Developing Optimal Lending Strategies in Practice

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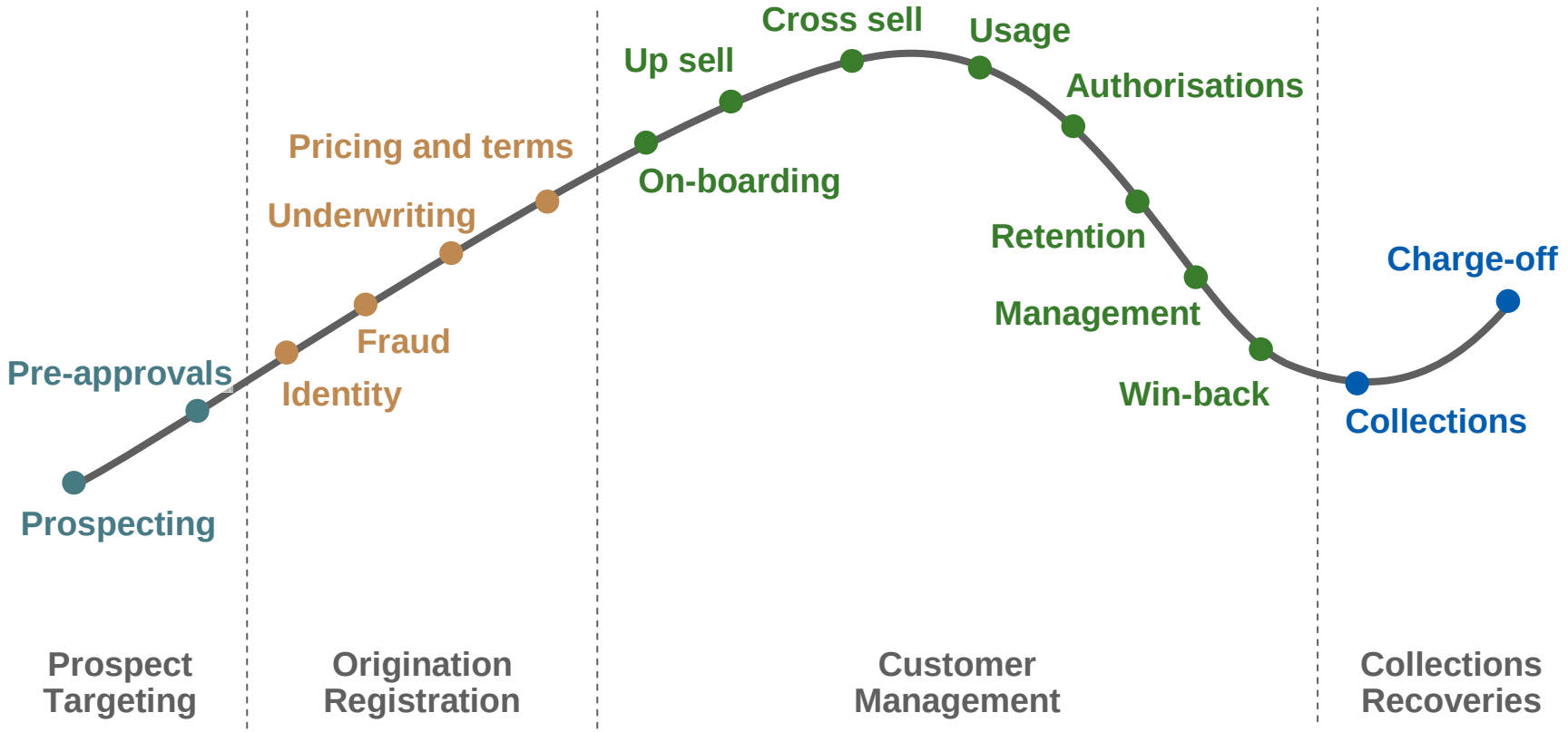
Contents

Developing optimal lending strategies: context

Q	A
1. Who?	1. Risk/portfolio managers responsible for terms of business strategies
2. What?	2. Credit limit, APR, loan amount, other factors affecting (typically) profit
3. When?	3. All stages of the credit lifecycle

