Collections policy comparison in LGD modelling

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Agenda

- Purpose of the research
- Data description
- Collection strategies
- Distribution of LGD
- Analysis of common variables
- Collection models
- LGD models
- Summary

Purpose of the research

Comparison of:

- Collection processes for in-house and 3rd party collections
- Loss Given Default (LGD) distribution for in-house and 3rd party collections
- Analysis for estimating LGD for in-house and 3rd party collections using the information available to each data set

Data description

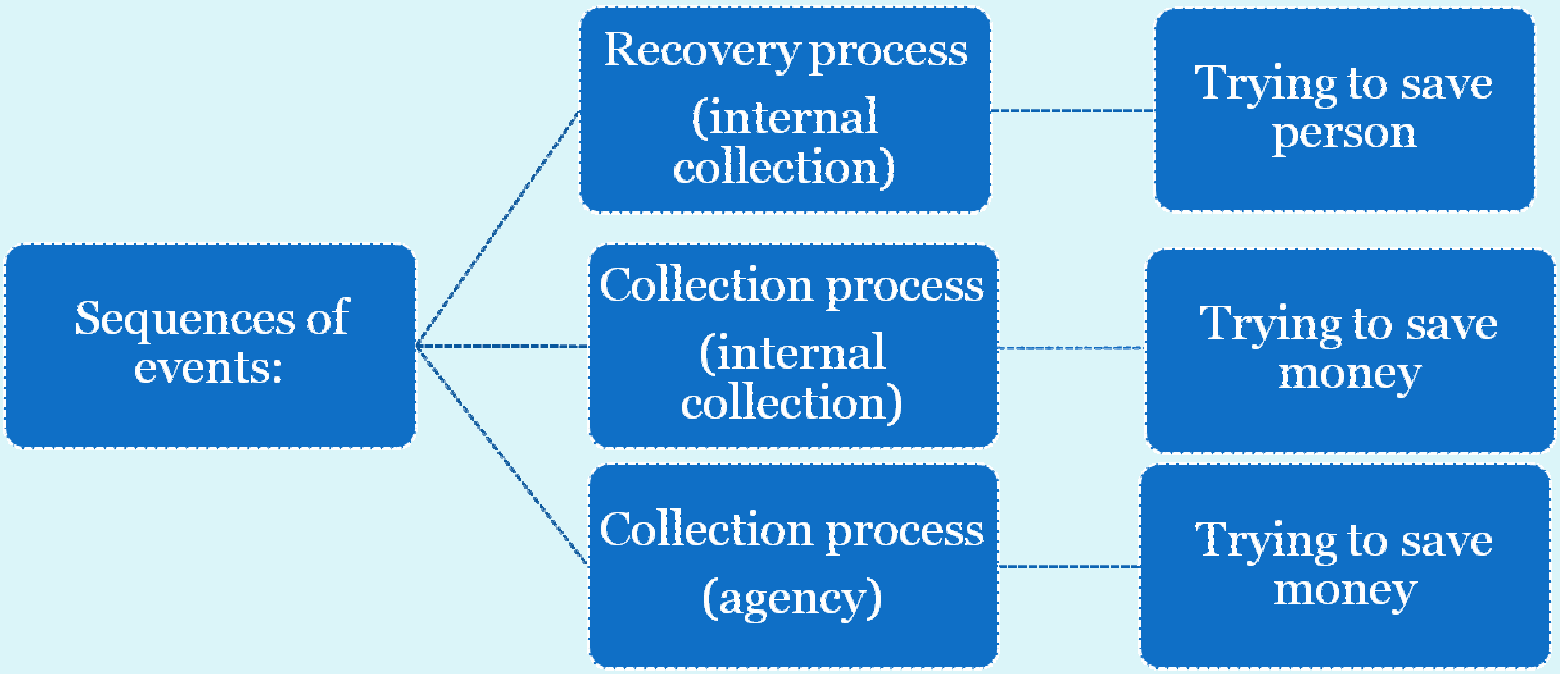
In-house:

