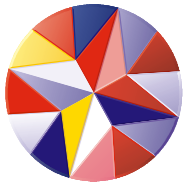

SNS REAAL

Improving PD and LGD models
following the changes in the market

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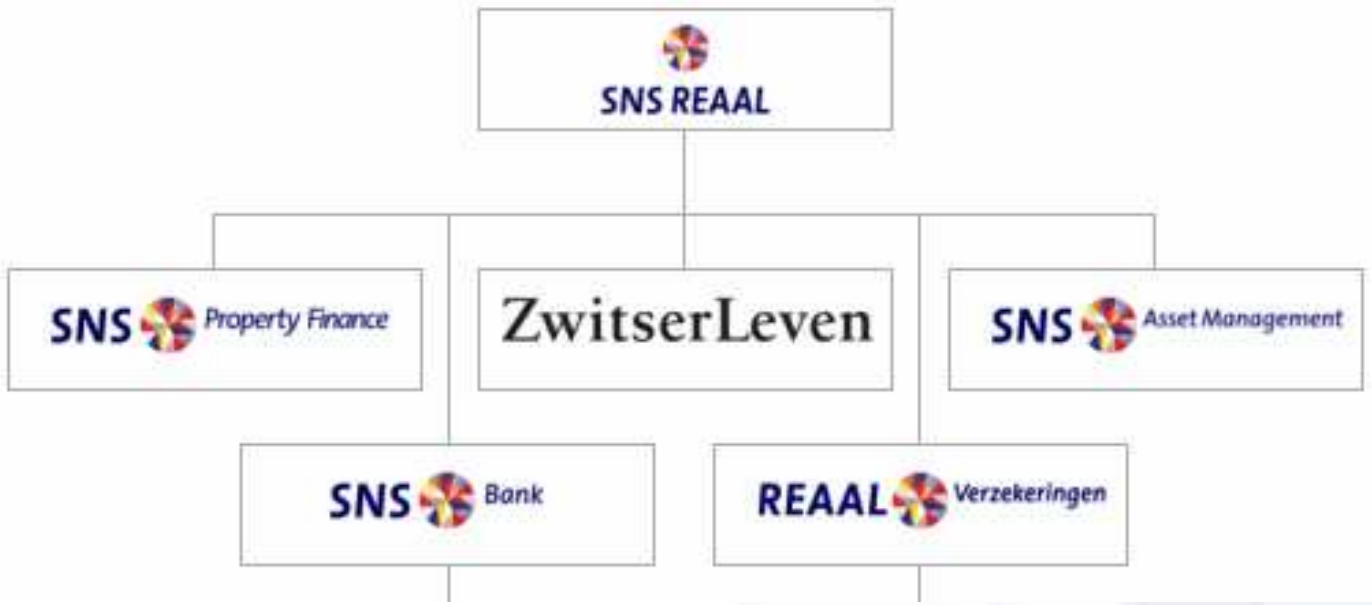
Credit Scoring Conference 2009 - Edinburgh

Agenda

- Introduction
- Basel II
- Modelling: Rating
- Modelling: Level
- Conclusion

Introduction

Introduction



- SNS Bank
  - Among the largest banking companies in The Netherlands
  - Balance sheet total of € 77 billion
  - 3245 employees (FTEs)
- Corporate staff: Group Risk Management – Credit Risk Management

Credit Risk is real...

