Analysis of the loss portfolio securities as an example of lease contracts
The case study for the Polish Leasing Market

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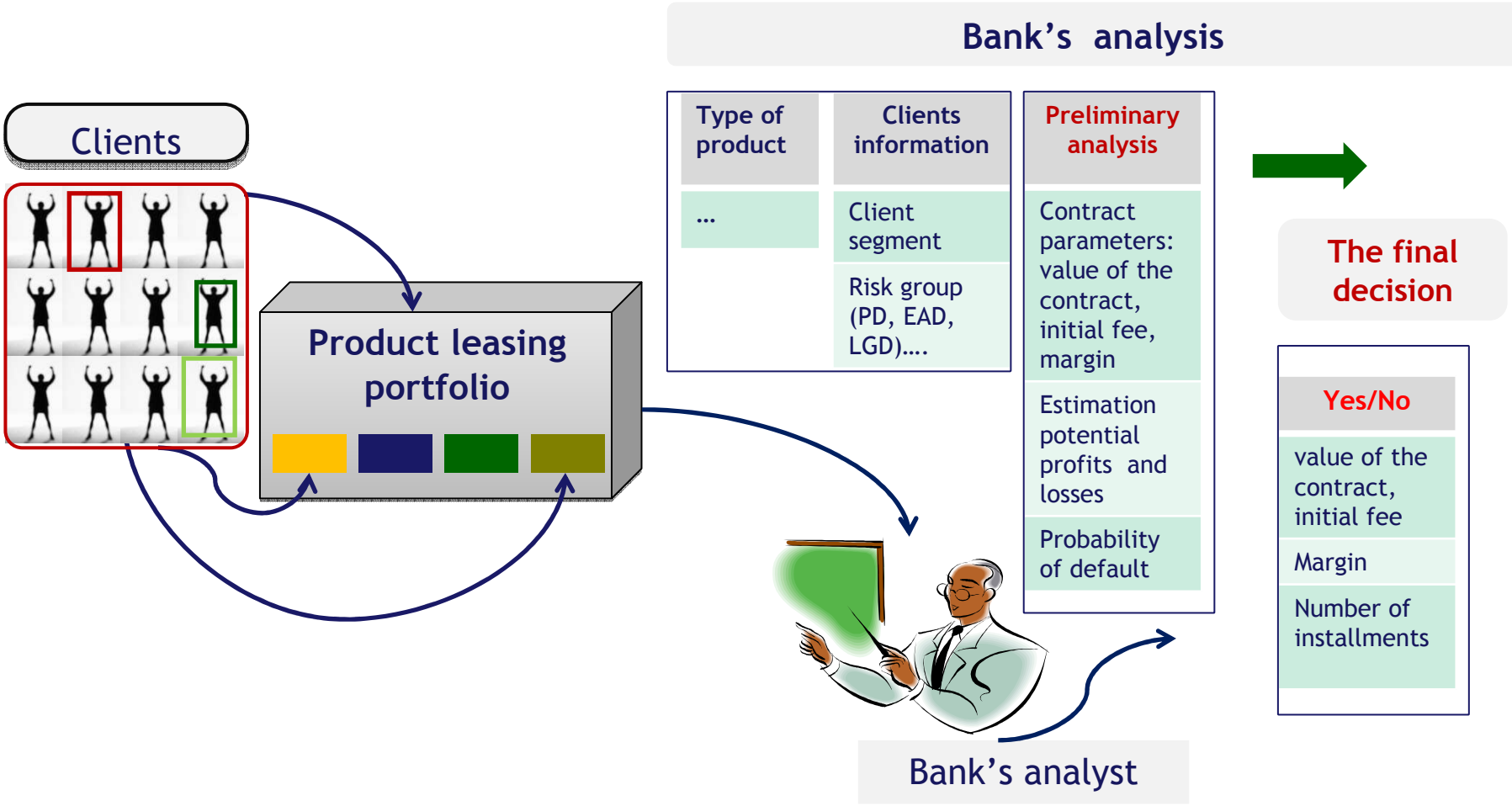
Agenda