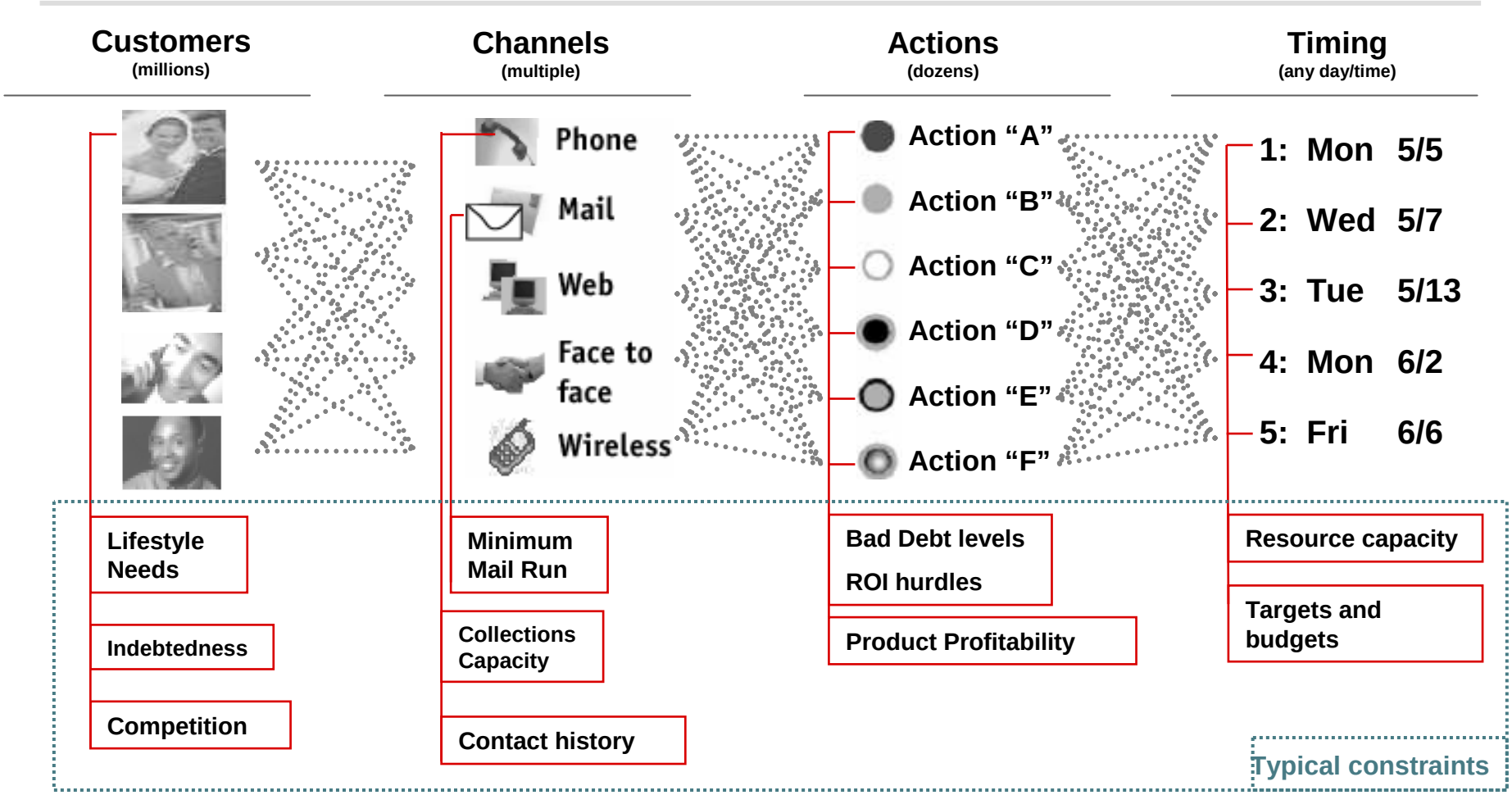
Optimisation is applicable at every customer decision point