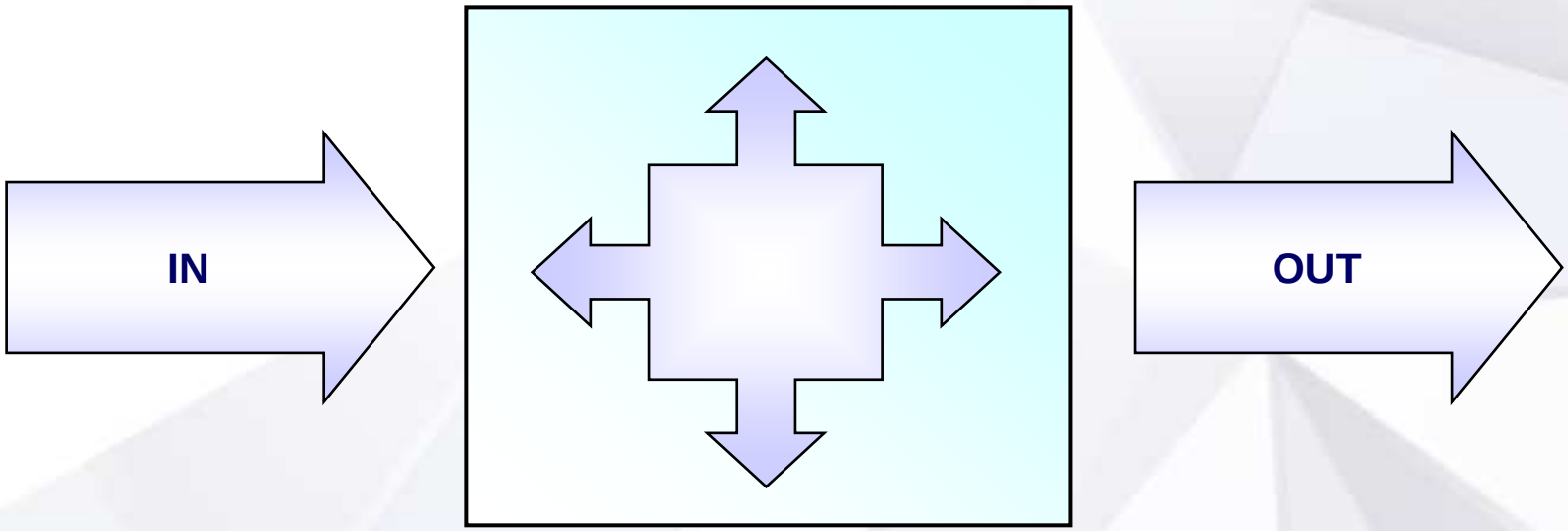
Managing Credit Risk

Acceptation Scorecard

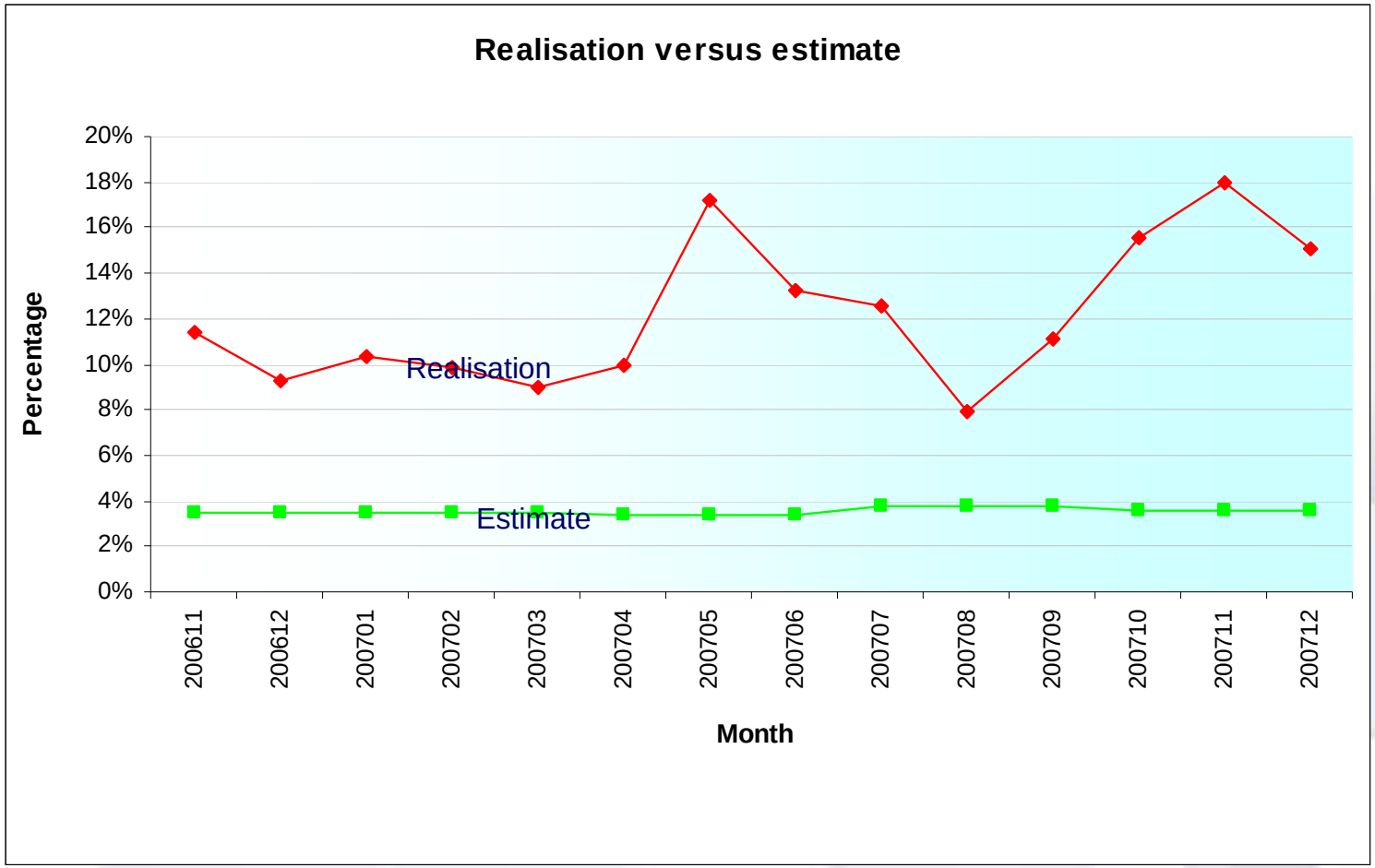
- New prospects
- Not required for Basel II
- Decision to accept