- Unsecured loans collected by lender in-house
- ~11K cases (all in default)
- Loans defaulted in 1991 and were collected for 24 months
- Data provided on the individual level
- Historical and application data known

3rd party:

- Unsecured loans sold to 3rd party
- ~70K cases (all in default)
- The debt was bought and collected in 2005-6
- Data provided on the individual level
- No historical or application data known

Collection strategies

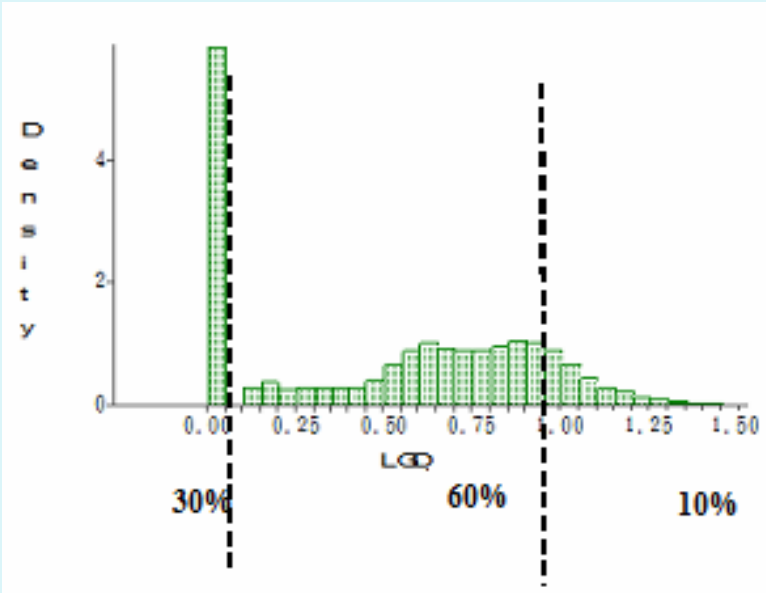


Collection comparison

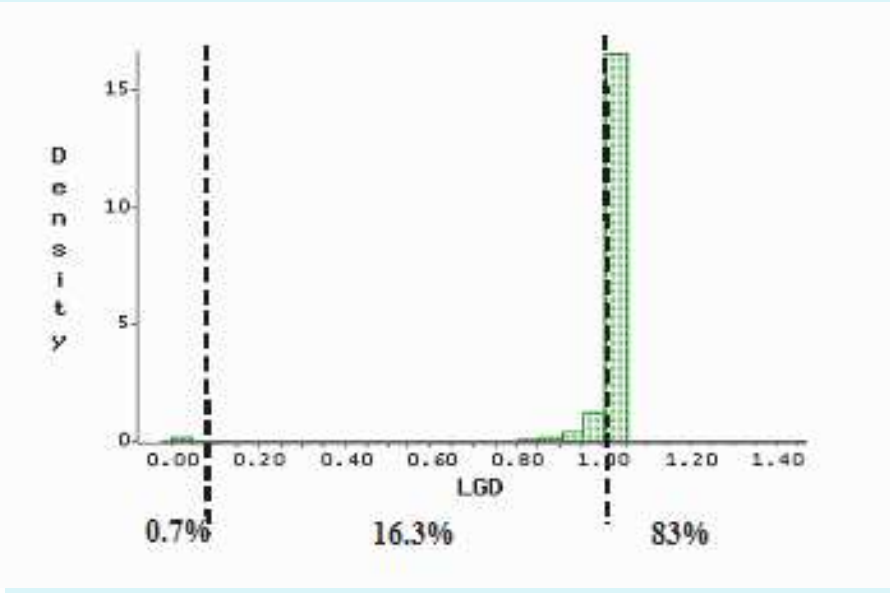
Factor	In house data set	3rd Party data set
Main tool	Letter	Telephone
Age of Debt	New	Old
Type of Debt	Unsecured	Unsecured
Average Debt Amount	£3,609	£562
Percentage Who Paid Back Whole Debt	30%	0.7%
Percentage Who Paid Back Part of the Debt	60%	16.3%
Percentage Who Paid Nothing	10%	83%
Mean value of LGD	0.544	0.95
Collection model	Decision tree model with sub-models	Agent's sub-model
LGD model	2-step model	2-step model
Information available	All details of loan and customer	Restricted data since not original lender