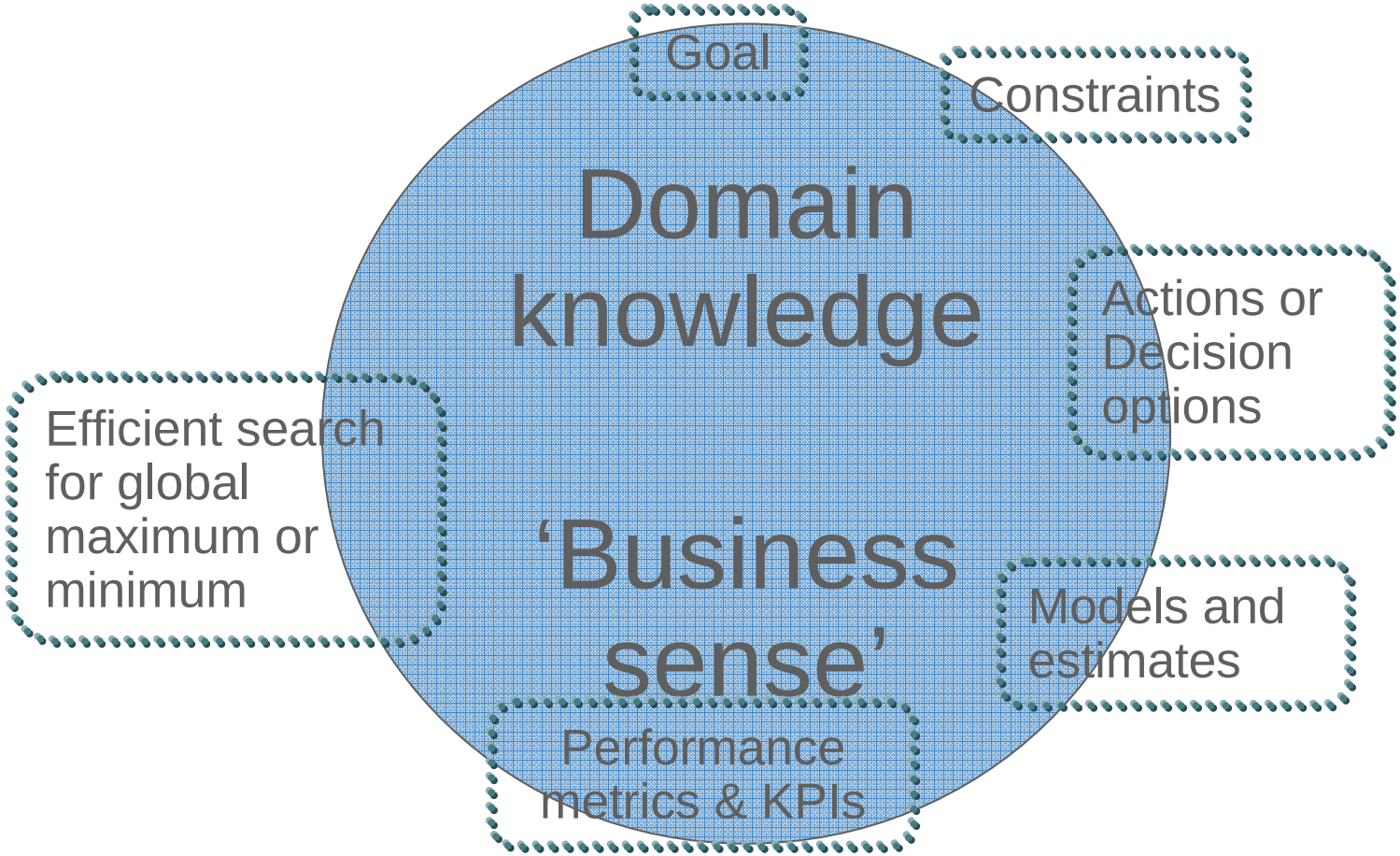
Developing optimal lending strategies: context

Q	A
4. Where?	4. Manually, specialist software; implementation of decision engine
5. Why?	5. Maximise: profit or ROI … Minimise: bad debt, exposure ..
6. How?	6. Considering ‘all’ possible alternatives for each account/transaction

Combinatorial explosion



Optimisation elements



Goal

Examples

- Maximise profit (revenues minus costs and losses)
- Minimise bad debt
- Maximise value of orders
- Minimise impairment rate
- Maximise efficiency of collections team resourcing
- …

Level of approximation

- Comprehensive accountancy approach
- Qualitative

Constraints

Examples

- Bad debt losses
- Exposure
- Accept rate
- Take up rate
- Attrition rate
- Operational costs (e.g. collections)
- Volume of referrals
- …

Decision options - Actions

- Profit (a typical goal) affected by
  - APR, credit limit, card type (APR/limit/extras), balance transfers, cross – sell, promotion of on-line spending,…
  - ‘Levers and dials’
- Monitor as alternative decision option scenarios applied
  - Credit limits, limit increase factor, APR,…

- Phase 0: Replicate BAU
  - Existing segmentation and decision options
- Phase 1: ‘Fine tune’ BAU strategy
  - Decision options variations on existing actions
  - Eg. current credit limit ± up to 25% of current limit in 5% ‘notches’
- Phase 2: New strategy and new decision options
  - Wider variations permitted

Models and estimates

- What would have happened if…?
- Multivariate models or data driven extrapolation of actual value
- Ideally estimate at individual level
- Data only recorded at product or portfolio level
- Sparsely populated regions of input space (‘DoE issue’)
- Some properties difficult to model
- Consider predictions qualitative