Behaviour models

- Current customers
- Required for Basel II
- Capital requirements



But… not always accurate



Note that the figures in the presentation do not correspond to actual data

Basel II

Key Measures used in Basel II

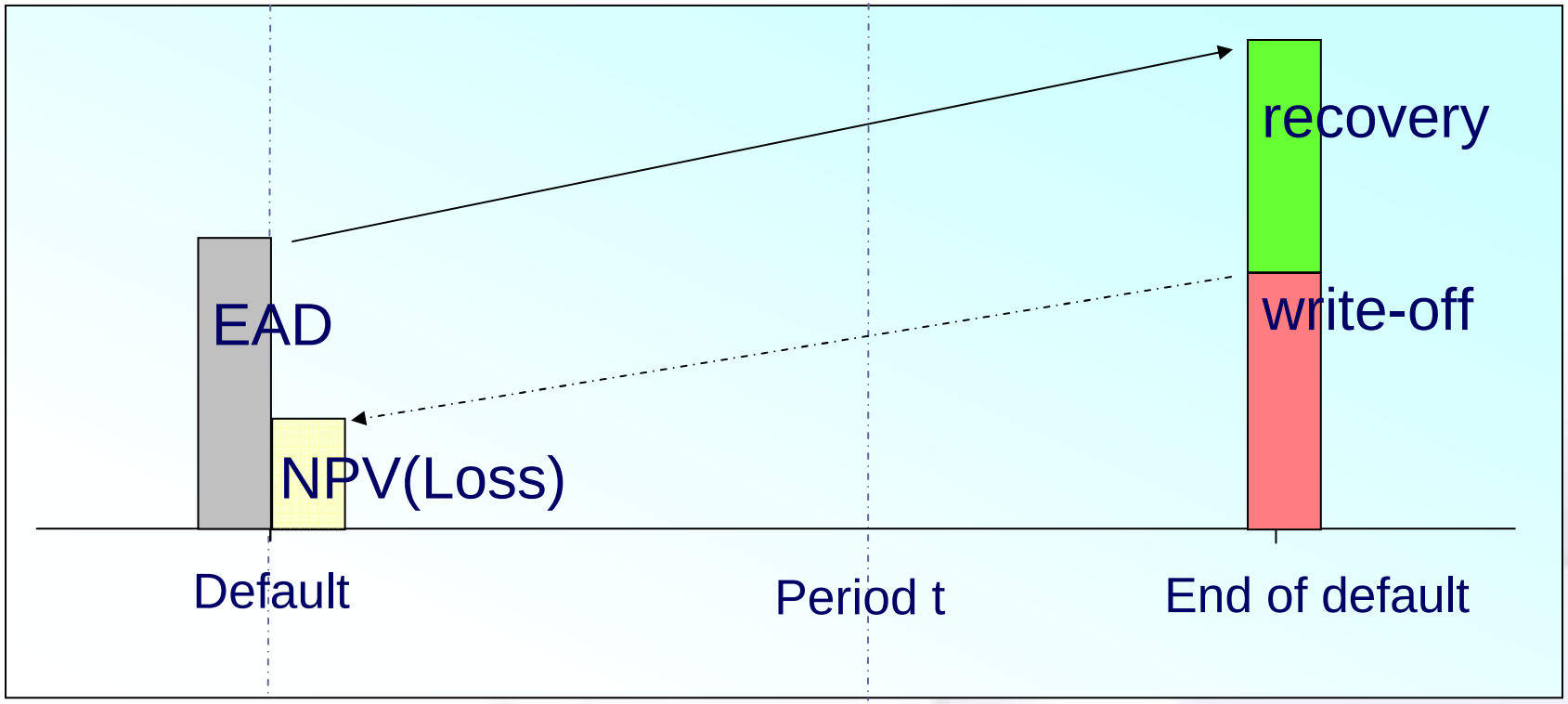
General Terminology

- Default
- PD: Probability of Default
- LGD: Loss Given Default
- EAD: Exposure at Default
- EL: Expected Loss
- UL: Unexpected Loss

