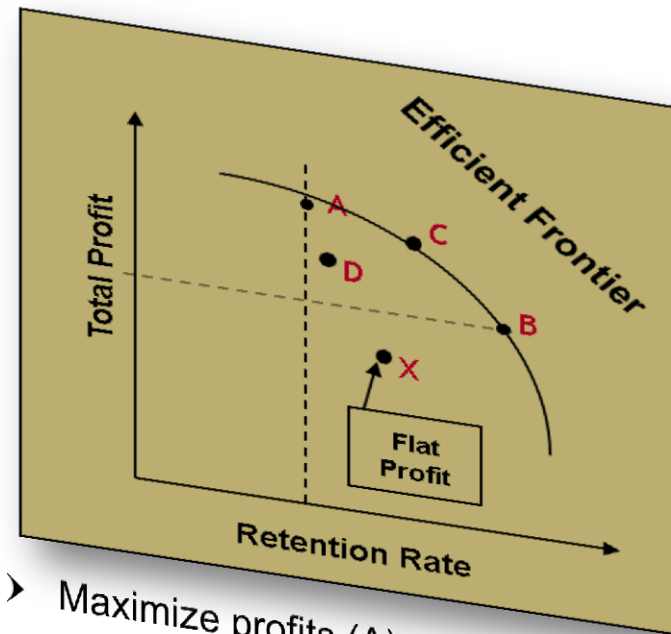
Scenario	Rate Change	Proposed Combined Ratio	Expected Renewal	Expected Combined Ratio
No change	0.0%	88.9	82.4%	90.1
Current rates + 5%	5.0%	84.7	80.0%	86.0
Indications with 6.5% profit	5.8%	84.0	79.6%	84.0
Selections* with 6.5% profit	6.4%	83.6	79.4%	83.5

* Reflects alternate factors in the class plan, model year factor and territory

Optimisation Process

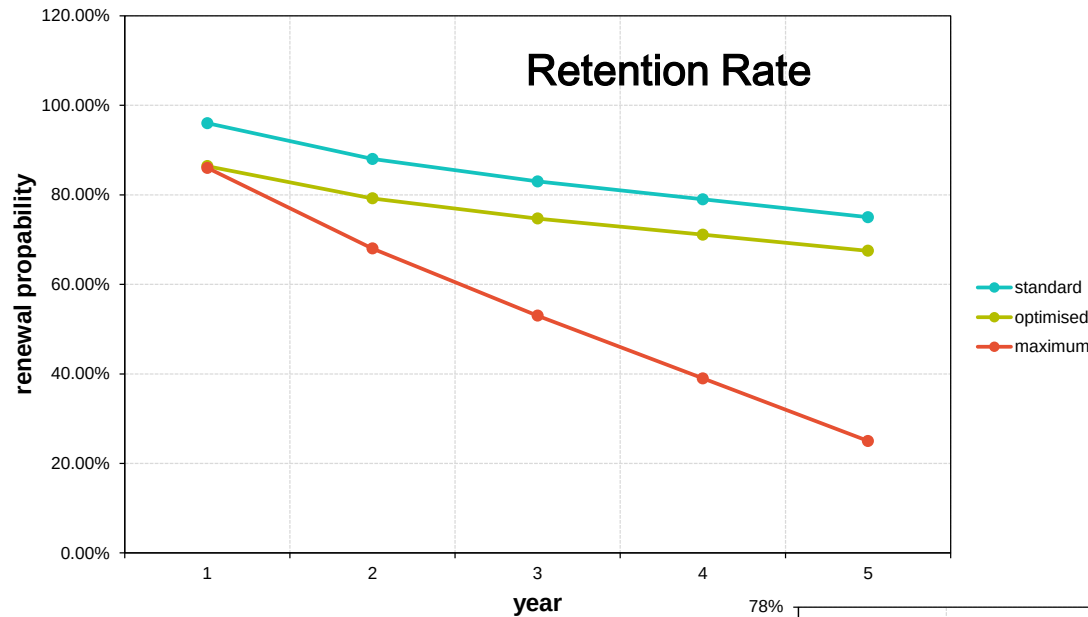
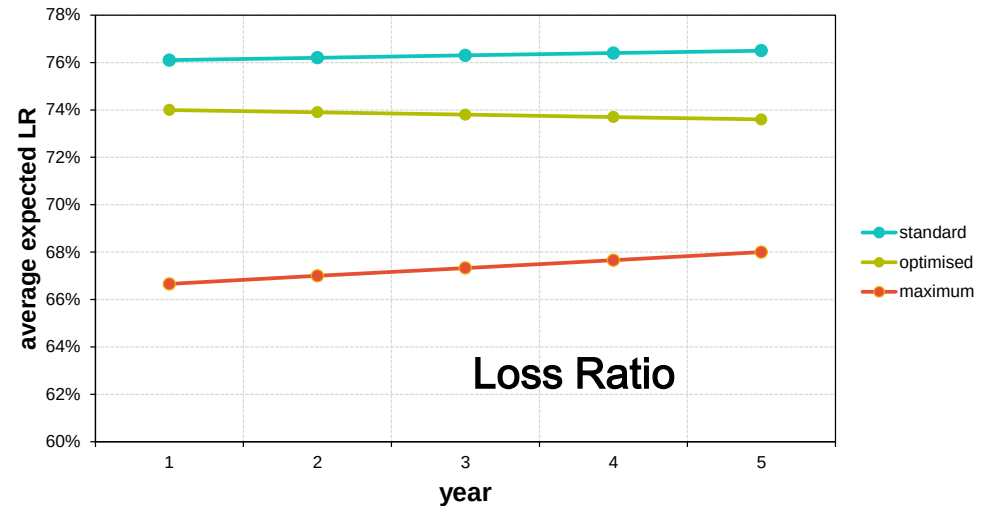
Hundreds of thousands of scenarios produced to study the impacts on individual customers with respect to different metrics