Performance metrics

- Components of utility (e.g. profit) function
  - Credit cards: interest, merchant fees, bad debt losses, cost of funds...
  - Personal loans: interest, insurance income, bad debt, take up rate
- Monitor as alternative decision option scenarios applied

Efficient search

- Calculate goal, utility function components and all metrics for all scenarios using models and estimates
- Automated iterative search

- Optimisation needs to be flexible and fast
- A simple example…

Optimisation process

Performance on credit card over 12 months

Credit Limit		Current Limit	+ £500	+ £1000
Customer 1	Profit	£90	£100	£120
	Bad Debt	£4	£6	£8
Customer 2	Profit	£70	£90	£60
	Bad Debt	£3	£6	£8
Customer 3	Profit	£20	£200	£300
	Bad Debt	£3	£12	£15

Simplified limit management optimisation example

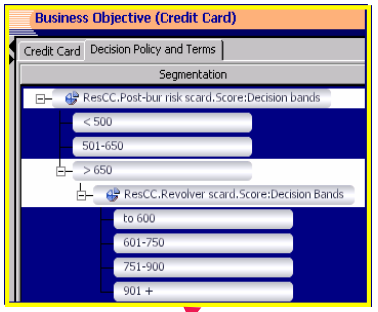
Option A: Maximise profit
Option B: Maximise profit but constrain total bad debt < £13
Option C: Maximise profit but constrain total bad debt < £20

Credit Limit		Current Limit	+£500	+£1000
Customer 1	Profit	£90	£100	£120
	Bad Debt	£4	£6	£8
Customer 2	Profit	£70	£90	£60
	Bad Debt	£3	£6	£8
Customer 3	Profit	£20	£200	£300
	Bad Debt	£3	£12	£15

Option/ Customer	A	B	C
1	+£1000	Current	Current
2	+£500	Current	Current
3	+£1000	Current	+£500
Profit	£510	£180	£360
Bad Debt	£29	£10	£19

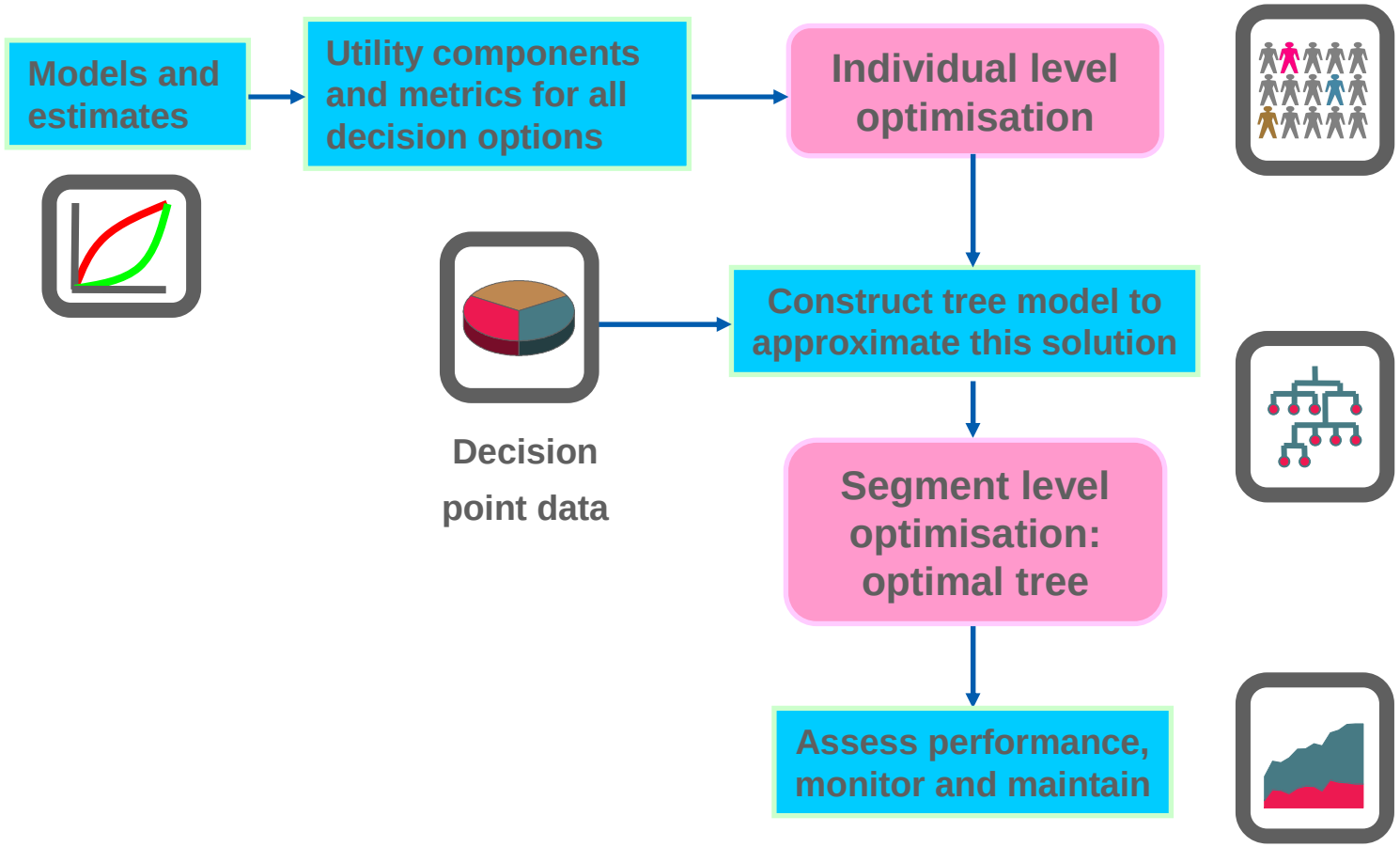
Account level optimisation vs. segment level optimisation