- Goal of the project
- Method of LGD estimation
- Case study

Case study

The Bank's pain - maximize the the credit portfolio profits and minimize losses



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- **Method of LGD estimation**
- Case study

Method of LGD estimation
Definition of LGD

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Posssible approaches

- **Market LGD** - applicable for exchange/market traded instruments
- **Implied Market LGD** - applicable for illiquid bonds
- **Implied Historical LGD** – used for retail portfolio only
- **Workout LGD**
  - Predictive model, bottom-up, PIT approach
  - Based on cash flow records
  - Transactions assigned to OpRisk excluded
  - Future recoveries depend on the state of the economy and are a function of the number of days of the collection process
  - Conservative approach - recoveries for the incomplete processes equal zero

Method of LGD estimation
Definition of LGD

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Predictive model for Work-out Method

General formula:

$$LGD \overset{def}{=} \frac{Economical\ loss}{EAD}$$

$$= \left(\frac{EAD - \sum_i \left(R_i(r) + W_i(r) \right) + \sum_k \left(C_{direct,k}(r) + C_{indirect,k}(r) \right)}{EAD} \right)$$

- EAD – Exposure at Default
- R, W – Realization proceeds (recoveries, clients payment)
- $C_{indirect}$ - Indirect costs during recovery period
- C_{direct} - Direct costs during recovery period
- r -Discounted rate

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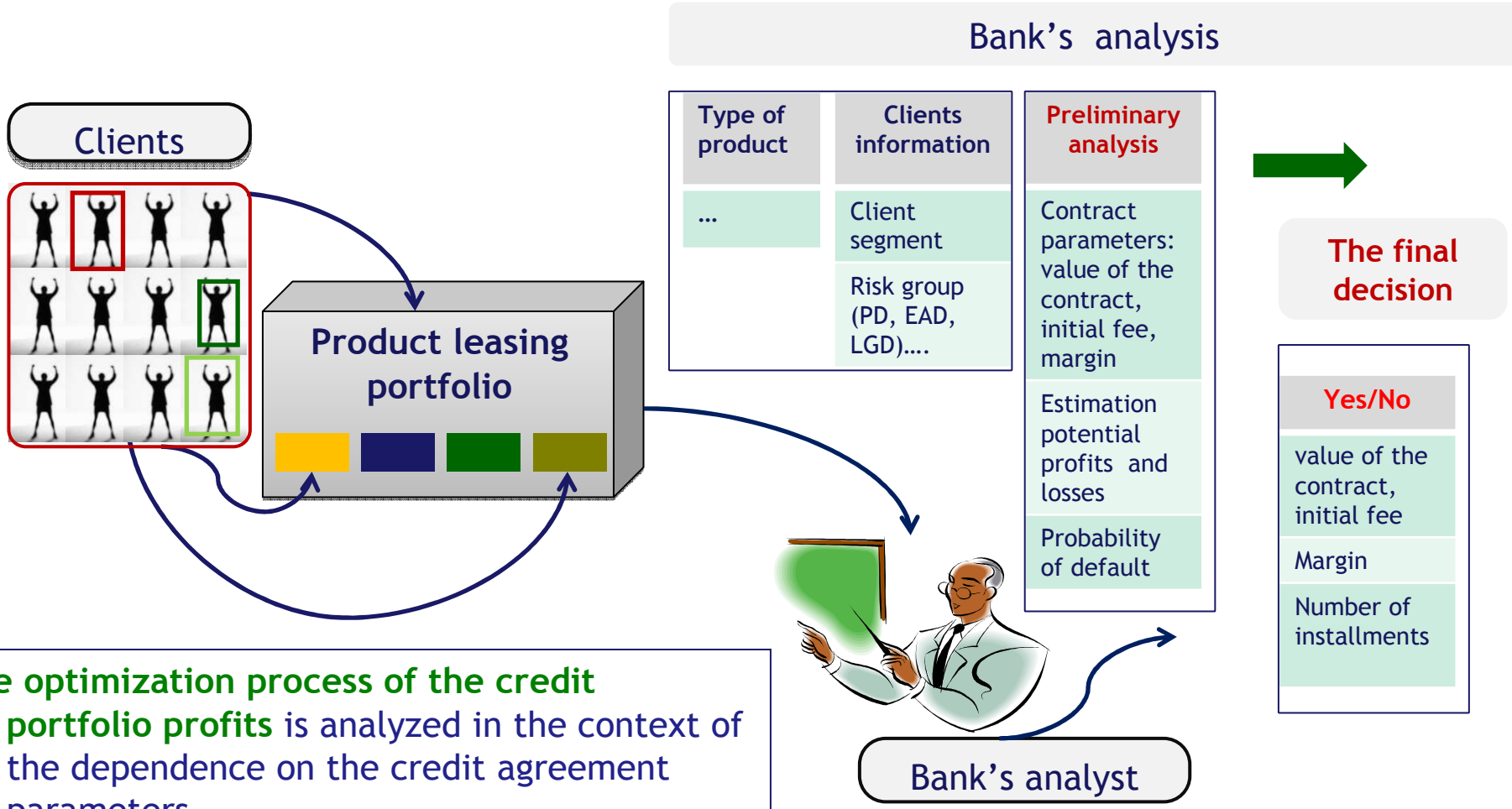