- Scenarios are combined to form an **efficient frontier**

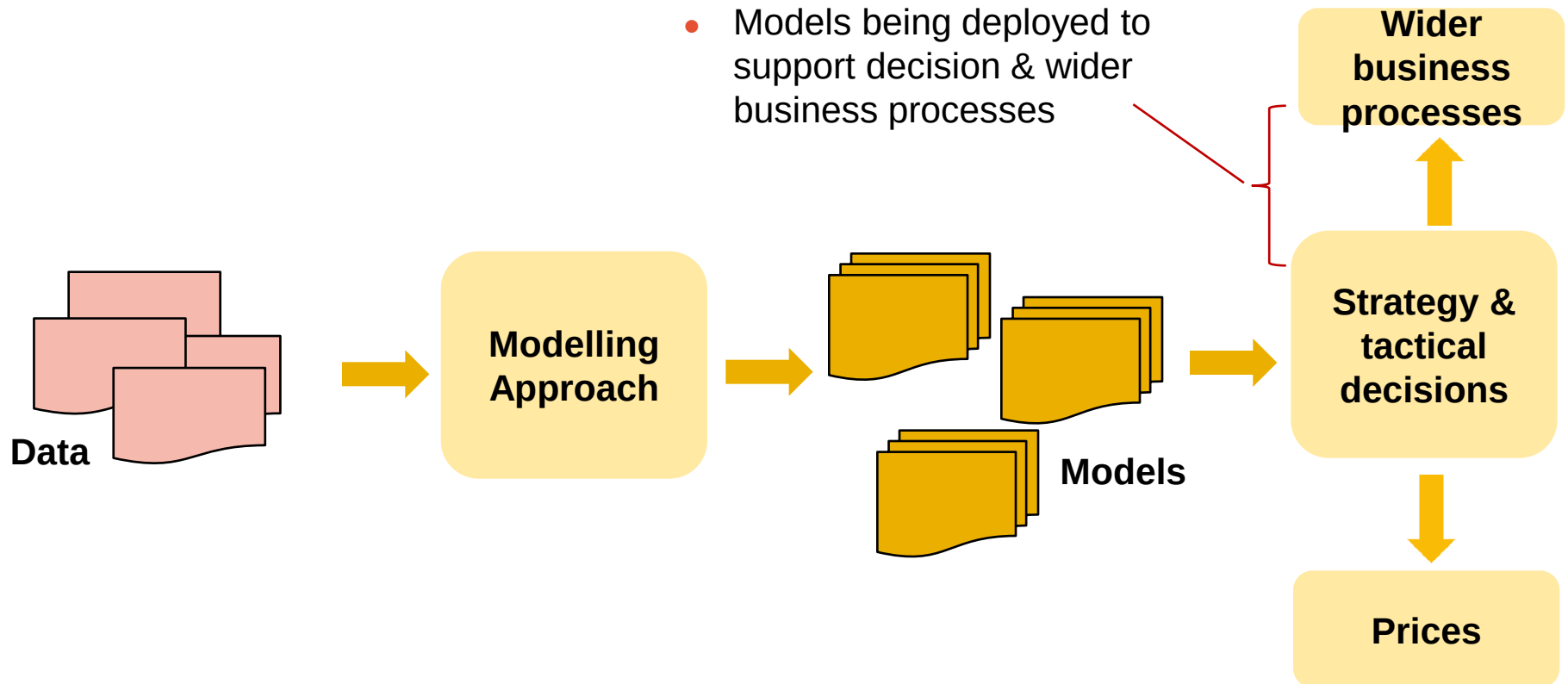


- Maximize profits (A)
- Maximize retention (B)
- Increase profits and retention (C)
- Softer targets (D)