A/C number	Base APR	Base + 0.5%	Base + 1%	…	Base + 9%
10356	✓				
12978		✓			
23795			✓		
25142	✓				
58973					✓
…					



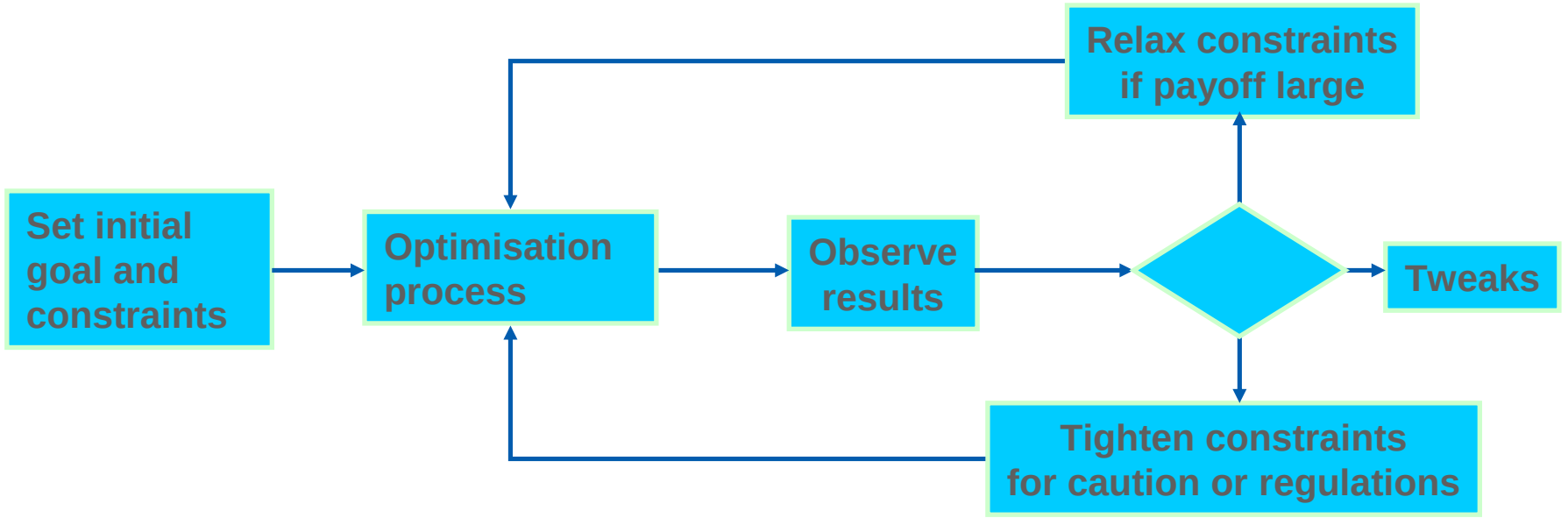
	Individual level	Segment level
Most appropriate decision option	✓	
Global maximum	✓	
'Black Box'		✓
Sensitivity to accuracy of models and estimates		✓
Incorporating domain knowledge manually		✓
Auditing and monitoring		✓
Implementation currently at segment level		✓

