



Fight against money laundering

application in life insurance



Eurobanking 2010 – Utrecht

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1 Introduction

2 Data

3 Warning indicator conception

4 Selection of groups with homogeneous behaviour

5 Results

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Fight against money laundering regulation is evolving

- **EU 3rd money laundering directive**
 - Compliance obligation
 - Strengthen fraudulent operations detection
 - Fight against money laundering using a risk approach

- **Life insurance companies**
 - **FFSA**
 - French Federation of Insurance Companies
 - **ACAM**
 - Former regulator of Insurance Companies
 - Now merged with the Bank regulator (Commission Bancaire)
 - **TRACFIN**
 - Public unit for money-laundering fight

- **Consequences for the company**
 - If money laundering is not declared in time, the company can be sentenced
 - Fines
 - Prison sentence
 - Cancellation of practice authorization

Evolution of the alerts system

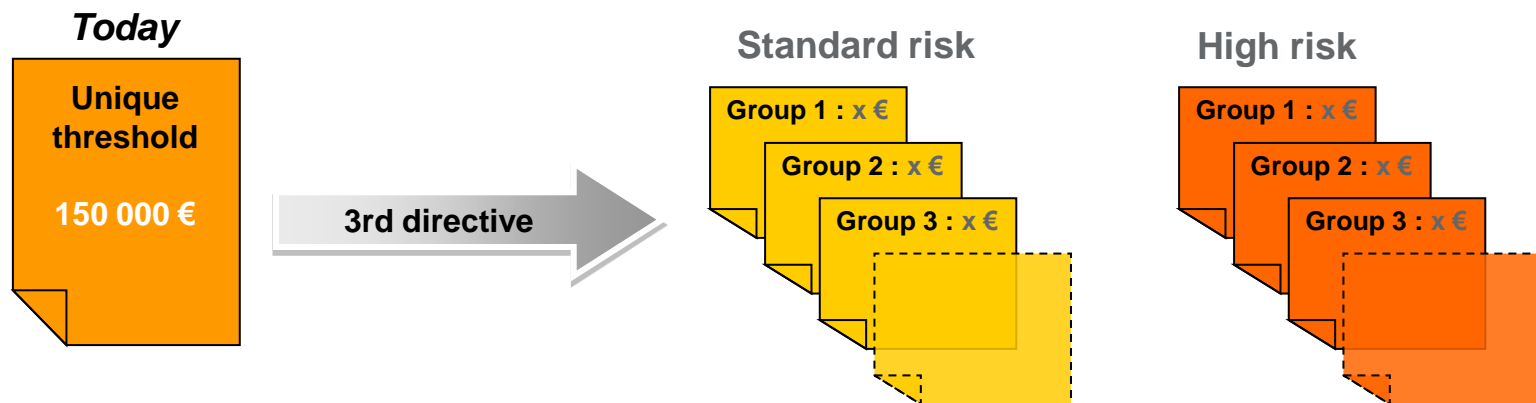
■ Alerts system

□ Qualitative criteria

- Renunciation during period of consideration
- Politically exposed person (PEP)
- Foreign registered address
- ...