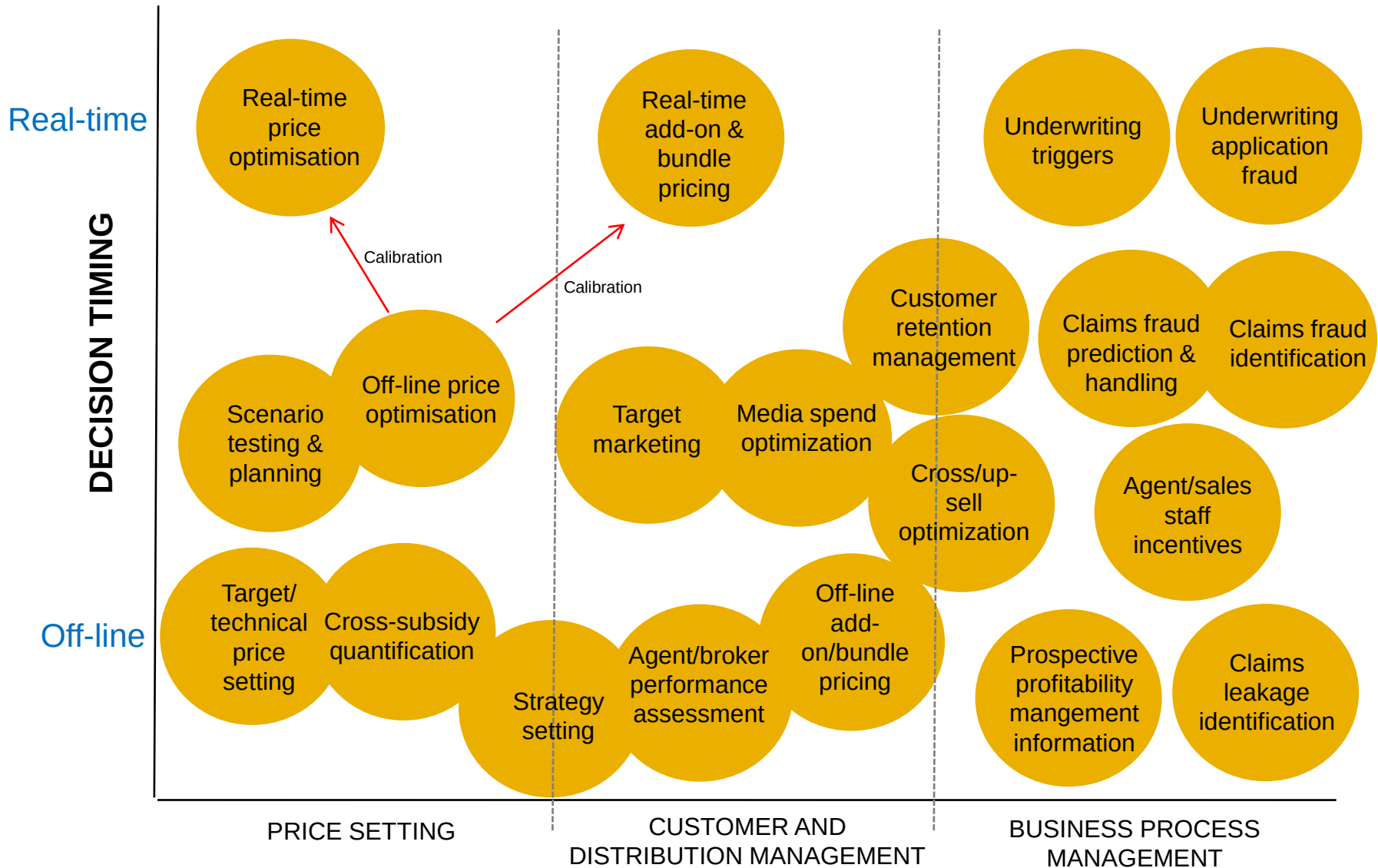
Define the problem – profit vs. volume, short vs. long term