Strategy Tree Optimisation process



Overlay domain knowledge

- Application of ‘business sense’ is iterative but manual



- Requires a fast, flexible development tool
- Final manual tweaks to strategy

Reality…

Theory	Practice
1. Clear goal definition	1. Multiple possible goals
2. Data at individual level, broad wide and dense	2. Limited data
3. Decision option scenarios give wide range of outcomes	3. Little to differentiate decision options
4. Risk manager willing to implement Challenger strategy	4. Risk/portfolio manager slow to adopt or cautious
5. Performance monitored and reported back	5. Little communication after implementation

Case Study 1: Credit cards initial limits

- Large Asia Pacific retail bank
- Credit cards portfolio
  - Mixture of products and demographics
  - Average to low risk
- Motivation: Over-complicated credit limit strategy
- Phase 1: minimise bad debt loss
- Phase 2: maximise profit

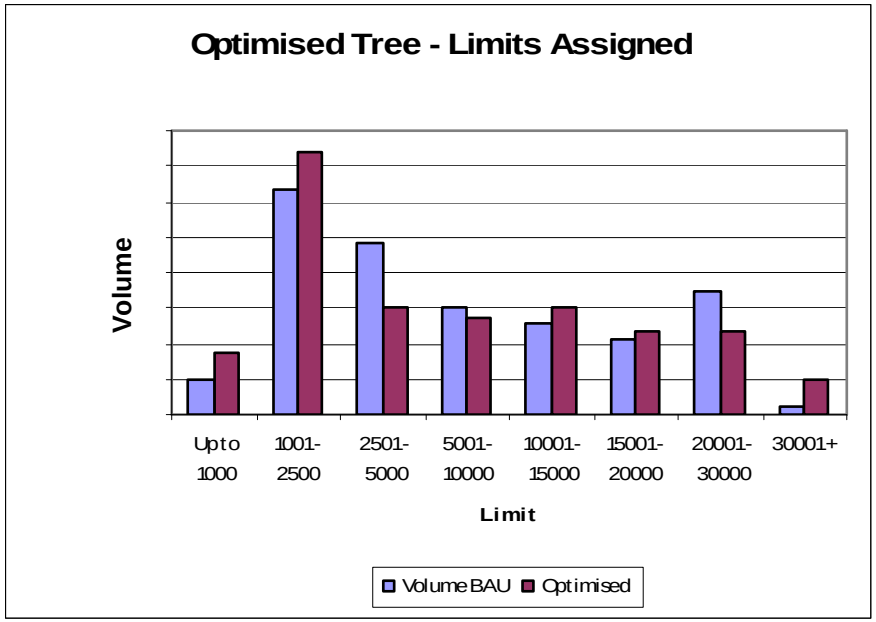
Case Study 1: Credit cards initial limits

- Phase 1
  - Goal: minimise bad debt loss
  - Constraints: maintain exposure, balance transfer volumes and profile of limits allocated
  - Decision options: limits - multiples of disposable income
  - Models and estimates
    - PD model supplied by client
    - PD ‘adjustment factor’ for higher risk customers
    - Bad debt loss *f(*PD, LGD, EAD)

Case Study 1: Credit cards initial limits

- Net 14.3% annual reduction in bad debt for acquired accounts
- Equivalent to approx A$900k per annum