□ Quantitative criteria

- Applied on one single operation or cumulative ones



Back to unit operations on life insurance contracts

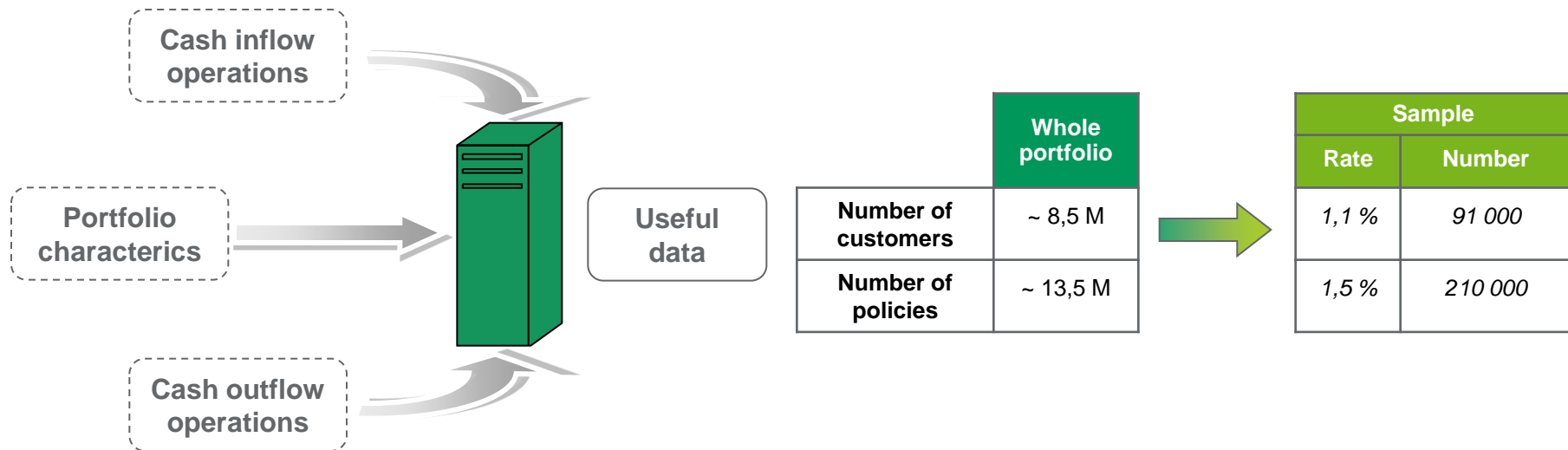
■ Data

□ Historical data

- Since 2005: 4 years of data
- Exhaustiveness of the policies, persons and operations

□ Need to sample the life insurance portfolio

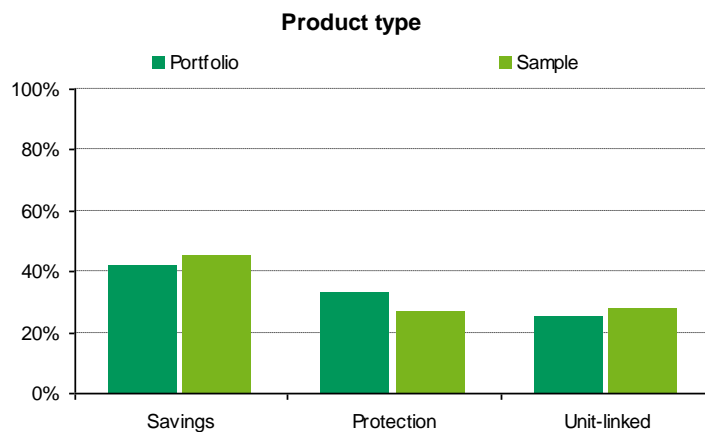
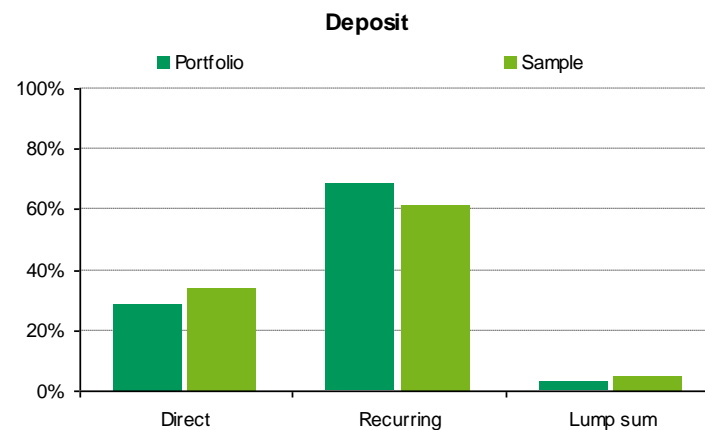
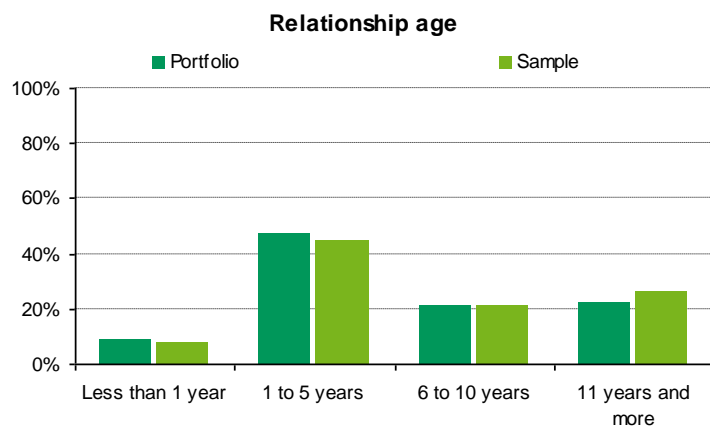
- Random sampling rate ~ 1 %