LGD distribution

In-house

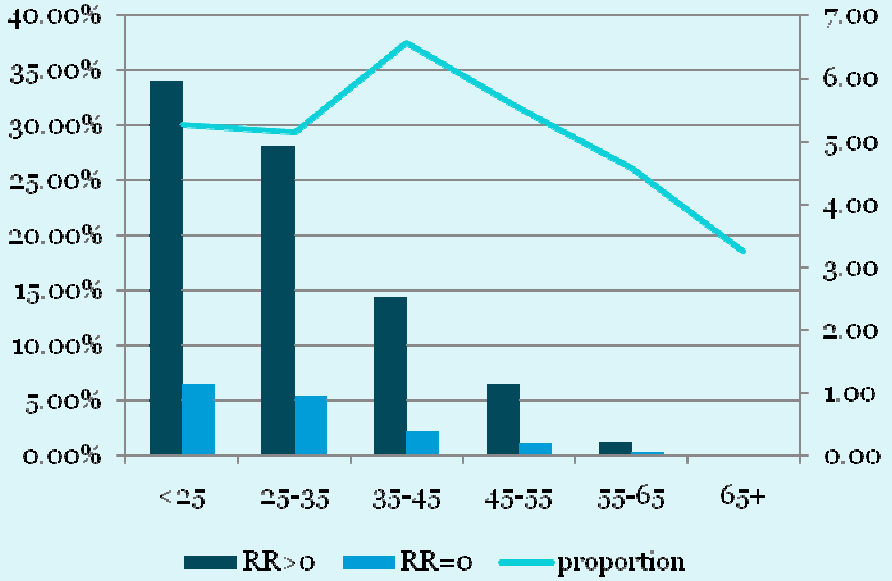


3rd party

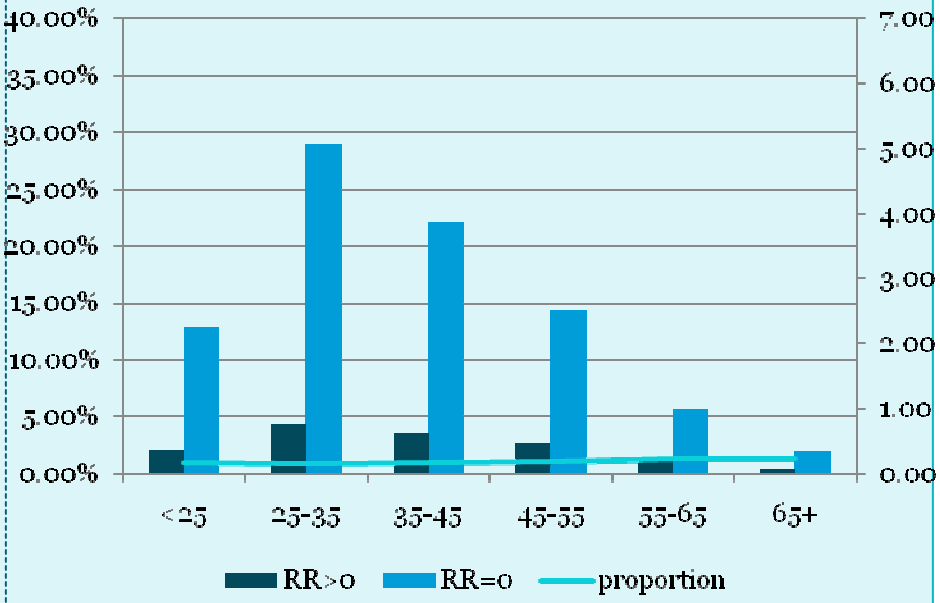


Analysis of common variables: Age

In-house

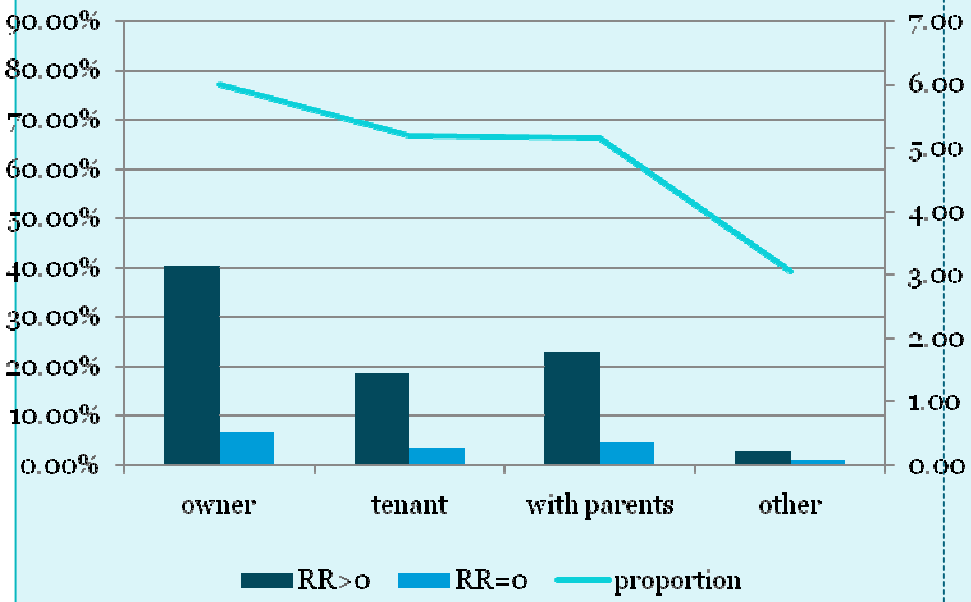