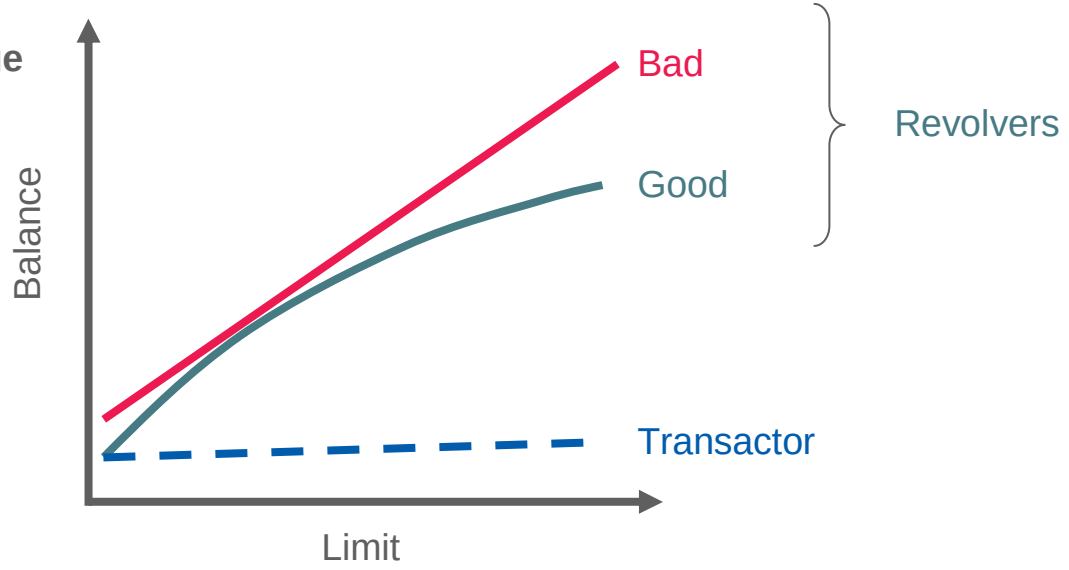
	Optimal Tree
Accounts	c. 150,000
Exposure	0.6% ↓
Bad debt	14.3% ↓
Limit/Account	1.8% ↓
Loss/Account	15.2% ↓
BT Sat Rate	0.6% ↓



Case Study 1: Credit cards initial limits

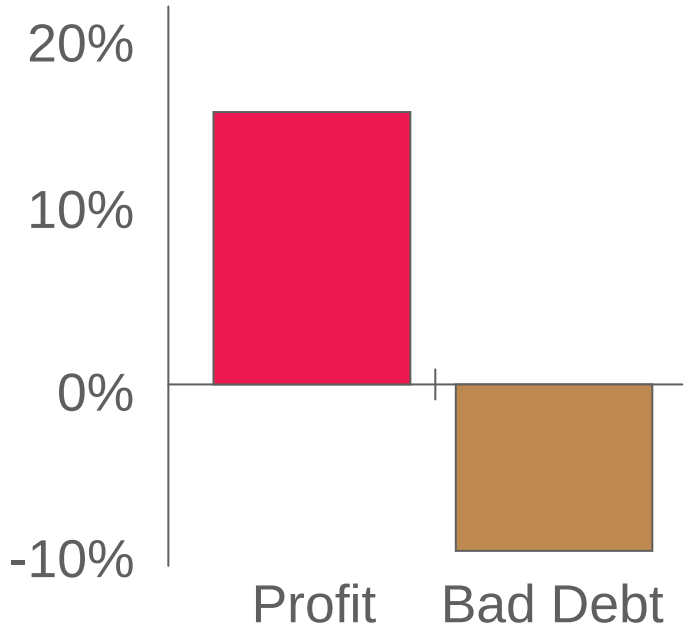
- Phase 2
- Goal: Maximise profit; Constraints: as Phase 1
  - Profit = Interchange Income + Interest Income – Bad Debt losses – Funding Cost
  - Models for propensity to revolve, utilisation and spend

Limit utilisation non-linear over large range



Case Study 1: Credit cards initial limits

- Performance
  - 14% improvement in profit
  - 9% reduction in bad debt
- Implemented as 10% challenger
- Initial hiccups – Revolver score incorrect
  - Used in KPIs and strategy tree optimisation
  - Optimisation process rapidly repeated