SNS Terminology

- ELT: Economic Loss Term
- DR: Default Rate
- RLR: Realised Loss Rate

Conceptual example of default



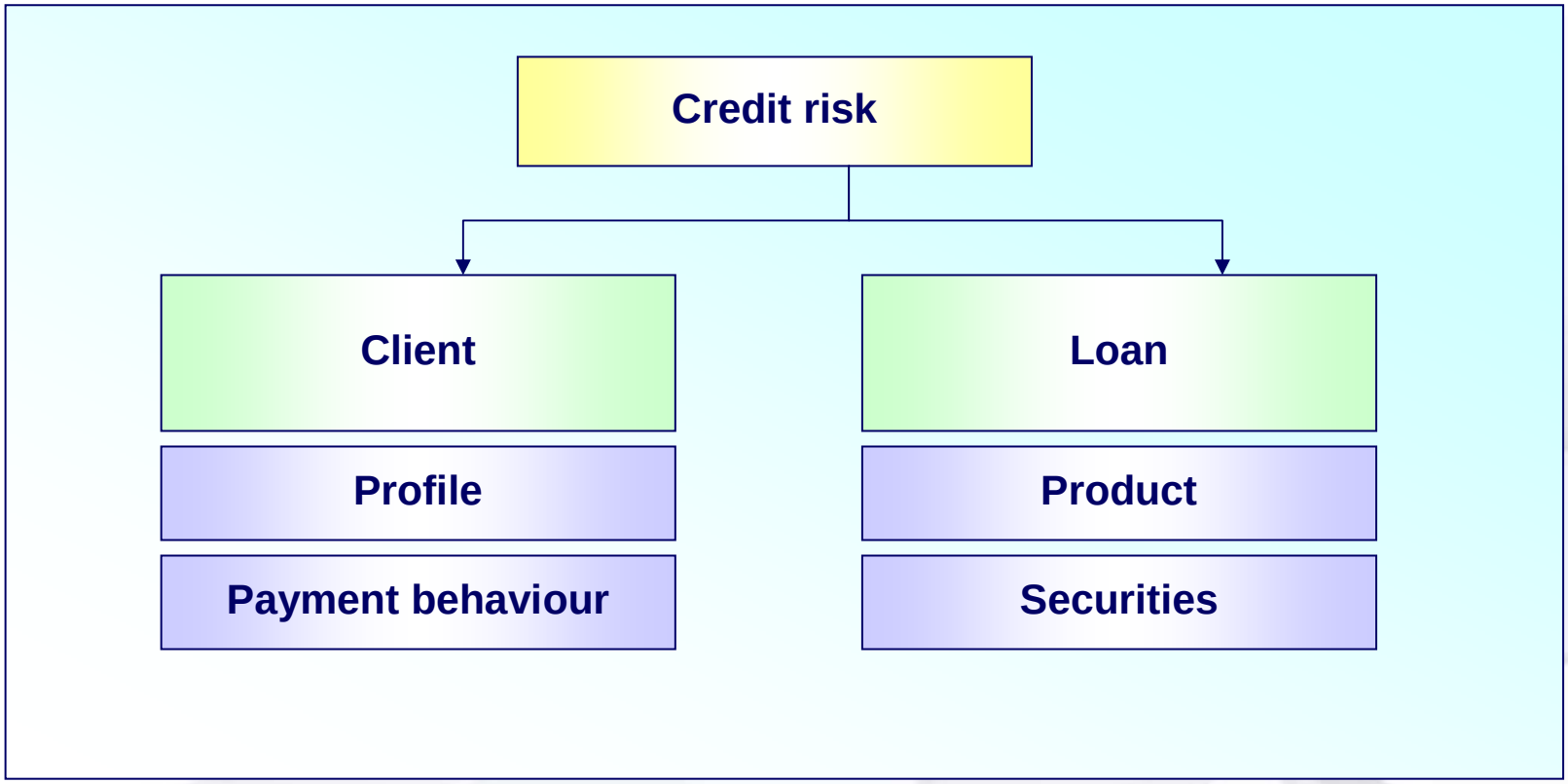
$$RLR = \frac{NPV_d(Loss)}{EAD}$$

Framework

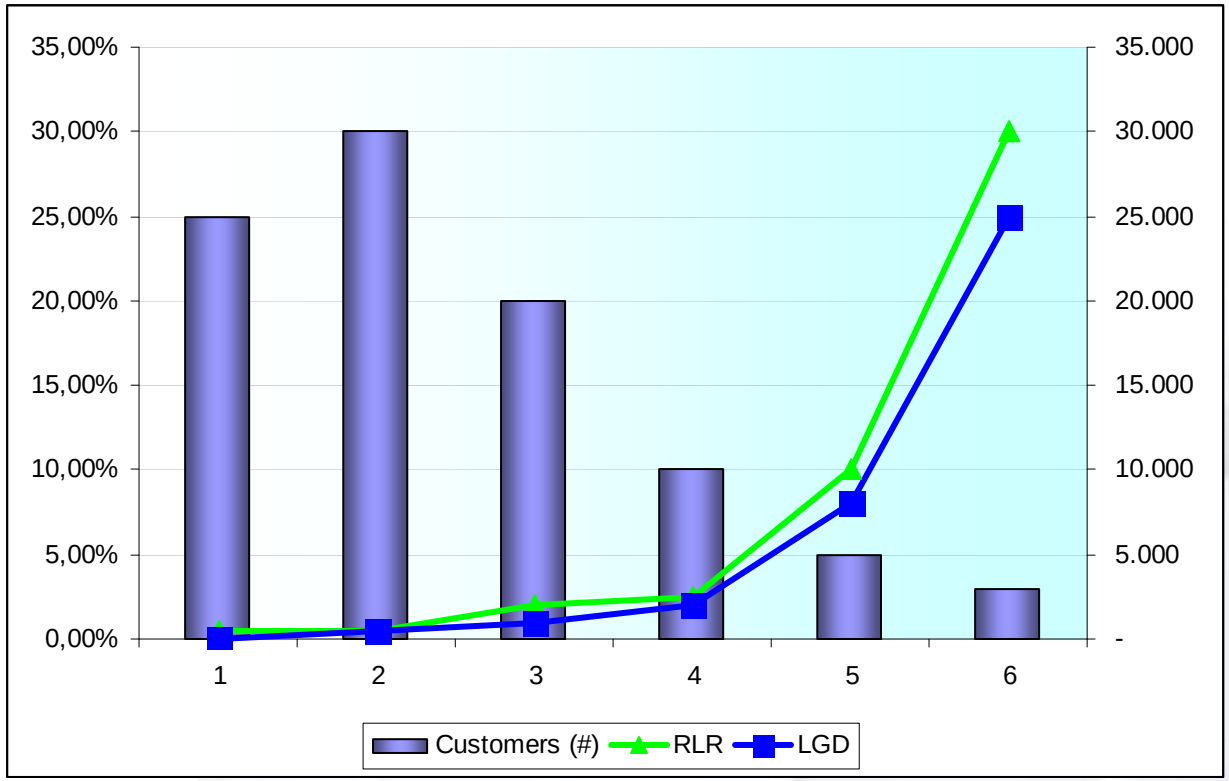
EL =	Non- Defaults	Defaults
LGD X	Loss Given Default model	LGD Best Estimate model
PD X	Probability of Default model	PD fixed 100%
EAD	Exposure at Default estimate	