3rd Party

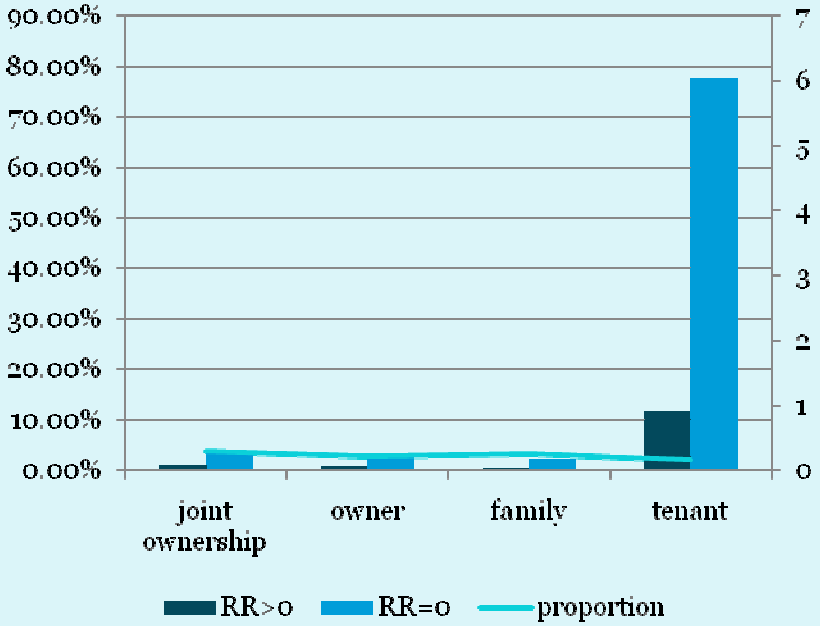


Analysis of common variables: Residential status

In-house

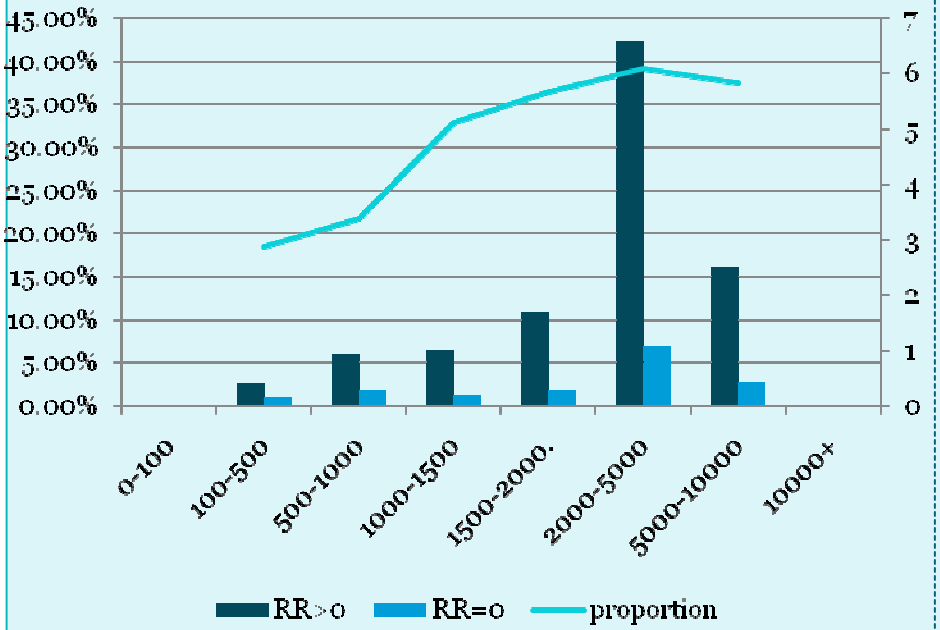


3rd party