Sample representativity

■ Comparison between sample and whole portfolio

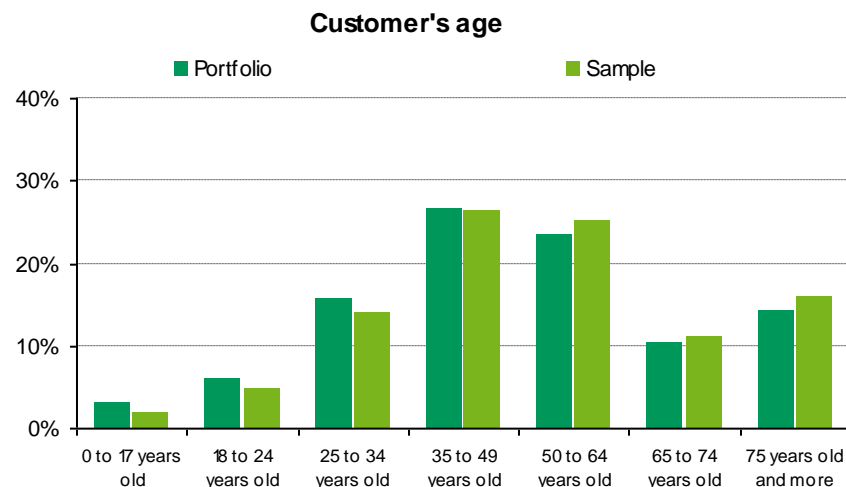
□ Policy level



Sample representativity

■ Comparison between sample and whole portfolio

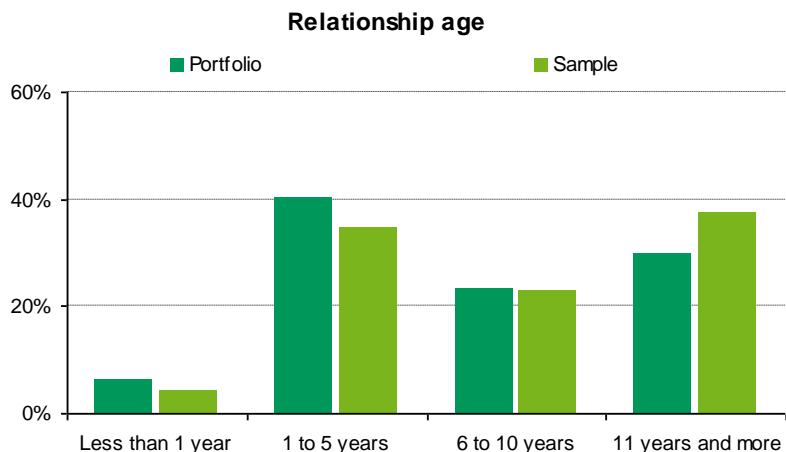
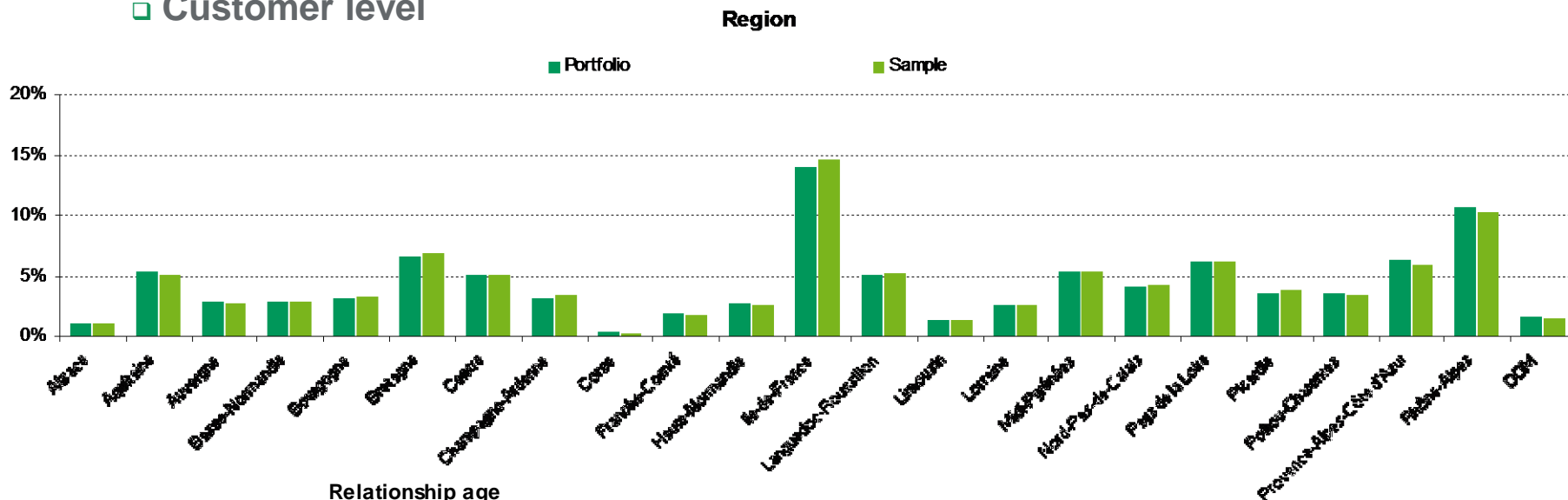
□ Customer level