The optimization process of the credit portfolio profits is analyzed in the context of the dependence on the credit agreement parameters

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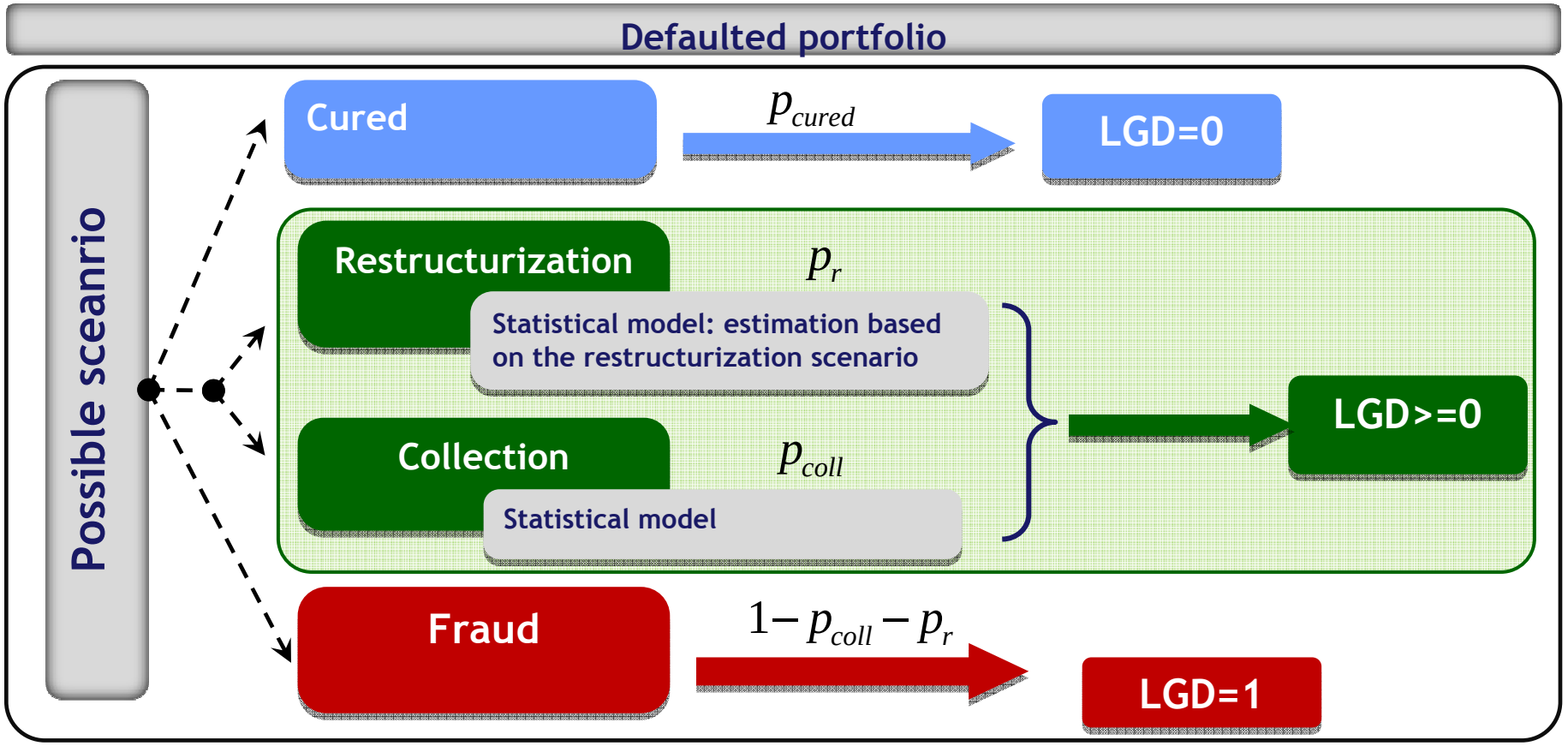