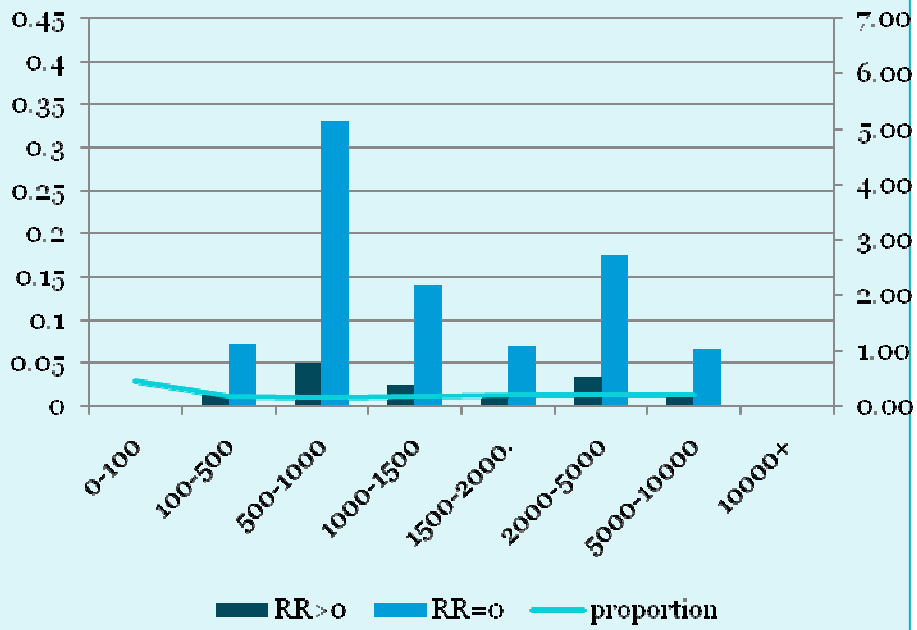


Analysis of common variables: Debt Amount

In-house

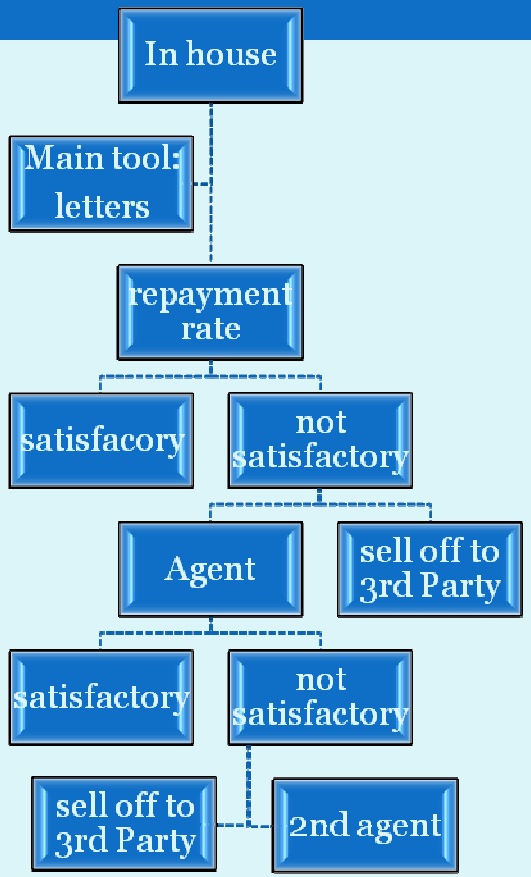


3rd party

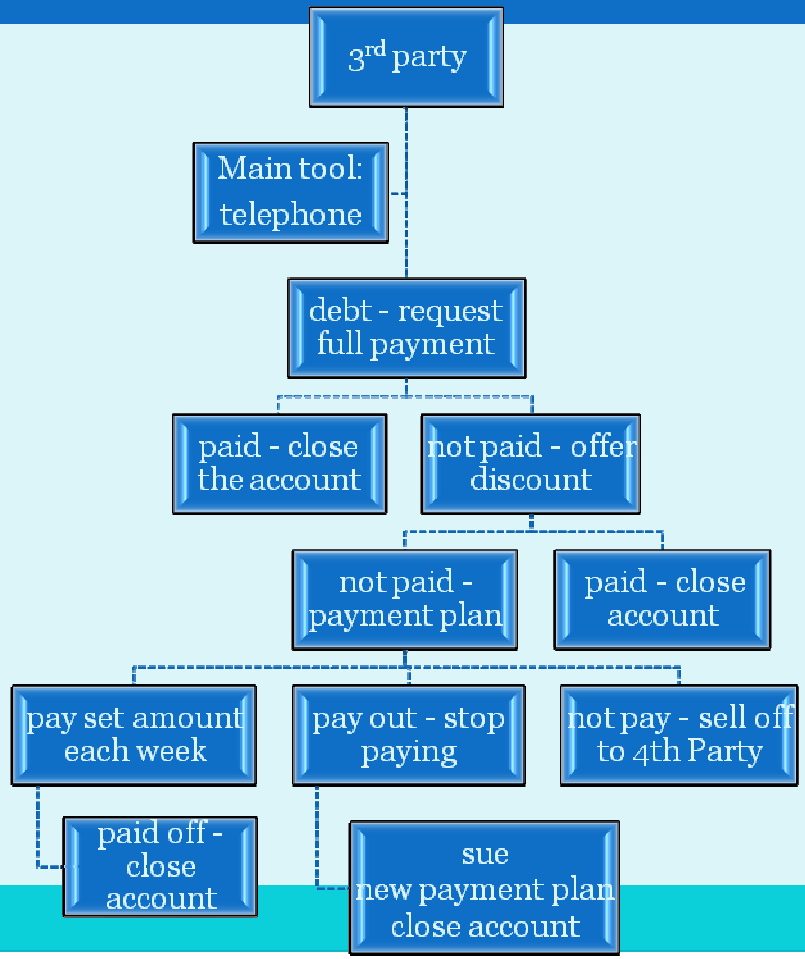


Collection trees