Sample representativity

■ Comparison between sample and whole portfolio

□ Customer level



Stability index → **OK** for all variables

Conception and use of relevant warning indicators

■ What do we want to detect ?

- Warning indicators have to fulfill 2 targets...

Identification of **unusual behaviour**
in comparison to
the average behaviour of the whole
customers or groups of customers

Identification of an **unusual operation** on a specific policy
in comparison to
the past observed life of the policy

- ... using two kind of indicators

Amounts

Ratios



Calculated on cash in and outflow operations

Conception and use of relevant warning indicators

■ Wich indicators and what kind of criteria to apply ?

□ Calibration of thresholds

- For each indicator : analysis of the cumulative distribution
- Thresholds set to select extreme value of the indicators
 - Suggested analysing cumulative distribution
 - Try to fit distribution on a theoretical law
 - Chosen discussing with business experience

□ Selection of relevant indicators and fine tuning of thresholds

- Simulation of the production of risk alerts for each indicator and linked threshold
- Optimization under two constraints
 - Redundancy of indicators
 - Workload of people in charge of investigations

■ Amounts

$$\square I_1 = \sum_{m-1}^{m-12} Amount_{\text{direct payment}}$$

$$\square I_2 = \sum_{m-1}^{m-12} Amount_{\text{withdrawal}}$$

$$\square I_3 = Amount_{\text{initial payment}}$$

$$\square I_4 = Amount_{\text{buyback}} \text{ (if not due to insured death)}$$

■ Ratios

$$\square \zeta_1 = \frac{Max_m (Amount_{\text{direct payment}})}{Max_{m=1}^{m-12} Amount_{\text{direct payment}}}$$

$$\square \zeta_2 = \frac{\sum_{m-1}^{m-12} Amount_{\text{direct payment}}}{Amount_{\text{initial payment}}}$$

$$\square \zeta_3 = \frac{\sum_{m-1}^{m-12} Amount_{\text{direct payment}}}{\sum_{m-13}^{m-24} Amount_{\text{direct payment}}}$$