$$LGD = 0 \cdot p_{cured} + (1 - p_{cured})\left[p_r \cdot E(LGD \mid R) + p_{coll} \cdot E(LGD \mid W_{coll}) + (1 - p_r - p_{coll}) \cdot E(LGD \mid F)\right]$$

- p_{cured} probability of cure
- p_r probability of restructurization
- p_{coll} probability of collection

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Required data

- **The data set,** which was provided by Polish leasing companies **covers the period between 2007 and 2010**
- **The data set used in the LGD modeling** contains information about:
  - collaterals
  - transaction data
  - application and behavioral empirical LGD data
- **The underlying assets** are segmented into **four general classes**:
  - machinery, equipment, vehicles, real estate

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Analysis of the loss portfolio securities as an example of the lease contracts

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Required data

- **Collateral data:**
  - type (on-balance, off-balance), interest rate, amounts, purpose, guarantees, collection actions, etc.
- **Product Information:**
  - amounts, dates, status, purpose, limits, product features, etc.
- **Company Level Information:**
  - relative seniority of a claim, distance to default, etc.
- **Industry Information:**
  - industry recovery average, etc.
- **Macroeconomic and Geographic Information:**
  - unemployment rate, 1yr treasury rate, etc.
- **Default and Recovery data** (empirical LGD)
  - recoveries dependent on parameters describing the customer
- **Other**
  - Seasonality, economic situation, changes in credits granting policy, volatility of risk drivers, etc.

Market value estimation

Market value of the product is the function of:

- Initial Value *InV*
- Terms of durations *T*
- Type of product α, β, γ

$$MV = InV \cdot \left(\beta \cdot e^{\alpha T} + \gamma\right)$$

Market value *MV* for vehicles (market value plummets the date of purchase):

$$MV = InV \cdot \beta \cdot e^{\alpha T}$$

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Collateral valuation

- **Market-based methods of collaterals evaluations:**
  - **the statistical model approach** –

    market value can be represented as a function of characteristic features similar to the measured objects
  - **the approach based** on the analysis of the selling price of the objects
- **Polish Market Databases:**
  - AMRON, Eurotax – Polish Real Estate and Vehicles Database
  - Polish Federation of Valuers' Associations

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Estimation of the most critical stage of the contract

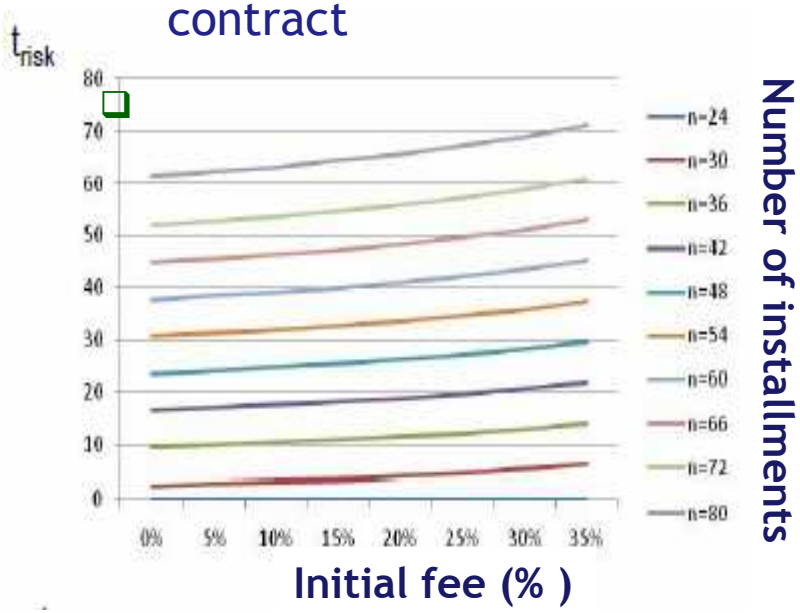
The aim: maximization the ratio of the capital due to pay and the market value of the loan