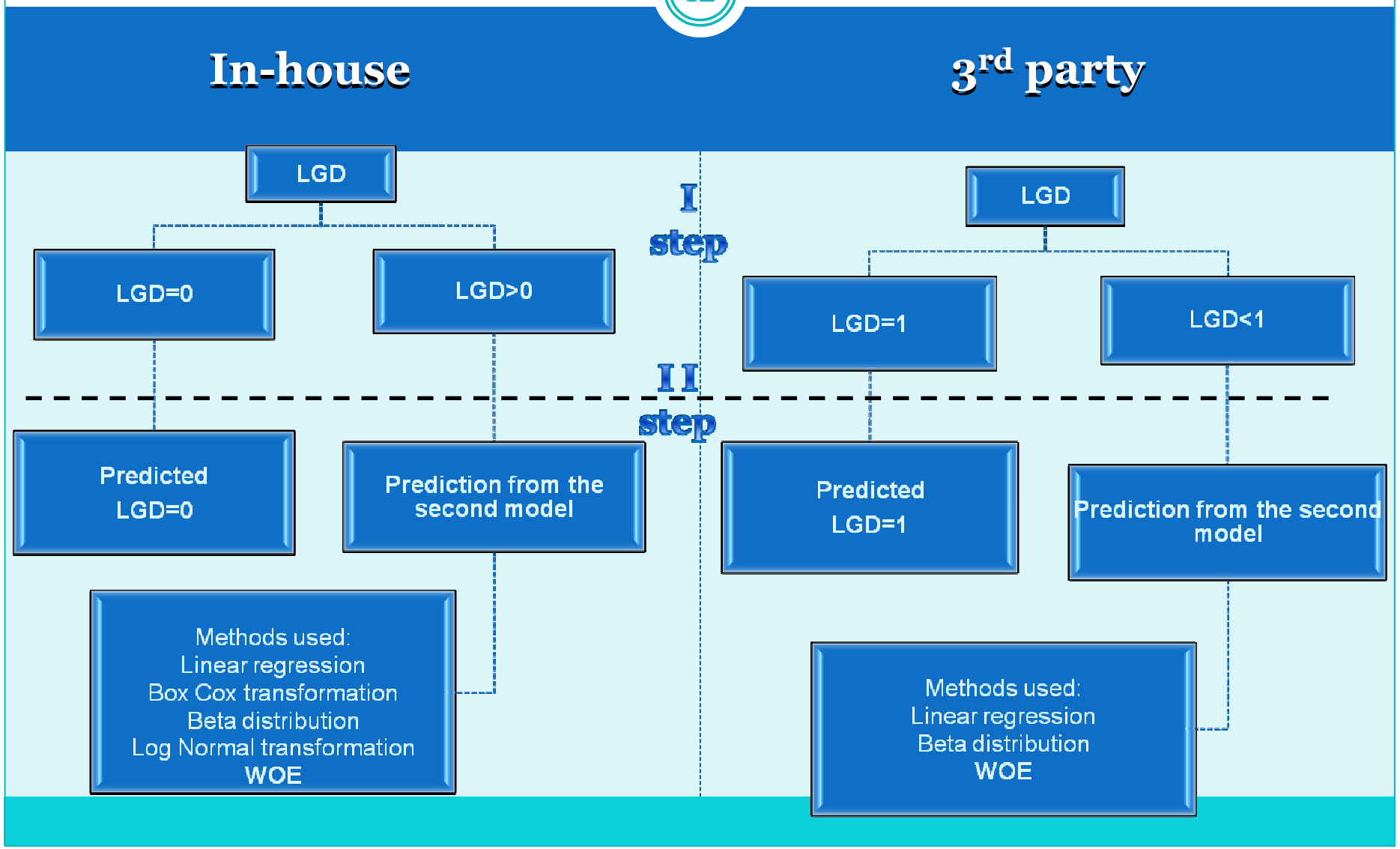
In-house



3rd party



LGD models


In-house
3rd party
LGD
LGD=0
LGD>0
I step
II step
Predicted LGD=0
Prediction from the second model
Methods used:
Linear regression
Box Cox transformation
Beta distribution
Log Normal transformation
WOE
LGD
LGD=1
LGD<1
Predicted LGD=1
Prediction from the second model
Methods used:
Linear regression
Beta distribution
WOE