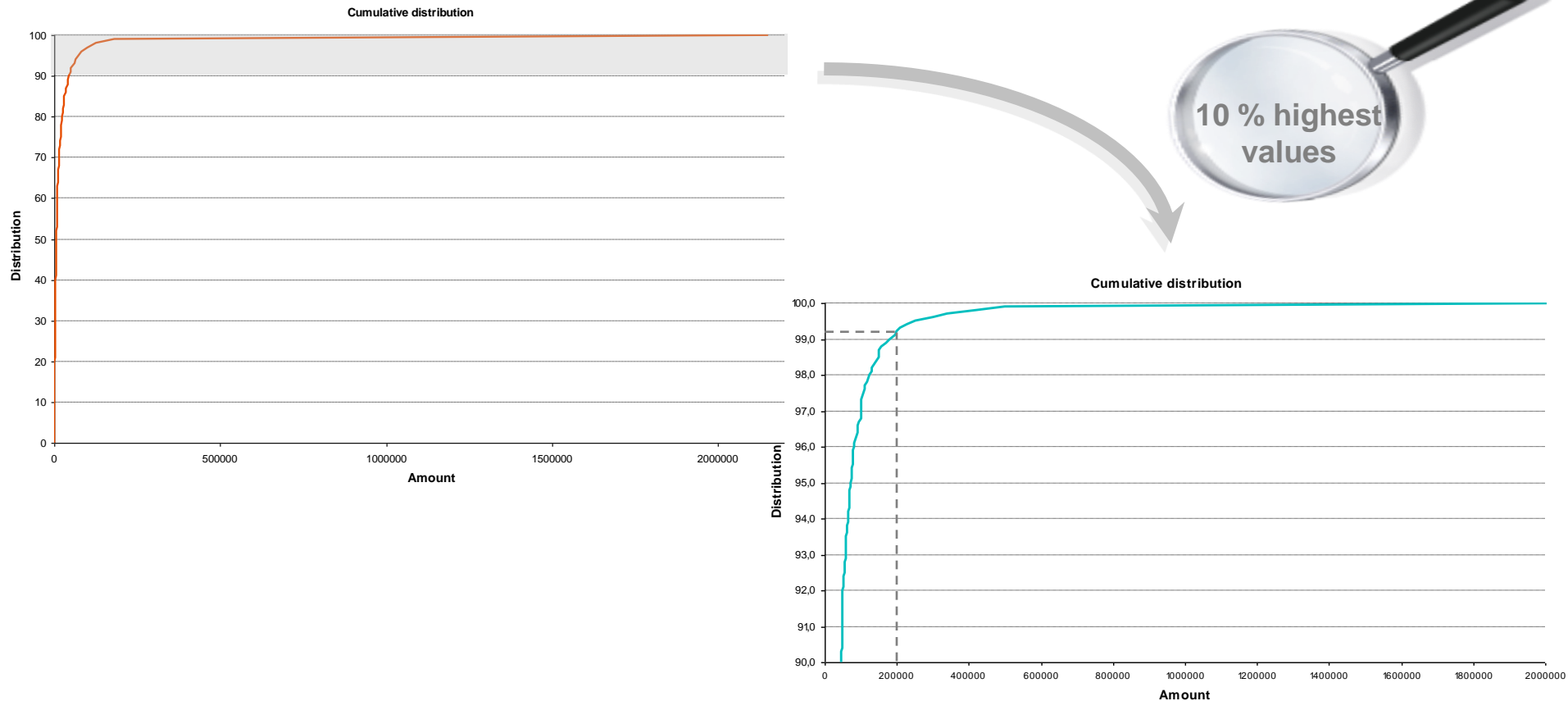
$$\square \zeta_4 = \frac{\sum_{m-1}^{m-12} Amount_{\text{withdrawal}}}{\sum_{m-1}^{m-12} Amount_{\text{direct payment}}} \quad \text{(rotation rate)}$$

Calibration of thresholds

Graphical analysis

■ Example on an indicator

□ Distribution of indicator I on the portfolio



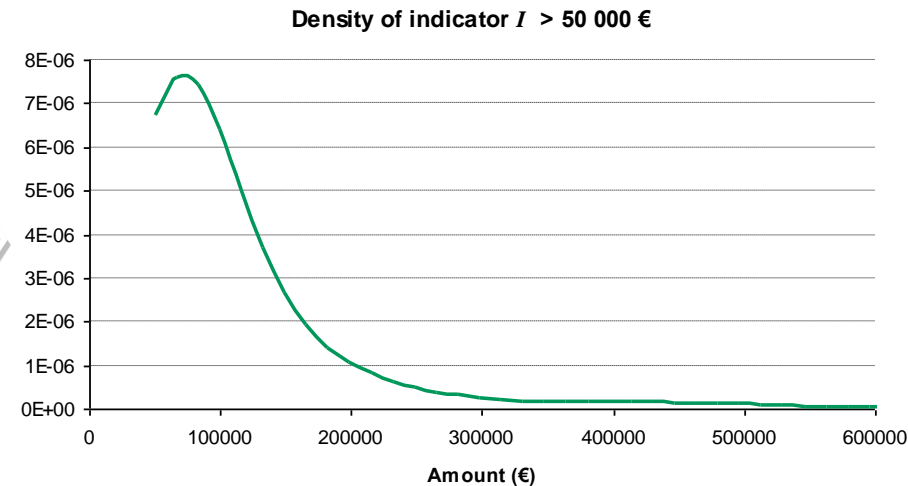
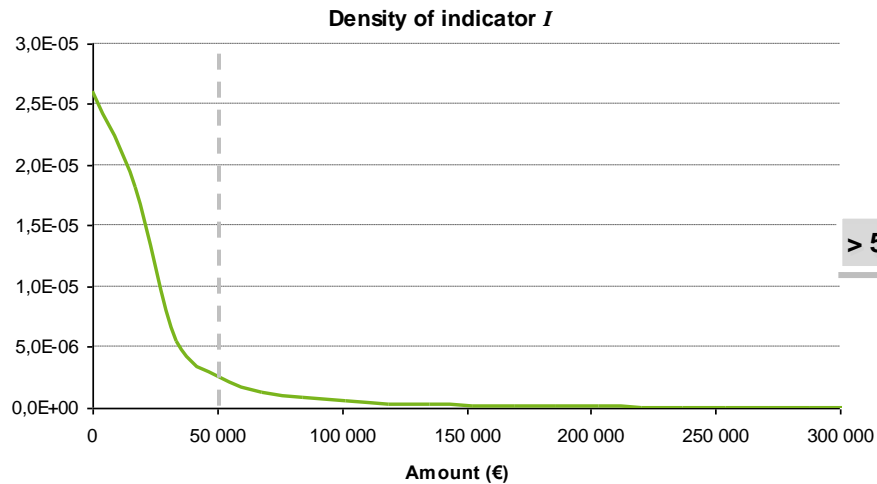
Elbow method → threshold = 200 000 €