Modelling: Rating

Risk Factors



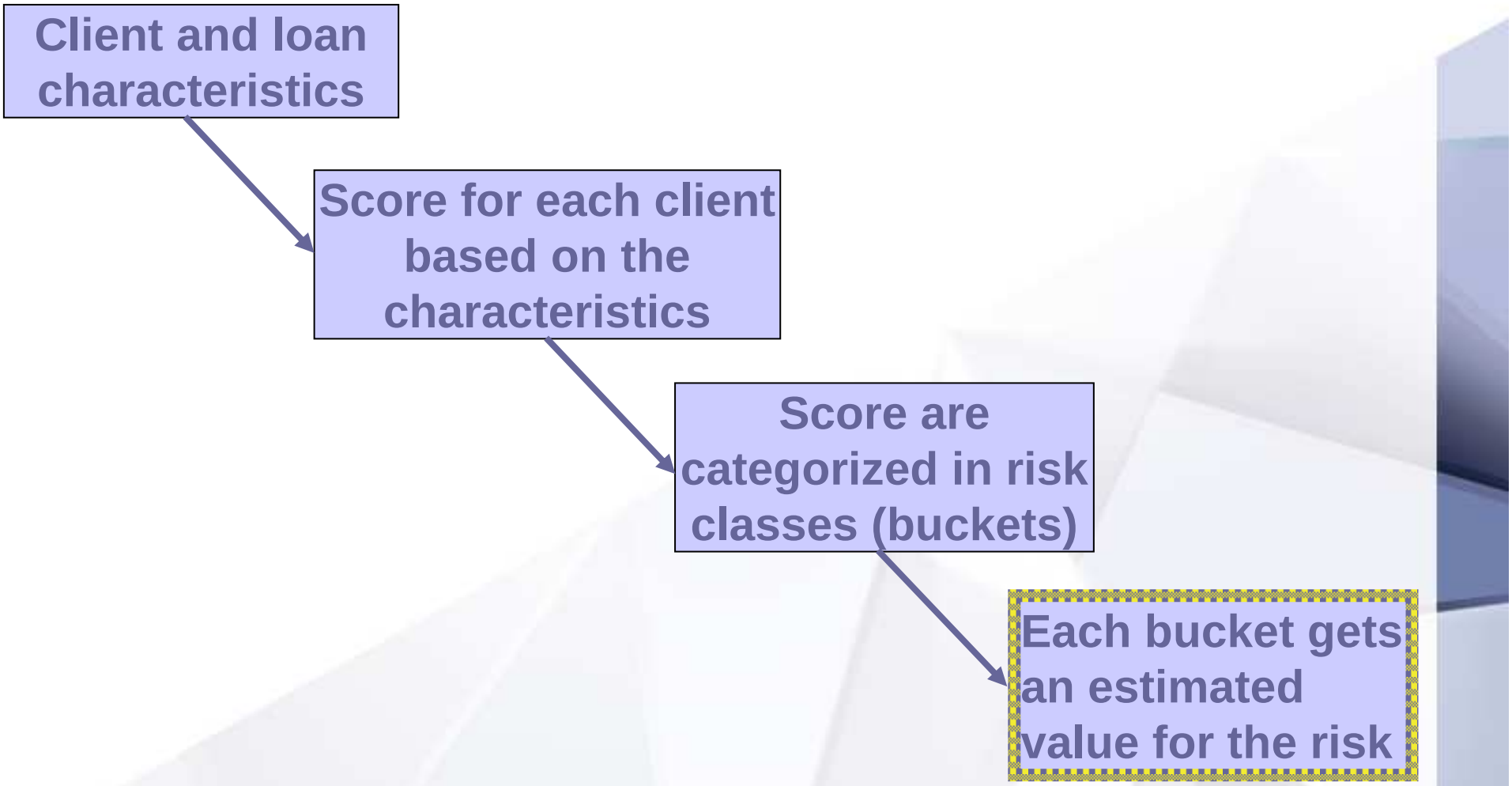
Clients are categorised in buckets



- Buckets have strictly increasing estimate (LGD or PD)
- Sufficient observations needed to create buckets

Modelling: Level

Scoring in pools versus estimated value



Estimated values

Commonly based on historical data

How can we get these values up to date?