WOE approach

- Defined the target variable
  - LGD to be above or below the mean
- Each characteristic
  - split into ten groups
  - look at the ratio of above or below mean
  - select bins based on WOE
  - The bin is given the value:

$$\log\left(\frac{n_a(i)}{n_b(i)} \Big/ \frac{N_a}{N_b}\right)$$

- Linear regression to determine if debtor is good or bad (above or below mean)

Variables used in the first model

In-house

- Loan amount at opening
- Number of months in arrears within the whole life of the loan
- Number of months in arrears in the last 12 months
- Lifetime of loan before default
- Application score

3rd party

- Telephone Information
  - Number of telephone numbers
  - Having a mobile
  - Having a work number
- Debt Amount – Bins
  - £0-£100
  - £100-£500
  - £500-£1,000
  - £1,000-£1,500
  - £1,500-£2,000
  - £2,000-£5,000

Results for the first model

In-house

LGD=0 vs LGD>0

- ↑ ***loan amount*** **:** ↓ pay off everything
- ↑ ***lifetime of the loan:*** ↑pay off everything
- ↑ ***application score:*** ↑ pay off everything
- ↑ ***time spent in arrears*****:** ↑ pay off everything
  - However if in arrears for more than 2/3 of the time: ↓ pay off everything
- ↑ ***in arrears recently:*** ↑ pay off everything

3rd Party

LGD=1 vs LGD<1

- ***work telephone:*** ↑ pay
- ***mobile telephone:*** ↑ pay
- ↑ ***telephone :*** ↑ pay
- ***less than £100 :*** ↑ pay

Variables used in the second model

In-house (LGD>0)	3rd party (LGD<1)
• Number of months with arrears in the whole life of the loan • Number of months with arrears in the last 12 months • Application score • Loan amount • Time of the loan until default	• Age of debtor at default • Debt amount • Telephone (yes/no) • Mobile (yes/no) • Work telephone (yes/no) • Ownership • Title

Comparison of the results

Method	In-house R^2	3rd party R^2
Box Cox	0.1299	
Linear regression	0.1337	0.1097
Beta distribution	0.0832	0.1161
Log Normal transformation	0.1347	
WOE approach	**0.2274**	**0.1496**

Outcomes from the second type models

In-house (LGD>0)

- ↑ ***loan amount:*** ↑ expected loss
- ↑ ***application score:*** ↓ expected loss
- ↑ ***lifetime of the loan:*** ↓ expected loss
- ↑ ***in arrears recently*** (last 12 months)***:*** ↓ expected loss
- ↑ ***time spent in arrears:*** ↓ expected loss

3rd party (LGD<1)

- ↓ ***debtor's age:*** ↓ expected loss
- ↓ ***default amount:*** ↑ expected loss
- ***Owners:*** ↓ expected loss
- ***Mobile:*** ↓ expected loss
- **No *contact number:*** ↓ expected loss

Predicting a year ahead

- In-house data set only
- Should you sell or keep?
- Based on first years collections
- Dependency since $RR_{24} \geq RR_{12}$

$$RR_{24} = 0.047 + 1.205 RR_{12}$$

- $R^2 = 0.58$ and a Root MSE=0.13

Predicting 2 years ahead

- Should you sell or keep?

$$RR_{36}=0.037-0.258RR_{12}+1.233RR_{24}$$

- $R^2=0.80$ and a Root MSE=0.11
- Dependency since $RR_{36} \geq RR_{24} \geq RR_{12}$
- Used for minimum value of debt

Summary

LGD depends on:

- The uncertainty or affordability whether a defaulter will repay the debt
- The lender's collection policy
- Stage of debt collection (in-house, 3rd party)

Model: Summary

- For in-house and 3rd party
- Data available is different
- Regression results are similar
- Approach
  - 2 step model
  - 1st step dissimilar spikes so different target LGDs
- WOE approach was the best in both cases (determining a good or bad repayer)

To sell or keep?

- In-house: Use the models to determine:
  - Which debt to sell
  - When to sell it
  - Minimum price
- 3rd party: Use the models to determine:
  - Which debt to focus on
  - Maximum price

Q&A

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