Case Study 2: Authorisation decision

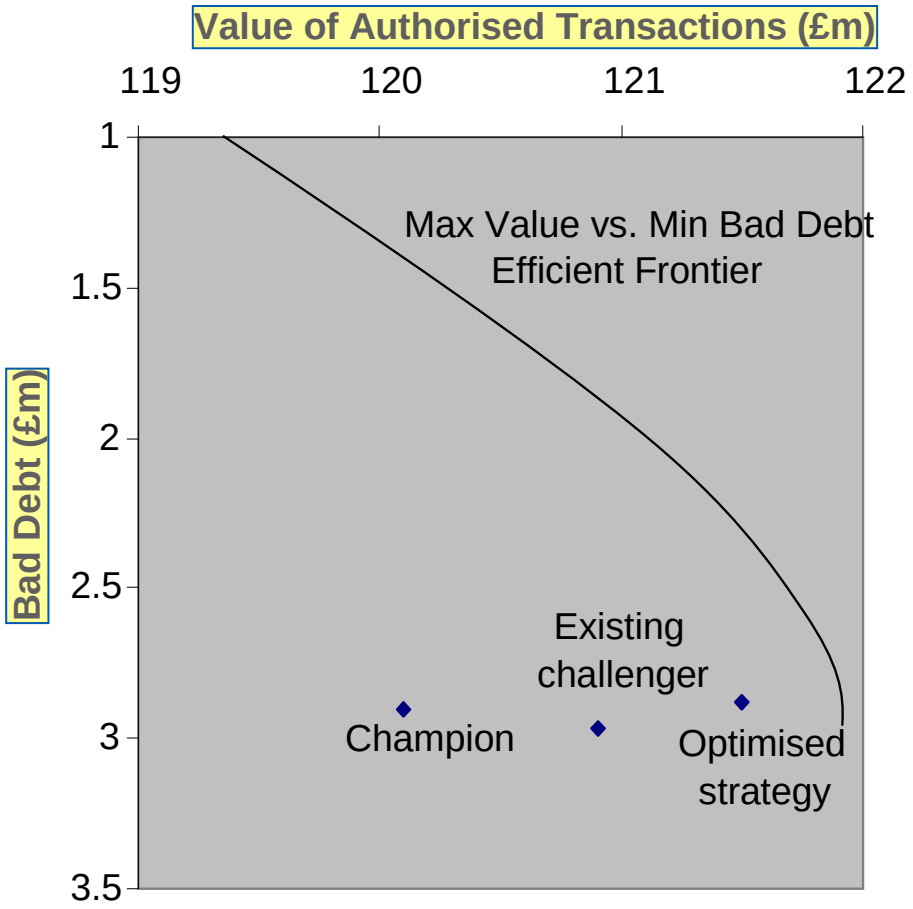
- Large European multi channel retailer
- Mail order and phone order, direct customer and agency
  - Typical mail order demographics
  - Near prime
- Motivation: revise authorisation process
  - Reduce value of declined orders
  - Reduce or maintain bad debt
  - Increase proportion of accepts
  - Reduce referrals

Case Study 2: Authorisation decision

- Goal: maximise accepted order value
- Constraints: maintain bad debt losses, reduce number of referrals
- Decision options
  - Accept/decline/refer
  - Order value and balance dependent
  - Dynamic ‘shadow limit’ incorporated into decision
- Models and estimates
  - P(Accept | referral) – underwriter decision
  - E(Bad debt loss | Auto accept)
  - E(Bad debt loss | Accepted referral)
- Expected loss 0 for c. 95% of orders
- Many strategies compared - changes in priorities
- Many tweaks to reduce risk sources identified – ‘business sense’ adjustments

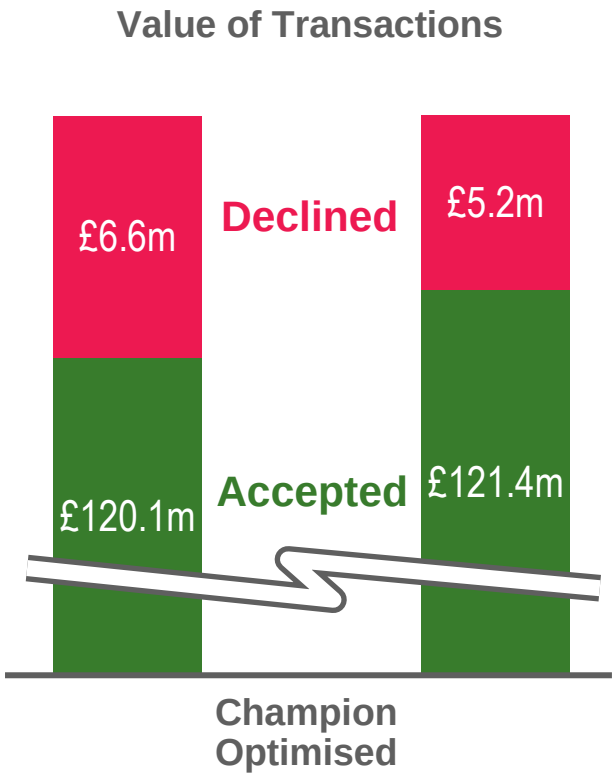
Case Study 2: Authorisation decision

Multi-goal optimisation



Case Study 2: Authorisation decision

- 14% reduction in referral rate
- Minimal change to expected bad debt
- 21% reduction in the value of declined transactions



Summary – practical considerations

- Goal not defined or multiple goals
- Limited data
- Analytics more complicated than anticipated
- Little to differentiate decision options
- Risk manager slow to adopt or cautious
- Little communication after implementation
- Balance between onerous detail and a practical solution
- Highly iterative - fast flexible development tool required
- Long term iterations – gradual data accumulation
- Demonstrations available!

Questions?