The risk level is the function of

- *MV*- the market value of the product
- *n*- the number of installments
- Product type
- *IF*- the initial fee
- *VP*- the value of the contract

$$t_{risk} = f(MV, n, VP, IF, product)$$

Time to default



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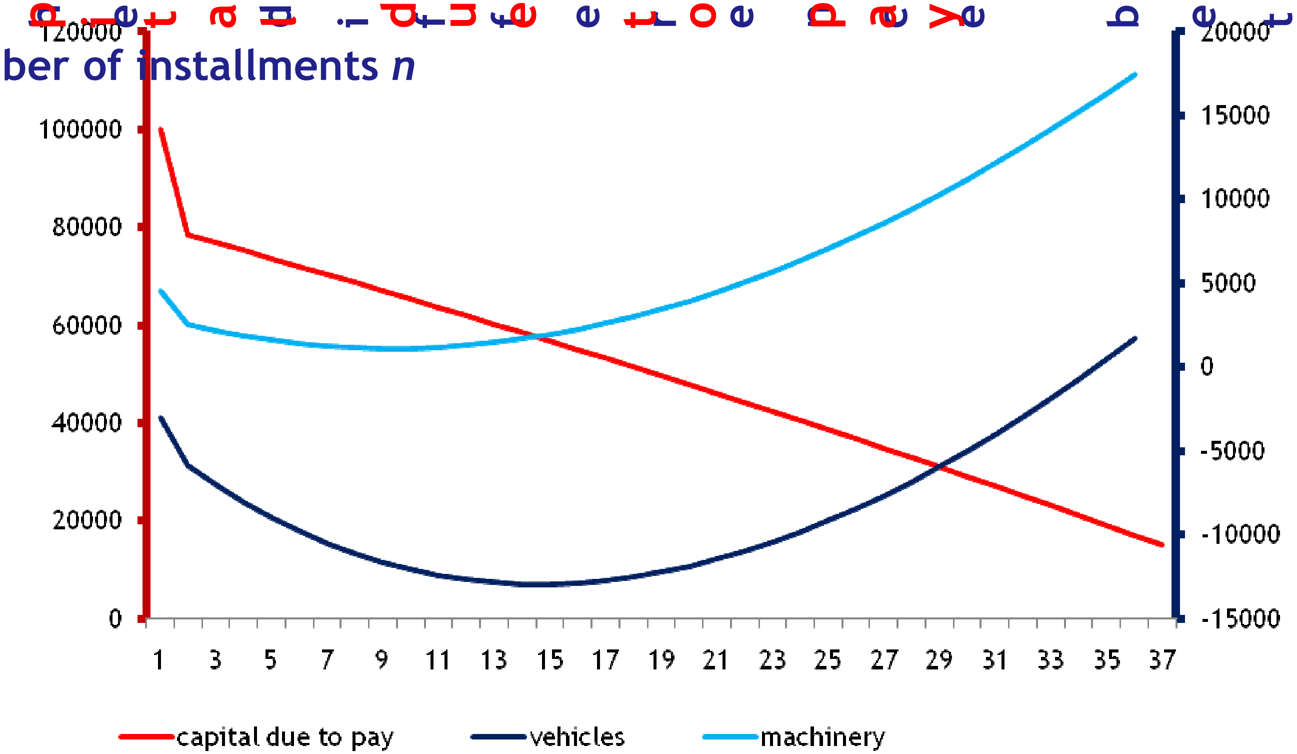
Impact of the contract parameters on recoveries