Calibration of thresholds

Fitting a theoretical law

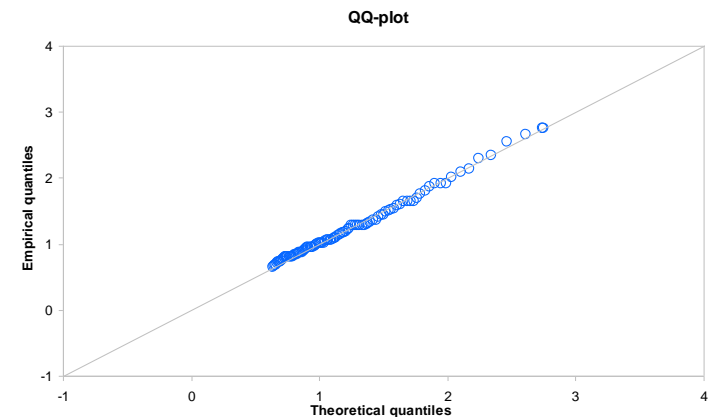
■ Example on an indicator

□ Empirical density



□ Fitting a lognormal law

- QQ-plot: well fit
- Proportion of operations $< 50\ 000\ €$
Empirical : **90.5 %** | Theoretical : **90.1 %**
- **Theoretical 99-centile \rightarrow threshold = 210 000 €**



Typology on customers : methodology

■ Multiple correspondance analysis

Active variables

Age

Relationship age

Age of policy

Region

Withdrawal in 2008 : yes / no

Direct payments in 2008 : yes / no

Direct payments in 2007 : yes / no

Policy amount at 30/11/2008

Policy amount at 31/12/2007

Cumulative recurring amount over 2008

□ Two axes

• Axis 1

Customers slowly beginning their long-term savings vs customers with savings totally accumulated

• Axis 2

Long-term savings activity level

■ Hierarchical clustering

- Using MCA dimensions
- Iterative processus to cluster the population in order to:
 - minimize intra cluster variance
 - maximize inter cluster variance