Example

PD pools

1	0.01 %
2	0.05 %
3	0.20%
4	1.00%
5	2.00%
6	8.00%
7	15.00%
8	25.00%

LGD pools

1	0.02%
2	0.09%
3	0.50%
4	2.10%
5	7.00%
6	13.00%
7	18.00%
8	30.00%

Calibration of the estimated value

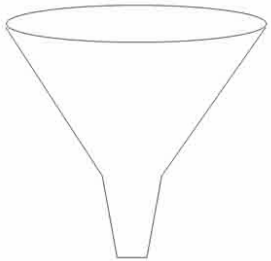
Layers

- Client (1)
- Risk buckets (2)
- Portfolio (3)

(1)

Frequency

- monthly
- quarterly
- yearly



(2)

Average Value Estimated

(3)

Realisation matrix (observed in the xth month)

Period \ month	1	2	3	4	5	6	7	8	…	22	23	24	>24
200711	3.4	3.2	1.2	1.5	0.9	0.5	0.2	0.0		0.0	0.2	0.1	0.0
200712	6.2	4.2	1.3	1.3	1.1	0.4	0.3	0.6		0.0	0.1	0.2	0.0
200801	2.3	2.3	1.9	1.2	0.7	1.2	0.4	0.1		0.1	0.0	0.1	0.1
200811	2.3	4.3	2.3	1.2	0.8	2.2	0.1	0.0					
200812	3.5	3.4	2.1	3.2	1.0	0.2	0.6	0.3					
200901	3.2	4.5	2.2	0.9	1.2	0.6	0.2	0.1					
200902	3.4	4.2	1.2	2.1	0.4	0.1	0.3						
200903	1.7	3.2	1.9	1.2	0.8	0.7							
200904	2.3	1.9	2.6	1.1	1.0								
200905	3.4	4.2	2.	1.4									
200906	5.4	2.1	2.										
200907	3.4	5.5											
200908	4.4												
200909													

Not observable at the period 200909

PD: clients observed in 200902 and in default in the 3rd month

LGD: clients in default in 200902 and recovered / lost in the 3rd month

Economic Loss Term

How to deal with a default with a very long default period

Period \ month	1	2	3	4	5	6	7	8	…	22	23	24	>24
200711	3.4	3.2	1.2	1.5	0.9	0.5	0.2	0.0		0.0	0.2	0.1	0.0
200712	6.2	4.2	1.3	1.3	1.1	0.4	0.3	0.6		0.0	0.1	0.2	0.0
200801	2.3	2.3	1.9	1.2	0.7	1.2	0.4	0.1		0.1	0.0	0.1	0.1
200811	2.3	4.3	2.3	1.2	0.8	2.2	0.1	0.0					
200812	3.5	3.4	2.1	3.									
200901	3.2	4.5	2.2	0.9	1.2	0.6	0.2	0.1					
200902	3.4	4.2	1.2	2.1	0.4	0.1	0.3						
200903	1.7	3.2	1.9	1.2	0.8	0.7							
200904	2.3	1.9	2.6	1.1	1.0								
200905	3.4	4.2	2.1	1.4									
200906	5.4	2.1	2.3										
200907	3.4	5.5											
200908	4.4												
200909													

Estimate the loss

Realisation matrix (observed in the x^{th} month)

Period \ month	1	2	3	4	5	6	7	8	…	22	23	24	>24
200711	3.4	3.2	1.2	1.5	0.9	0.5	0.2	0.0		0.0	0.2	0.1	0.0
200712	6.2	4.2	1.3	1.3	1.1	0.4	0.3	0.6		0.0	0.1	0.2	0.0
200801	2.3	2.3	1.9	1.2	0.7	1.2	0.4	0.1		0.1	0.0	0.1	0.1
200811	2.3	4.3	2.3	1.2	0.8	2.2	0.1	0.0					
200812	3.5	3.4	2.1	3.2	1.0	0.2	0.6	0.3					
200901	3.2	4.5	2.2	0.9	1.2	0.6	0.2	0.1					
200902	3.4	4.2	1.2	2.1	0.4	0.1	0.3						
200903	1.7	3.2	1.9	1.2	0.8	0.7							
200904	2.3	1.9	2.6	1.1	1.0								
200905	3.4	4.2	2.1	1.4									
200906	5.4	2.1	2.3										
200907	3.4	5.5											
200908	4.4												
200909													