Global advances in pricing – wider deployment



Models, scores & algorithms being deployed in wider business processes



Global advances in pricing

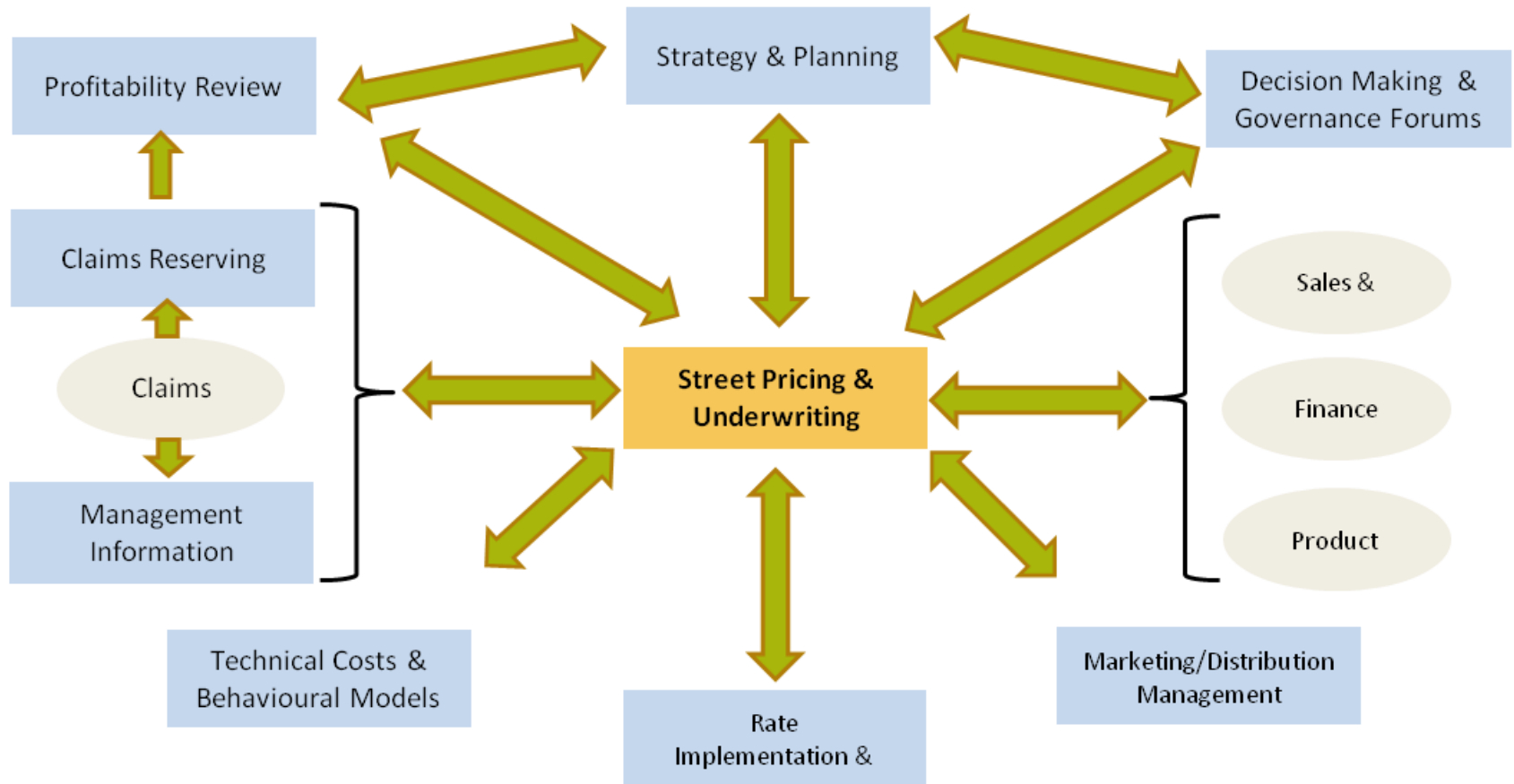


Summary

Realising business value from technical analysis



Engagement is key



Summary

Predictive modelling is now deployed worldwide

- GLMs proven framework
- Enhanced GLM implementation
- Tailored P&C techniques continuing to be developed to complement

Predictive modelling has significant applications beyond predicting claims cost

Models now being deployed as scores or algorithms in decisions & business processes

Technical modelling is only a part of the work

- Data & models appropriate for purpose
- Effective implementation relies on wider processes being in place as well

And watch this space for UBI....