□ Four clusters kept

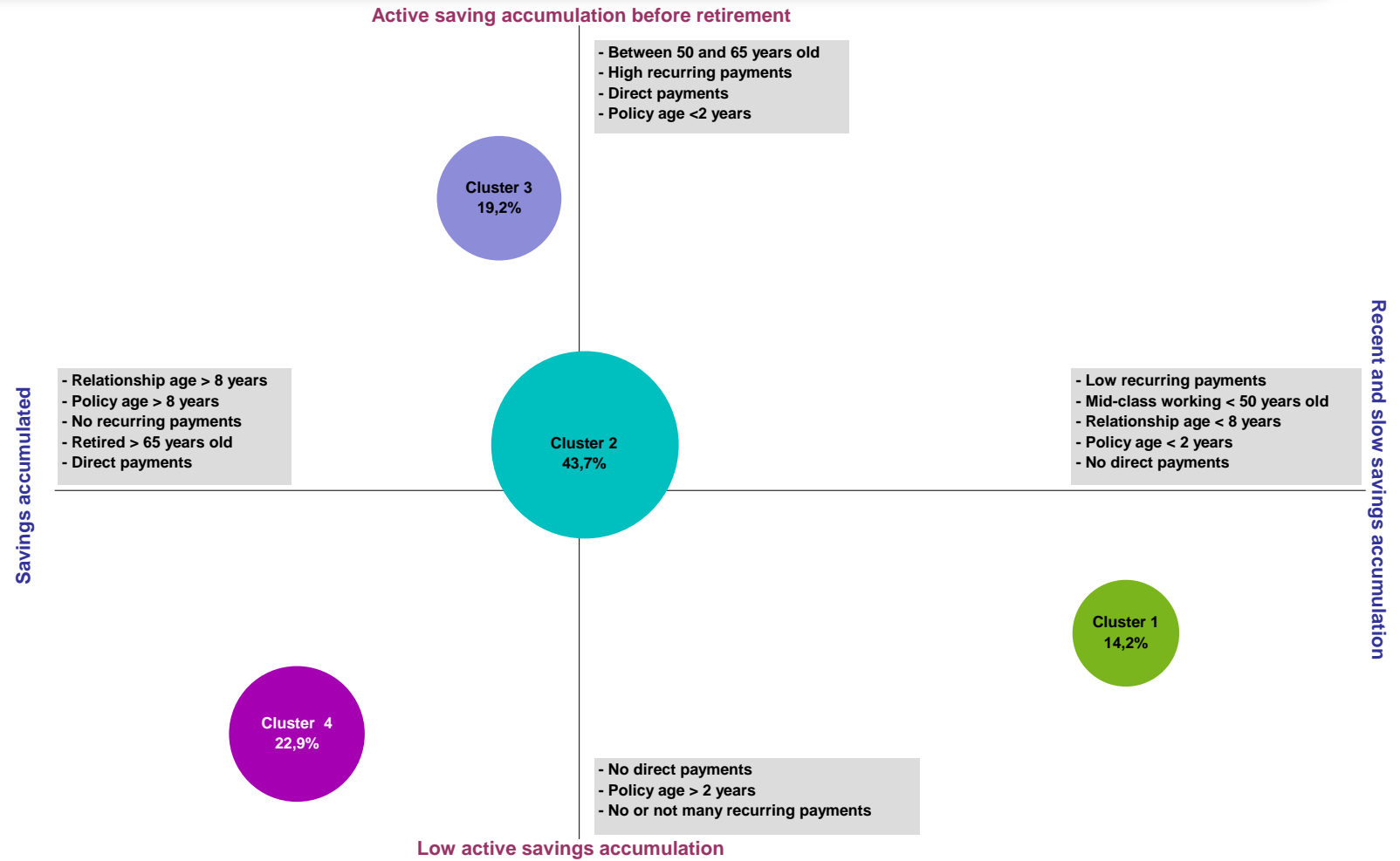
Cluster 1
Begin one's savings

Cluster 2
Savings for the future

Cluster 3
Plan one's retirement

Cluster 4
Enjoy retirement

Representation of the results



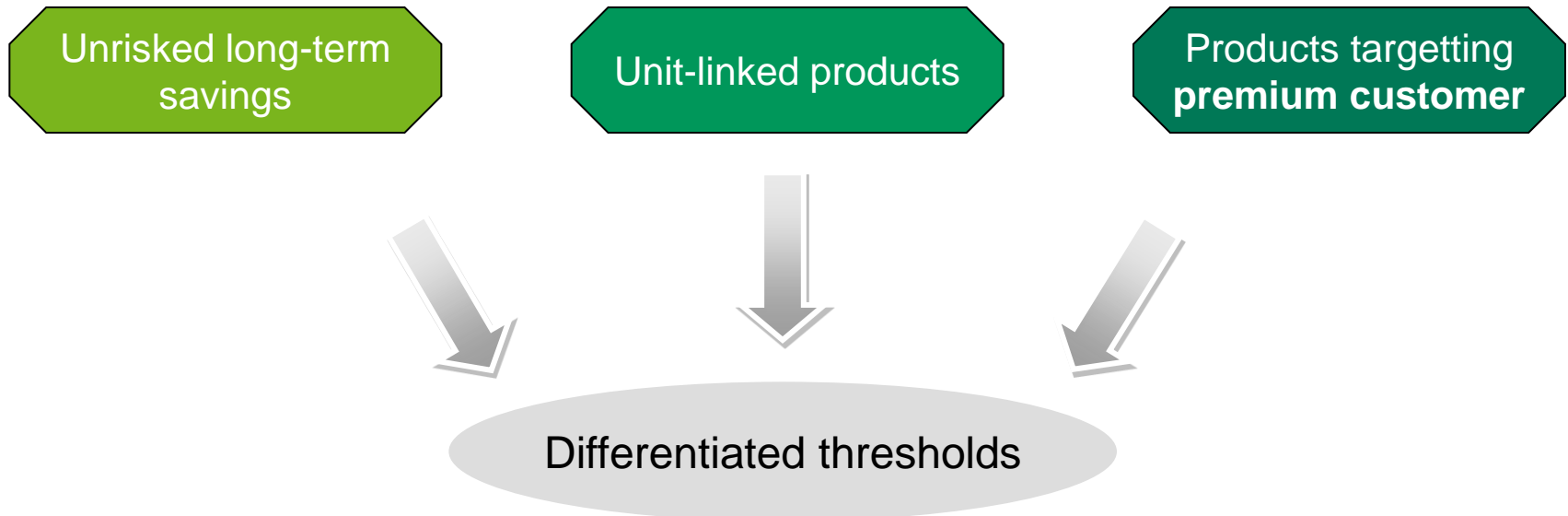
➔ no significant differences between indicators distributions over the 4 clusters