SUM X_t

SUM X_{t+1}

SUM X_{t+1}

Historic data used for calibration

How to use the realisations

- Linear regression
  - a x + b = y
  - a = 1 and x +b =y

  $\Rightarrow$ linear trend taken

- Moving Average
  - 1/n Sum (x) =y

  $\Rightarrow$ average over the last n observations

- Exponential Smoothing
  - a y(t) = x(t) + (1- a)y(t-1)

  =>weighted moving average

Realisation matrix (observed in the x^{th} month)

Period \ month	1	2	3	4	5	6	7	8	…	22	23	24	>24
200711	3.4	3.2	1.2	1.5	0.9	0.5	0.2	0.0		0.0	0.2	0.1	0.0
200712	6.2	4.2	1.3	1.3	1.1	0.4	0.3	0.6		0.0	0.1	0.2	0.0
200801	2.3	2.3	1.9	1.2	0.7	1.2	0.4	0.1		0.1	0.0	0.1	0.1
200811	2.3	4.3	2.3	1.2	0.8	2.2	0.1	0.0					
200812	3.5	3.4	2.1	3.2	1.0	0.2	0.6	0.3					
200901	3.2	4.5	2.2	0.9	1.2	0.6	0.2	0.1					
200902	3.4	4.2	1.2	2.1	0.4	0.1	0.3						
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200907	3.4	5.5											
200908	4.4												
200909													