the number of installments *n*



the value of initial capital = 100 000
the initial fee IF =20 000

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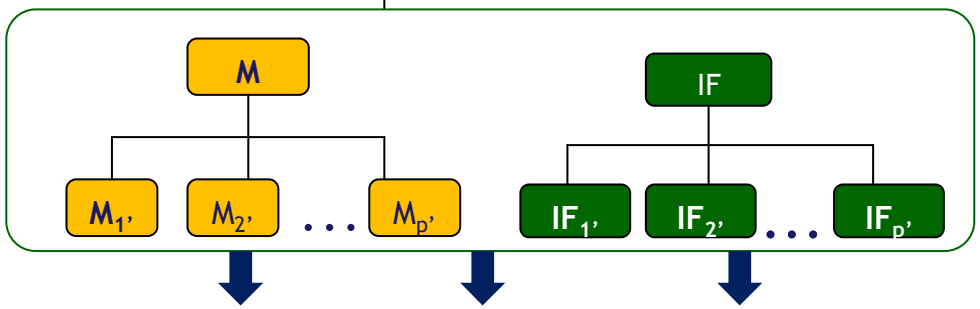
Optimization the portfolio profits with the respect of Initial Fee IF and margin M

How to estimate the portfolio profits with the respect to Initial Fee and Margin?

Historical portfolio for the leasing product A and the customer risk groups

Risk Group 1 | **Risk Group 2** | ... | **Risk Group L**



$$\Delta K \approx K \cdot (\Delta IF) \qquad NPV' \approx NPV \cdot f(\Delta M, \Delta IF, IF, M)$$

$$p_{accept} \approx \frac{1}{1+\max(M - M',0)} \cdot \frac{1}{1+\max(IF - IF',0)}$$

Aggregations profits from every customer

ΔK The difference between the new and the current exposure

NPV' The new value of NPV

p_{accept} Probability of the acceptance the contract on new terms by the customer

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Optimization the portfolio profits with the respect of Initial Fee IF and margin - results

Product type A

Margin

Margin

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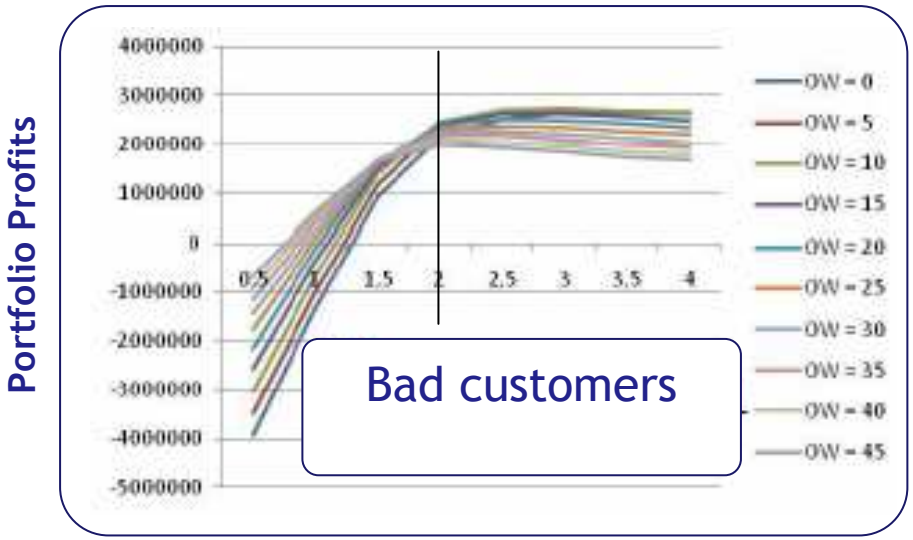
Optimization the portfolio profits with the respect of Initial Fee IF and margin - results

Product type B

Margin



Margin

Conclusions

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Ability to:

- control the risk level assign to the customers
- maximizing portfolio profits
- minimizing losses

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