■ Products groups

□ Definition of homogeneous groups of products

- from a marketing point of view
- based on business experience

→ 3 products groups



Results by group and risk level

■ Indicators thresholds

- Differentiated by products group and risk level

		Long-term savings		Unit-linked		Premium Customers	
		Standard Risk	High Risk	Standard Risk	High Risk	Standard Risk	High Risk
Amounts	I_1	$x_1 \text{ €}$	$y_1 \text{ €}$	$x_1' \text{ €}$	$y_1' \text{ €}$	$x_1'' \text{ €}$	$y_1'' \text{ €}$
	I_2	$x_2 \text{ €}$	$y_2 \text{ €}$	$x_2' \text{ €}$	$y_2' \text{ €}$	$x_2'' \text{ €}$	$y_2'' \text{ €}$
	I_3	$x_3 \text{ €}$	$y_3 \text{ €}$	$x_3' \text{ €}$	$y_3' \text{ €}$	$x_3'' \text{ €}$	$y_3'' \text{ €}$
	I_4	$x_4 \text{ €}$	$y_4 \text{ €}$	$x_4' \text{ €}$	$y_4' \text{ €}$	$x_4'' \text{ €}$	$y_4'' \text{ €}$
Ratios	ζ_1	a_1	numerator > $b_1 \text{ €}$	a_1'	numerator > $b_1' \text{ €}$	a_1''	numerator > $b_1'' \text{ €}$
	ζ_2	a_2	numerator > $b_2 \text{ €}$	a_2'	numerator > $b_2' \text{ €}$	a_2''	numerator > $b_2'' \text{ €}$
	ζ_3	a_3	numerator > $b_3 \text{ €}$	a_3'	numerator > $b_3' \text{ €}$	a_3''	numerator > $b_3'' \text{ €}$
	ζ_4	$a_4 \leq . \leq b_4$	numerator > $b_4 \text{ €}$	$a_4' \leq . \leq b_4'$	numerator > $b_4' \text{ €}$	$a_4'' \leq . \leq b_4''$	numerator > $b_4'' \text{ €}$

Results by group and risk level

■ Simulation of alerts

- The defined thresholds are applied to simulate the generation of alerts on the historical data sample
- Extrapolation to the whole portfolio on 2008 and comparison to 2008 realisation

		Simulation	2008
Standard risk →	Long-term savings	2250	1300
	Unit-linked	4350	2400
	Premium Customers	6750	9150
	TOTAL	13350	12850
High risk →	Long-term savings	1550	1300
	Unit-linked	2900	2400
	Premium Customers	3600	9150
	TOTAL	8050	12850

Application of the results

■ Use of this new rules

- Computing programming and implementation of the alerts
- Operational use for the subsidiary in 2011
- Both qualitative and quantitative rules will be used

■ Risk approach

- Adapting the alerts to the policy/client profile to fight more efficiently against money laundering
 - By products group
 - By risk level
- No decrease of the number of alerts, but more relevant triggering criteria
 - Significant decrease for Premium Customers

■ What about banking ?

- Existing processes in banks and exchange between entities
- This study can inspire new process to fight against money laundering in banking
- We have more information on bank customers so the process can take into account more descriptive variables