X_t X_{t+1} • • • • • Historic data used for calibration

Which is the best

Root mean square error

$$\sqrt{\frac{1}{n}\sum_{t=1}^{n}(y_t - z_t)^2}$$

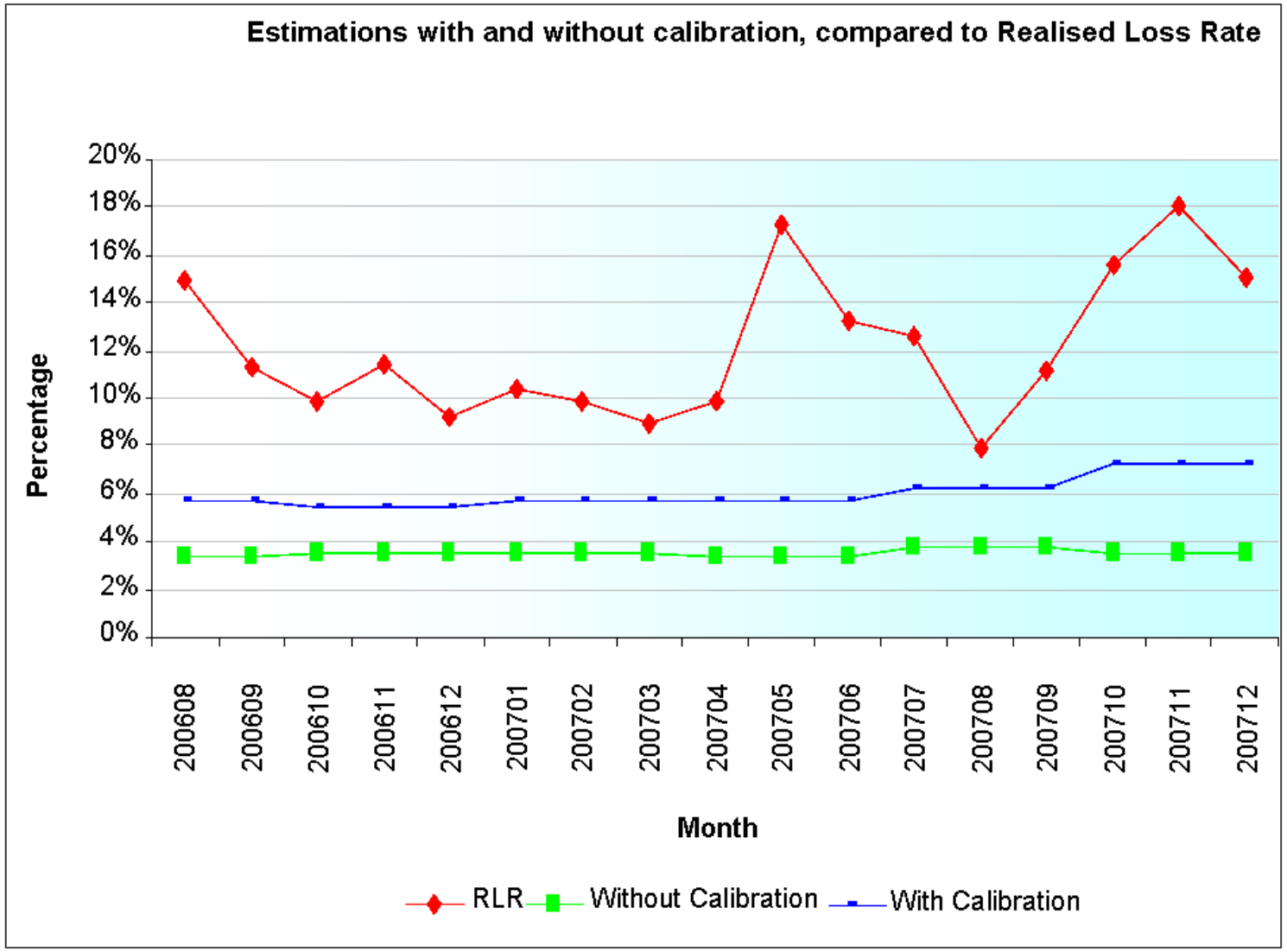
Mean square error

$$\frac{1}{n}\sum_{t=1}^{n}\left|y_t - z_t\right|$$

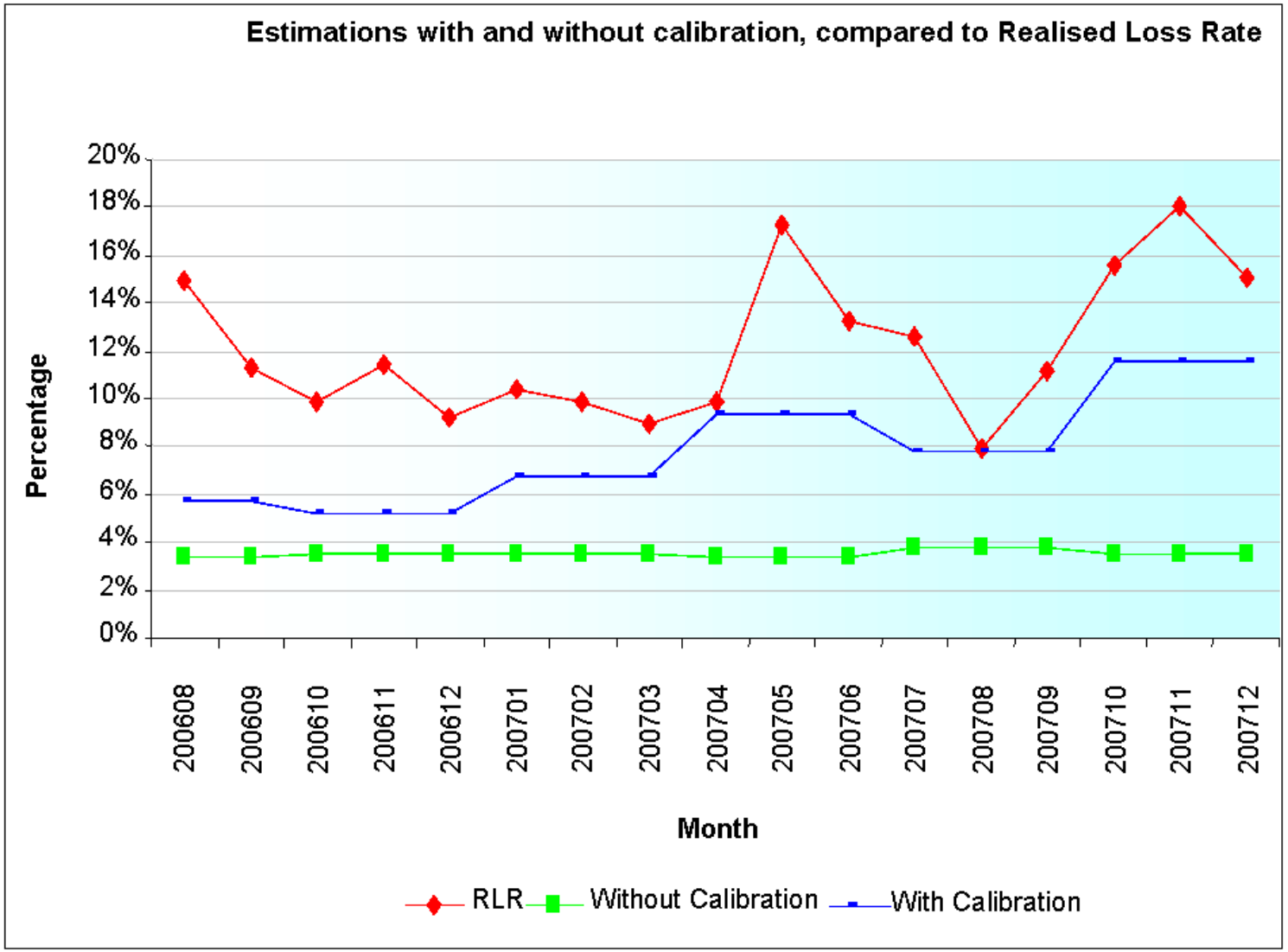
Mean absolute percentage error

$$\frac{1}{n}\sum_{t=1}^{n}\left|\frac{y_t - z_t}{z_t}\right|$$

Results for moving average (LGD)



Results for moving average (LGD)



Conclusion

- Basel II
  - guidelines → credit risk models
- Observed
  - Realisations versus estimates
- Calibration is needed
  - Using historical data avoiding the performance period
- Case study

Remarks

- ELT
- Macro economic variables